Draft National Wastewater Sludge Management Plan
National Wastewater Sludge Management Plan

Asset Strategy
# Contents

**Executive Summary**

1 **Introduction** 1
   1.1 Irish Water Role and Responsibilities 1
   1.2 Background to Plan 1
   1.3 Interaction with Irish Water Tier 2 Plans 3
   1.4 What is Wastewater Sludge 4
   1.5 Purpose of National Wastewater Sludge Management Plan 4
   1.6 Key Objectives 5

2 **Sludge Composition, Loads and Outlets** 7
   2.1 Introduction 7
   2.2 Minimisation of Sludge 7
   2.3 Reported Sludge Loads and Outlets 7
   2.4 Estimated Current and Future Sludge Loads 8
   2.5 Domestic Wastewater Treatment Systems Sludge 11
   2.6 Type of Sludge 12
   2.7 Constituents of Wastewater Sludge 14
   2.8 Value of Wastewater Sludge 14

3 **Review of Standards and Plans** 15
   3.1 Introduction 15
   3.2 Current Legislation 15
   3.3 Proposed Legislation 16
   3.4 Legislation within other EU Member States 17
   3.5 Sludge Treatment Standards and Guidance Documents 18
   3.6 Waste Management Plans 19
   3.7 Review of Sludge Management Plans 19

4 **Consultation Process** 24
   4.1 Introduction 24
   4.2 Stakeholders / Consultees 24
   4.3 Public Information Strategy 24
   4.4 Public Consultation Feedback Report 25

5 **Sludge Treatment Processes** 27
   5.1 Introduction 27
   5.2 Sludge Volume Reduction 27
   5.3 Treatment Processes to Produce Biosolids 28
   5.4 Advanced Thermal Sludge Treatment Processes 31
   5.5 Emerging Sludge Treatment Processes 32
   5.6 Sludge Treatment Process to Produce Biosolids 33

6 **Sludge Transport Strategy** 35
   6.1 General 35
   6.2 Existing Sludge Transport 35
   6.3 Sludge Transport Strategy 35
   6.4 Sludge Infrastructure to Optimise Transport Volumes 38

7 **Sludge Satellite and Hub Infrastructure** 41
   7.1 General 41
   7.2 Sludge Satellite Infrastructure 41
   7.3 Sludge Hubs and Treatment Centres 43
   7.4 Sludge Hub and Satellite Centre Assessment by Local Authority Area 45
   7.5 Future upgrades 55
# 8 Sludge Outlet Options

8.1 Introduction
8.2 Reuse in Agriculture
8.3 Agricultural Areas in Ireland
8.4 Suitability of Land for Reuse in Agriculture
8.5 Other Potential Restrictions
8.6 Overall Availability of Agricultural Land
8.7 Reuse in Non-Agricultural Land
8.8 Thermal Processes
8.9 Landfill
8.10 Other Recovery Re-Use Options

# 9 Options Assessment and Alternatives

9.1 General
9.2 Options for Sludge Management
9.3 Existing Infrastructure
9.4 Liquid Sludge Options
9.5 Site Selection for New Infrastructure
9.6 Selection of Satellite Dewatering Centres
9.7 Selection of Sludge Hub Centres
9.8 Selection of Treatment Options to Produce Biosolids
9.9 Selection of Outlets
9.10 Potential Impacts and Mitigation Measures
9.11 Risk Assessment of Current Sludge Outlet
9.12 Risk Assessment of Landspraying

# 10 Quality Assurance, Monitoring and Reporting

10.1 Introduction
10.2 Background Data Collection
10.3 Source Control
10.4 Audit of Current Wastewater Sludge Management
10.5 Asset Register
10.6 Reporting Sludge Data
10.7 Monitoring and Reporting of Sludge Data
10.8 Monitoring of Impacts of Sludge Disposal
10.9 Quality Assurance

# 11 Review Research and Opportunities

11.1 Introduction
11.2 Irish Water Research and Innovation Policy
11.3 Relevance of Innovation and Research Policy to Wastewater Sludge
11.4 Research in Wastewater Sludge Management

# 12 Financial Evaluation

12.1 General
12.2 Cost of Proposed Improvements

# 13 Conclusions and Recommendations

# Appendices

Appendix 1 - Stage 1 Public Consultation Report
Appendix 2 - Glossary and Abbreviations
Executive Summary

General

Irish Water was established under the Water Services Acts 2013. Irish Water became responsible for all of the public water and wastewater activities of Ireland’s then 34 Local Authorities on 1st January, 2014. Our responsibilities for wastewater commence when effluent reaches the public wastewater network. We are responsible for its transfer to wastewater treatment plants, its treatment and the subsequent discharge of the treated effluent back into the water environment. We are also responsible for the treatment and disposal of the sludge that is generated at these wastewater treatment plants.

The wastewater treatment process generates sludge which require further treatment prior to re-use or disposal. Wastewater sludge is primarily the organic by-product of the biological treatment of wastewater, and comprises organic and inorganic solids removed during the treatment processes and may contain microbiological and chemical contaminants. An analysis has been undertaken of current sludge management practices and areas where investment is needed.

The objectives of Irish Water in relation to sludge management are summarised as follows:

- To avoid endangering human health or harming the environment;
- To maximise the benefits of wastewater sludge as a soil conditioner and source of nutrients;
- To ensure that all regulatory and legislative controls are met, and due regard is taken of non-statutory Codes of Practice and industry guidance;
- To establish long term, secure and sustainable disposal routes and outlets;
- To ensure cost-effective and efficient treatment and reuse/disposal techniques;
- To reduce potential for nuisance from sludge transport and sludge facilities;
- To extract energy and other resources where economically feasible.
- To drive operational efficiencies, e.g. through use of Sludge Hub Centres.

Sludge Composition, Loads and Outlets

There have been over 1,000 agglomerations identified under the Wastewater Discharge Licence Regulations, represented as applications for licences or certificates by the Local Authorities. Over 95% of these agglomerations currently have some level of wastewater treatment and consequently are producing sludge. The total quantity of wastewater sludge generated in 2014, as reported to the EPA, was 53,543 tonnes dry solids (tds), i.e. the dry solids equivalent excluding water content. Over 98% of this was re-used in agriculture. The sludge produced includes primary, biological, chemical and septic tank sludge which undergo further treatment prior to re-use in agriculture.

The quantity of wastewater sludge produced is expected to increase over the next 25 years, as new and upgraded wastewater treatment plants are completed. The predicted sludge quantity in 2040 is 96,442 tds/annum. Additional wastewater sludge is produced in individual Domestic Wastewater Treatment Systems (DWWTS’s), mainly septic tanks, some of which is currently accepted at Irish Water wastewater treatment plants. It is expected that the amount of DWWTS sludge accepted by Irish Water will increase over the duration of the NWSMP.

Review of Standards and Plans

There are three main European Directives which significantly impact the management of wastewater sludge as follows:

- Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture - referred to hereafter as the Sewage Sludge Directive
• Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources - referred to hereafter as the Nitrates Directive

It is expected that future legislation will provide a broader protection of soil, in addition to more stringent controls on the use of wastewater sludge. A revision of the EU regulation on fertilisers is proposed which will involve new measures to facilitate the EU wide recognition of organic and waste-based fertilisers, thus stimulating the sustainable development of an EU-wide market for properly treated sludge.

The Regional Waste Management Plans prepared on behalf of the regional waste authorities set out the overall strategy for waste management for the country and have been reviewed in the development of this plan. These plans are required to consider wastewater sludge. Sludge management plans were prepared by individual Local Authorities in the late 1990’s and early 2000’s. These plans have been reviewed and recommendations incorporated into the NWSMP where appropriate.

Standards in relation to sludge management have been produced by the European Committee for Standardisation, CEN, which provide recommendations for sludge management particularly in relation to treatment, reuse and risk assessment. In Ireland, the Department of the Environment, Community and Local Government (DECLG) developed a Code of Good Practice for Use of Biosolids in Agriculture. Irish Water policy requires compliance with this code of good practice.

National Wastewater Sludge Management Plan
In October 2015, the Water Services Strategic Plan (WSSP) prepared by Irish Water under Section 33 of the Water Service No. 2 Act of 2013, was formally approved by the Minister for the Environment, Community and Local Government. The WSSP is a high level (Tier 1) plan with a 25 year time frame and identifies a series of more detailed, Tier 2, plans as required. One of these is the National Wastewater Sludge Management Plan (NWSMP).

The NWSMP is subject to Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA) with respect to the Habitats Directive, which must be completed before the NWSMP can be formally adopted by Irish Water. This includes statutory public consultation on the NWSMP, SEA and AA.

Consultation Process
In order to successfully implement a long term sustainable sludge strategy it is important not only to comply with legislation but also to have the confidence of stakeholders including government departments, agricultural and food bodies, local communities, environmental bodies, users of the final product and any other stakeholders impacted by the strategy.

There are three phases to the public information strategy for the NWSMP as follows:-

• Non-statutory public consultation at SEA Scoping stage (completed);
• Statutory consultation on the Draft NWSMP and associated environmental reports;
• Publication of the finalised NWSMP and SEA Statement.

Submissions from the first stage of consultation at the SEA Scoping stage, have been reviewed and taken into account in the development of the NWSMP and associated SEA and AA. Submissions on the draft NWSMP and associated environmental reports will be taken into account in the final documents. The SEA Statement will outline how environmental
considerations have been integrated into the NWSMP and how consultation influenced the development of the NWSMP.

**Sludge Treatment Processes**

Sludge processes can be generally divided into the following main categories:-

- Sludge volume reduction
- Sludge quantity reduction
- Sludge biosolids production

Sludge volume reduction is achieved by thickening and dewatering whereby trapped water is removed by mechanical means with the filtrate water recycled to the wastewater treatment process. The sludge quantity can be further reduced by aerobic or anaerobic digestion. There are numerous options in each case for providing these treatments. A final treatment process to produce ‘biosolids’, suitable for use in agriculture, is required where agricultural re-use is proposed. The term ‘biosolids’ applies to a fully treated sludge product which is both biologically stable and free of harmful pathogens (bacteria, viruses). Biosolids are suitable for use as a fertiliser and soil conditioner subject to careful monitoring for possible contaminants.

There are advanced thermal treatment options for sludge treatment, leading to destruction of the sludge, as an alternative to biosolids production. Currently, the main process for thermal conversion of wastewater sludge internationally is incineration. This may, if necessary in the future, provide an alternative outlet for Irish Water. Other thermal treatment processes include pyrolysis, gasification, wet oxidation and melting furnace. However, these options are not currently available at a commercial scale for use in Ireland. The main output of thermal treatment processes, in addition to energy production (heat and electricity) is a residual ash which may either be reused or disposed of as waste.

**Sludge Transport Strategy**

Transportation is a significant part of sludge management in terms environmental impacts and cost. The total of volume of sludge from wastewater treatment plants is estimated as up to 900,000 m³/annum. An analysis of sludge transportation has identified a number of options for reducing sludge volumes for transport and optimising transportation. This analysis has identified a shortfall in sludge Satellite Sites to allow more efficient sludge management. Options for sludge volume reductions on-site have been considered and require further investigation to establish the most appropriate solution for each site. There is the potential to reduce the volume of sludge for transport by 20 to 25% by optimising sludge thickening at smaller wastewater treatment plants.

An overall assessment of sludge infrastructure requirements has been carried out based on the sludge transport assessment and operating requirements. General recommendations are provided as guide to the type of infrastructure relative to the size and location of the wastewater treatment plant (WWTP). A site specific review is required to assess the particular WWTP requirements. The option of sludge reed beds as an alternative technology to transportation of liquid sludge may provide a sustainable solution, for smaller plants, particularly where there are long transport distances to a satellite dewatering centre.

**Sludge Satellite and Hub Infrastructure**

The use of a ‘Sludge Hub Centre and Satellite Site’ system for the management of wastewater sludge has been implemented in a number of counties in Ireland. This use of a Sludge Hub Centre backed up with Satellite dewatering allows for economies of scale and greater flexibility in the selection of treatment processes, particularly energy recovery and also assist in the maintenance of quality control over the outputs from any selected treatment processes. This system of satellite and hubs is commonly used internationally and it is considered that this system is appropriate for use by Irish Water given the large number of small communities
dispersed across the country. However, local authority areas will no longer be considered individually allowing greater flexibility and efficiency on a regional basis.

The provision of advanced sludge treatment is currently provided on site at approximately 24 wastewater treatment plants. Sludge from the smaller wastewater treatment plants is transferred to existing Sludge Hub Centres for treatment prior to disposal. Off-site treatment is provided by a number of contractors. These include composting, anaerobic digestion and pasteurisation and lime stabilisation facilities. The final disposal of treated sludge is generally sub-contracted by the wastewater treatment plant operator.

Each of the individual local authority areas has been reviewed to assess the current situation and recommendations for the future from which a number of conclusions arise. It is intended that existing Sludge Hub Centres should be used to their maximum capacity unrestricted by county boundaries. In particular, the use of existing anaerobic digestion infrastructure should be maximised to increase energy recovery. In the case of thermal drying facilities, the maximum use of the Sludge Hub Centre may not be the most economically advantageous solution, given the high cost of thermal drying compared to alternatives.

**Sludge Outlet Options**
At present over 98% of wastewater sludge is treated to produce a biosolids product which is being re-used in agriculture. There are very limited alternative options available in Ireland at present. However, it is considered important to explore alternative outlets further to reduce the risks associated with depending on a single outlet. Irish Water, though confident in the quality of properly treated biosolids, recognises that issues have been raised by stakeholders in relation to the use of biosolids on dairy and beef pasture, as reflected in the Bord Bia Quality Schemes. Therefore the main focus for future biosolids use is targeted at other crops, such as crops for animal feed. Potential alternative options such as use in production of energy crops and thermal processes have been reviewed and are considered to provide alternative options for the future.

**Options Assessment and Alternatives**
The options in relation to wastewater sludge management relate mainly to treatment, transport and disposal. The main criteria in selection of options are as follows:

- Environmental impact – emissions to air, water and land, climate change impact and energy use
- Social impact – potential nuisance (e.g. odour, noise, traffic), public perception and food safety
- Financial impact – life cycle costs, energy cost and recovery, reliability of technology

These impacts cannot be considered in isolation. Any option selected, for treatment, transport or disposal, must be economically, environmentally and socially acceptable. The sustainability of any option and the risks associated with it are a combination of all potential impacts. The options for sludge management and their associated risks are considered including risks associated with landspreading.

The main treatment processes used for producing biosolids are thermal drying and lime stabilisation. Due largely to the high cost of thermal drying, a number of the thermal drying installations provided over the last 10-15 years are no longer in operational use. Properly controlled lime stabilisation provides an accepted method of sludge treatment. However, an audit of sludge management activities has identified a significant variation in the adequacy of lime treatment being provided, particularly at off-site installations. The main issues identified were inadequate dosing of lime and inadequate monitoring of temperature and pH during treatment. Due to the difficulties in controlling off-site activities, it is proposed that off-site treatment of sludge by lime stabilisation is phased out in the short-term and a minimum lime dose is specified for any use to be continued.
Studies of biosolids treatment options have indicated that advanced anaerobic digestion provides the most economically feasible option and the lowest carbon footprint for sludge treatment. There are fourteen wastewater treatment plants in Ireland with anaerobic digestion currently in operation. Over 50% of all wastewater sludge was anaerobically digested in 2014. This is expected to increase to approximately 65% when upgrades, currently underway, are completed. It is proposed that the number of sites with anaerobic digestion is increased to nineteen sites, as the optimum strategy for treatment, with the biogas produced used for energy recovery in all cases. There may be a demand in the short to medium term for advanced thermal sludge treatment in order to reduce the dependence on a single outlet for sludge to agriculture. At present, the only viable option for this would be incineration.

Quality Assurance, Monitoring and Reporting

There are a number of statutory requirements in relation to monitoring and reporting of sludge management activities. However, in order to ensure the risks and perception issues are addressed, it is proposed that a quality assurance system is put in place for the whole process from source control of pollutants, through sludge treatment and reuse. As part of this quality assurance system, full monitoring and reporting requirements of each step of the process is necessary.

Irish Water is applying source control principles to commercial and industrial discharges to the sewer network. Through source control, standardised conditions are applied to discharge licences based on the nature of the discharger’s activity, the capacity of the receiving network and the capability of the wastewater treatment plant to remove pollutants. Source control is preferable to end-of-pipe treatment to minimise the risk of specific pollutants (e.g., metals, persistent organic pollutants, pharmaceutical products, etc.) in the biosolids. This is a key step in minimising the risk of contaminants in the sludge.

Summary

The NWSMP proposes to develop the network of ‘hub’ treatment sites and satellite dewatering plants, with ‘hubs’ optimised on a regional rather than county basis. While thermal drying will continue to be provided where practically and economically viable, advanced anaerobic digestion is the preferred option. Lime stabilisation at off-site centres will be phased out and any on-site lime treatment will be strictly controlled for effective treatment. The preferred disposal option for biosolids is re-use, with primary focus in agriculture on lands used for animal feed crops. Alternative options, such as energy crops, forestry etc. will be developed where possible.
1 Introduction

1.1 Irish Water Role and Responsibilities

Irish Water was established under the Water Services Acts 2013. Irish Water became responsible for all of the public water and wastewater activities of Ireland’s then 34 Local Authorities on 1\textsuperscript{st} January, 2014\textsuperscript{1}.

Our responsibilities for wastewater commence when effluent reaches the public wastewater network. We are responsible for its transfer to wastewater treatment plants, its treatment and the subsequent discharge of the treated effluent back into the water environment. We are also responsible for the treatment and disposal of the sludge that is generated from both our water and wastewater treatment plants. The NWSMP assesses the management of wastewater sludge only. A separate plan will be prepared in relation to sludge produced at drinking water plants.

The wastewater treatment process generates sludge which requires further treatment prior to reuse or disposal. Effective and safe management of wastewater sludge, utilising its potential for energy generation and/or re-use where feasible, is identified as a key objective in Irish Water’s Water Services Strategic Plan (WSSP).

![Diagram of water treatment process](image)

Figure 1.1 – Irish Water Responsibilities

1.2 Background to Plan

Irish Water completed its Water Services Strategic Plan (WSSP) in October 2015 which is required under Section 33 of the Water Service No. 2 Act of 2013. The WSSP forms the highest tier of asset management plans which Irish Water will prepare and it sets the overarching framework for subsequent detailed (Tier 2) implementation plans and water services projects.

\textsuperscript{1} Since 1 June 2014 (under the Local Government Reform Act 2014), there are 31 city and county councils with integrated municipal districts.
Figure 1.2 illustrates the position of the WSSP in terms of the overall Irish Water asset management planning and environmental assessment hierarchy context.

As identified in the WSSP, the implementation of the strategies identified in the WSSP will be detailed in a number of Implementation Plans (Tier 2) which are being prepared by Irish Water following the approval of the WSSP by the Minister of the Environment Community and Local Government in October 2015. One of the Tier 2 Implementation Plans identified is the National Wastewater Sludge Management Plan (NWSMP).

As a public plan, the Draft NWSMP has been subjected to Strategic Environmental Assessment (SEA) in accordance with the European Union (EU) SEA Directive (2001/42/EC) and Appropriate Assessment (under the EU Habitats Directive) and these documents are also published for review.
1.3 Interaction with Irish Water Tier 2 Plans

A number of Tier 2 plans are currently being prepared by Irish Water, some of which will impact, directly or indirectly on the NWSMP. The following Tier 2 plans will have interactions with the NWSMP:

- National Water Resources Plan
- Lead Compliance Strategy (National Lead in Drinking Water Mitigation Plan)
- Wastewater Compliance Strategy
- Climate Change Adaptation and Mitigation Strategy
- Corporate Waste Management Strategy/Plan
- Sustainable Energy Strategy

The planning for waterworks sludge management, i.e. sludge from drinking water treatment plants, is being considered separately. The management of liquid sludge, from drinking water treatment plants, is being assessed on a site by site basis, as part of the National Water Resources Plan, to establish whether the sludge will be discharged to sewer or dewatered on site. A separate plan is being developed in relation to recovery, reuse or disposal of waterworks sludge.

Waterworks sludge contains coagulants such as aluminium or ferric sulphate used in the treatment of drinking water. The disposal of waterworks sludge to sewer has a potential impact on the quantity of wastewater sludge produced at a wastewater treatment plant and may also increase the concentration of phosphorus in the sludge as the coagulants in the sludge transfer phosphorus from the liquid stream to the sludge stream.

Irish Water has introduced limits on the quantity of waterworks sludge which may be accepted at a WWTP which will mitigate any potential impact on the treatment process. Where waterworks sludge is discharged to the inlet of a wastewater treatment plant at appropriate levels, it may have a beneficial effect where phosphorus reduction is required as the waterworks sludge typically contains aluminium or ferric sulphate which is beneficial in the removal phosphorus from wastewater.

The National Lead in Drinking Water Mitigation Plan is currently being prepared. One of the options being considered to reduce lead in drinking water is orthophosphate treatment. The extent and location of this dosing is not yet finalised. However, where there is a potential impact on receiving waters, it will be necessary to remove the phosphorus from the wastewater prior to discharge. Studies in the UK, where orthophosphate treatment has been ongoing for a number of years, have indicated that the quantity of wastewater sludge produced can increase by approximately 6%.

The Irish Water Sustainable Energy Strategy is linked to the NWSMP in terms of energy use in producing biosolids, energy generation and transportation. The Sustainable Energy Strategy will describe how Irish Water will achieve our 33% increase in energy efficiency obligation by 2020, using 2009 as our baseline year. The Sustainable Energy Strategy will also set our how Irish Water will mitigate the effects of climate change by reducing our carbon emissions and inform on how we will manage our risk in relation to future energy costs as well as ensuring security of supply.

The efficient generation and use of energy are key to achieving our objectives. Irish Water recognises the opportunity for using wastewater sludge as a renewable energy resource, the Sustainable Energy Strategy will detail how Irish Water will increase the amount of energy we use from renewable sources. The Sustainable Energy Strategy will also inform how Irish Water will work towards the efficient and low carbon transport of materials and staff.
The Irish Water Climate Change Adaption and Mitigation Strategy is due to be published in 2016. This strategy is currently at the early stages of development but it is expected that our Sustainable Energy Strategy will be used to drive the decarbonisation of our energy mix and mitigate the effects of climate change. The benefits of treated wastewater sludge as a possible carbon sink may also be considered in the strategy.

The Irish Water Corporate Waste Management Strategy/Plan will address the management of all wastes produced by Irish Water. The particular requirements for the management of wastewater sludge are addressed in the NWSMP in line with Irish Water’s overall strategy for waste management.

**What is Wastewater Sludge?**

Sludge from wastewater treatment plants is primarily the organic by-product of the biological treatment of wastewater, and comprises the solids removed during the treatment processes. Wastewater treatment plants operate biologically active processes, and sludge is the natural product of this process. When appropriately treated and managed it does not present a risk to the environment or human health and it can be safely recycled to provide a benefit to society and the environment. It can be particularly beneficial as a soil conditioner and source of nutrient enrichment (fertiliser).

Wastewater sludge from the wastewater treatment process is normally separated from the treated effluent using gravity settlement. This produces a liquid wastewater sludge with a solids concentration in the range 1 – 3% dry solids (DS). This sludge is further treated using mechanical, biological or chemical processes, or a combination of these processes, prior to recycling. These processes are aimed at removing water, hence reducing sludge volume, and stabilising the organic matter. Further details on this are included in Section 5.

Wastewater sludge is considered to be a valuable product with potential benefits in terms of nutrients, organic and energy content. In particular, wastewater sludge is a source of phosphorus which is a limited diminishing resource essential for all plant growth.

### 1.4 Purpose of National Wastewater Sludge Management Plan

The National Wastewater Sludge Management Plan (NWSMP) is required in order to set out the short, medium and long-term strategy for management of sludge produced at wastewater treatment plants under the control of Irish Water. The NWSMP, in conjunction with the associated Strategic Environmental Assessment, takes into account current legislation and guidance documents in relation to the treatment and utilisation of wastewater sludge in addition to potential environmental impacts and sustainability of proposals. The proposals of the National Wastewater Sludge Management Plan will be used to inform future capital and operational activities in relation to sludge management.

The NWSMP will assess issues in relation to long-term sludge management:-

- Current and predicted future sludge quantities
- Statutory and guideline requirements for utilisation of sludge
- Potential for sludge reduction and increased energy recovery
- Availability of sludge outlets and risks to current outlets
- Monitoring and reporting on treated sludge quality and lands receiving biosolids

It is proposed that the NWSMP will have ongoing five yearly reviews. The NWSMP will consider wastewater sludge only, with the potential for imports of domestic wastewater treatment systems sludge (i.e. sludge from septic tanks and individual treatment systems) considered in Section 2.5. Other non-hazardous sludges, such as industrial or agricultural sludges are not considered in this plan. Sludge from water treatment plants will be considered in a separate plan.
1.5 Key Objectives

The Irish Water National Wastewater Sludge Management Plan has been prepared to set out the long-term strategy for management of sludge produced at wastewater treatment plants under the control of Irish Water together with any wastewater sludge accepted by Irish Water from other domestic and non-domestic wastewater treatment plants.

The management of sludge includes sludge production, treatment, transport, disposal, monitoring, reporting and consultation with stakeholders. Source control of discharges to wastewater treatment plants is also important in ensuring the quality of the treated sludge product. The NWSMP takes into account current legislation, guidance documents and Irish Water policies. The NWSMP reviews current practice in sludge management and assesses options for optimisation. The development of the NWSMP includes a consultation process with the public and stakeholders to allow input from interested parties. The NWSMP sets out a strategy for future capital works, operating procedures, quality control and risk management systems to ensure a sustainable strategy for wastewater sludge management.

The following objectives of Irish Water in terms of sludge management are addressed in this plan:

- To avoid endangering human health or harming the environment;
- To maximise the benefits of wastewater sludge as a soil conditioner and source of nutrients;
- To ensure that all regulatory and legislative controls are met, and due regard is taken of non-statutory Codes of Practice and industry guidance;
- To establish long term, secure and sustainable disposal routes and outlets;
- To ensure cost-effective and efficient treatment and reuse/disposal techniques;
- To reduce potential for nuisance from sludge transport and sludge facilities;
- To extract energy and other resources where economically feasible.
- To drive operational efficiencies, e.g. through use of Sludge Hub Centres.

The European Commission considers that using wastewater sludge as fertiliser on agricultural soils remains one of the best environmental options, provided it poses no threat to the environment or to animal and human health and is desirable under the Hierarchy of Waste Management, as shown in Figure 1.3. As wastewater sludge cannot be prevented, the primary aim is to minimise production with beneficial re-use of the remaining sludge produced.

Recent communication from the EU recognises that recycled nutrients are a distinct and important category of secondary raw materials, present in organic waste material, and can be returned to soils as fertilisers. Their sustainable use in agriculture reduces the need for mineral-based fertilisers, the production of which has negative environmental impacts, and depends on imports of phosphate rock, a limited resource.
We aim to treat all wastewater sludge, for use in agriculture, to meet the requirements of the DECLG Code of Practice for re-use as fertiliser and soil conditioner. This requires a stable pasteurised product, complying with chemical standards for safe use in agriculture or equivalent use. Irish Water will work with stakeholders and industry to develop alternatives for the beneficial re-use of wastewater sludge and the possible recovery of energy and/or constituents in a sustainable and economically viable manner. The NWSMP supports the Hierarchy of Waste Management by optimal minimisation of volume and organic stabilisation followed by re-use.
2 Sludge Composition, Loads and Outlets

2.1 Introduction

The quantity of wastewater sludge being produced in Ireland has increased in line with the increase in secondary wastewater treatment since the implementation of the Council Directive 91/271/EEC concerning urban waste water treatment. In 2014, over 93% of wastewater produced in Ireland received secondary treatment or more stringent treatment. This has increased from 25% in 1998. There has consequently been a significant increase in sludge production. Proposed new and upgraded works to provide secondary or more stringent treatment for existing agglomerations and works to reduce stormwater overflows will further increase wastewater sludge production in the coming years.

Over 98% of wastewater sludge produced at Irish Water wastewater treatment plants is currently disposed to agriculture including sludge which is composted and subsequently disposed of to agriculture. Over 95% of this was treated, in accordance with the treatment processes recommended in the Code of Good Practice for Use of Biosolids in Agriculture, in 2014 with further improvements to treatment levels introduced during 2015.

2.2 Minimisation of Sludge

In accordance with the waste hierarchy minimisation is the next most preferred waste solution after prevention. Wastewater treatment processes can be designed to reduce the quantity of sludge produced. Traditional extended aeration treatment plants with long sludge ages can produce smaller quantities of sludge. However, the additional capital and operating cost is generally insufficient to warrant increasing process tank sizes. New and emerging technologies with substantially lower sludge production are being developed. Techniques for the minimisation of sludge include treatment process modification, sludge digestion, advanced digestion and wetland/reed bed application.

Further details of sludge treatment processes are included in Section 5. The utilisation of these processes needs to be examined on a case by case basis taking into account economic and environmental criteria. It is both environmentally and financially advantageous to make maximum use of existing sludge digestion facilities for minimisation of sludge. For new or upgraded wastewater treatment plants or Sludge Hub Centres, an individual assessment is required to assess whether upgrading to reduce sludge quantities is economically viable.

2.3 Reported Sludge Loads and Outlets

There is an obligation to report wastewater sludge data annually to the EPA. The sludge register data provided to the EPA from 2009 to 2014 is summarised in Table 2.1 below. This is a compilation of all sludge data compiled by the Local Authorities relating to sludge produced within their administrative area. The requirement for sludge register data only applies to wastewater treatment plants with a population equivalent of greater than 5,000. However, reporting of sludge data to the EPA is also required under the Urban Waste Water Treatment Directive for all licenced plants over 2,000 PE. Sludge quantities are reported as ‘tonnes dry solids’ equivalent (i.e. net weight of solids fraction only). The total sludge weights are not meaningful without knowing the water content, hence the use of tonnes dry solids equivalent for reporting purposes. There has been some misreporting of data over the last number of years where total tonnes of sludge have been reported in some cases. This accounts for the drop in reported sludge production since 2009.
Table 2.1 – Summary of Sludge Register Data

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture</th>
<th>Landfill</th>
<th>Other (e.g. land remediation, forestry etc.)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>66,194</td>
<td>63</td>
<td>40,521</td>
<td>106,778</td>
</tr>
<tr>
<td>2010</td>
<td>82,670</td>
<td>188</td>
<td>7,133</td>
<td>89,991</td>
</tr>
<tr>
<td>2011</td>
<td>57,699</td>
<td>304</td>
<td>27,645</td>
<td>85,648</td>
</tr>
<tr>
<td>2012</td>
<td>68,329</td>
<td>4</td>
<td>4,096</td>
<td>72,429</td>
</tr>
<tr>
<td>2013</td>
<td>66,022</td>
<td>2,866</td>
<td>959</td>
<td>69,847</td>
</tr>
<tr>
<td>2014</td>
<td>51,749</td>
<td>381</td>
<td>1,433</td>
<td>53,543</td>
</tr>
</tbody>
</table>

Notes: 1. Sludge reported as “other” in 2014 is all sludge in storage

2.4 Estimated Current and Future Sludge Loads

2.4.1 General

An estimate of the expected sludge production from wastewater treatment plants has been undertaken based on the agglomeration population equivalent (PE) and the type of treatment process in place. A breakdown of the type of treatment nationally is shown in Figure 2.1 below.

Figure 2.1 – Level of Treatment by % of Agglomerations and Population Equivalent

A substantial number of the existing wastewater treatment plants that currently do not have tertiary treatment will require tertiary treatment for nutrient removal in the coming years. The projected change to sludge loads over the next 25 years will depend on a number of factors. The main factors are as follows:

- Population and non-domestic effluent growth rates
- Provision of new or upgraded WWTP’s
- Changes to wastewater treatment processes
- Changes to sludge treatment processes
- Increases due to orthophosphate treatment for lead mitigation
- Scheduled desludging of small WWTP’s
- Import of domestic wastewater treatment plant (DWWTS) sludge

3 The option of ortho-phosphate treatment is currently being considered in the National Lead in Drinking Water Mitigation Plan. The locations, if any, where this will proceed will be identified in 2016. It’s use would result in a small increase in sludge production due to removal of additional phosphorus in wastewater treatment.
2.4.2 Sludge Production per PE

Sludge loading design parameters for the main treatment processes in place in Ireland has been assessed and summarised in Table 2.2. These design parameters will be used to estimate current load and predict future loading. It should be noted that where a wastewater treatment plant is underloaded or designed as an extended aeration system the quantity of sludge produced is lower due to a higher sludge age being achieved in the biological process.

Table 2.2 – Sludge Loading per PE

<table>
<thead>
<tr>
<th>Treatment Process</th>
<th>g/PE/day¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Primary only</td>
<td>30</td>
</tr>
<tr>
<td>2 Primary and secondary sludge</td>
<td>65</td>
</tr>
<tr>
<td>3a Primary, secondary and P removal</td>
<td>70</td>
</tr>
<tr>
<td>3b Primary, secondary and NP removal</td>
<td>65</td>
</tr>
<tr>
<td>3b Primary, secondary and N removal</td>
<td>60</td>
</tr>
<tr>
<td>4 Secondary treatment only</td>
<td>55</td>
</tr>
<tr>
<td>5a Secondary and P removal</td>
<td>60</td>
</tr>
<tr>
<td>5b Secondary and NP removal</td>
<td>55</td>
</tr>
<tr>
<td>5c Secondary and N removal</td>
<td>50</td>
</tr>
<tr>
<td>6 Reduction with Anaerobic Digestion</td>
<td>30%</td>
</tr>
<tr>
<td>7 Reduction with Anaerobic Digestion and hydrolysis</td>
<td>45-55%</td>
</tr>
</tbody>
</table>

Notes:
1. For wastewater treatment plants where detailed information is available on actual sludge production and/or reduction in sludge by digestion these values have been used in estimating the sludge produced.

2.4.3 Population Growth Rate

Population growth rates have been reviewed by ESRI on behalf of Irish Water. Predicted growth rates have been provided on a county by county basis. A pro-rata increase in non-domestic effluent is assumed. The quantity of sludge produced at wastewater treatment plants will increase in line with increased populations.

2.4.4 Estimated Sludge Loads

An estimate of current and future sludge production for all municipal wastewater treatment plants has been undertaken as detailed above. These loads are summarised per local authority in Table 2.3 below. The estimated sludge loads for 2015 includes predicted sludge load for treatment of existing wastewater loads at all agglomerations. The completion dates for treatment plants with no treatment will extend beyond 2015 in a number of cases. It is expected that all agglomerations will have treatment by 2021. There are additional sludge loads at due to imports of sludge from private wastewater treatment plants. However, the quantities of sludge imported, for further treatment is low relative to the indigenous wastewater treatment plant sludge.

Table 2.3 Predicted Sludge Load per County

<table>
<thead>
<tr>
<th>County</th>
<th>TDS/a (2015)</th>
<th>TDS/a (2020)</th>
<th>TDS/a (2030)</th>
<th>TDS/a (2040)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carlow</td>
<td>1,032</td>
<td>1,066</td>
<td>1,137</td>
<td>1,214</td>
</tr>
<tr>
<td>Cavan</td>
<td>1,217</td>
<td>1,321</td>
<td>1,557</td>
<td>1,842</td>
</tr>
<tr>
<td>Clare</td>
<td>1,538</td>
<td>1,656</td>
<td>1,921</td>
<td>2,229</td>
</tr>
<tr>
<td>Cork¹</td>
<td>5,087</td>
<td>5,331</td>
<td>5,856</td>
<td>6,433</td>
</tr>
<tr>
<td>Cork City</td>
<td>3,243</td>
<td>3,409</td>
<td>3,768</td>
<td>4,164</td>
</tr>
<tr>
<td>Donegal</td>
<td>1,768</td>
<td>1,848</td>
<td>2,021</td>
<td>2,212</td>
</tr>
<tr>
<td>Location</td>
<td>2013</td>
<td>2014</td>
<td>2016</td>
<td>2018</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Dublin City</td>
<td>18,036</td>
<td>18,922</td>
<td>20,828</td>
<td>22,925</td>
</tr>
<tr>
<td>Dun Laoghaire-Rathdown</td>
<td>1,011</td>
<td>1,061</td>
<td>1,167</td>
<td>1,285</td>
</tr>
<tr>
<td>Fingal</td>
<td>3,007</td>
<td>3,155</td>
<td>3,472</td>
<td>3,822</td>
</tr>
<tr>
<td>Galway</td>
<td>1,326</td>
<td>1,391</td>
<td>1,531</td>
<td>1,684</td>
</tr>
<tr>
<td>Galway City</td>
<td>2,089</td>
<td>2,294</td>
<td>2,765</td>
<td>3,332</td>
</tr>
<tr>
<td>Kerry</td>
<td>1,789</td>
<td>1,897</td>
<td>2,134</td>
<td>2,403</td>
</tr>
<tr>
<td>Kildare</td>
<td>3,301</td>
<td>3,807</td>
<td>5,067</td>
<td>6,747</td>
</tr>
<tr>
<td>Kilkenny</td>
<td>1,332</td>
<td>1,407</td>
<td>1,569</td>
<td>1,751</td>
</tr>
<tr>
<td>Laois</td>
<td>1,083</td>
<td>1,154</td>
<td>1,309</td>
<td>1,487</td>
</tr>
<tr>
<td>Leitrim</td>
<td>342</td>
<td>343</td>
<td>344</td>
<td>346</td>
</tr>
<tr>
<td>Limerick</td>
<td>3,557</td>
<td>3,746</td>
<td>4,153</td>
<td>4,605</td>
</tr>
<tr>
<td>Longford</td>
<td>395</td>
<td>399</td>
<td>407</td>
<td>416</td>
</tr>
<tr>
<td>Louth*</td>
<td>2,284</td>
<td>2,359</td>
<td>2,516</td>
<td>2,684</td>
</tr>
<tr>
<td>Mayo</td>
<td>1,708</td>
<td>1,838</td>
<td>2,132</td>
<td>2,482</td>
</tr>
<tr>
<td>Meath</td>
<td>2,075</td>
<td>2,546</td>
<td>3,836</td>
<td>5,796</td>
</tr>
<tr>
<td>Monaghan</td>
<td>927</td>
<td>966</td>
<td>1,049</td>
<td>1,139</td>
</tr>
<tr>
<td>Offaly</td>
<td>1,204</td>
<td>1,249</td>
<td>1,343</td>
<td>1,446</td>
</tr>
<tr>
<td>Roscommon</td>
<td>875</td>
<td>916</td>
<td>1,004</td>
<td>1,103</td>
</tr>
<tr>
<td>Sligo*</td>
<td>845</td>
<td>864</td>
<td>905</td>
<td>948</td>
</tr>
<tr>
<td>Tipperary*</td>
<td>2,808</td>
<td>2,875</td>
<td>3,013</td>
<td>3,163</td>
</tr>
<tr>
<td>Waterford</td>
<td>1,788</td>
<td>1,862</td>
<td>2,077</td>
<td>2,186</td>
</tr>
<tr>
<td>Westmeath</td>
<td>1,439</td>
<td>1,495</td>
<td>1,612</td>
<td>1,738</td>
</tr>
<tr>
<td>Wexford</td>
<td>2,019</td>
<td>2,071</td>
<td>2,178</td>
<td>2,290</td>
</tr>
<tr>
<td>Wicklow</td>
<td>1,768</td>
<td>1,905</td>
<td>2,212</td>
<td>2,570</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>70,894</td>
<td>75,150</td>
<td>84,820</td>
<td>96,442</td>
</tr>
</tbody>
</table>

Notes:
1. Predicted sludge loads in Cork include sludge from wastewater treatment plants in Youghal and the Cork Lower Harbour which are currently under construction and will significantly increase sludge production.
2. The sludge quantities in Louth, Sligo and Tipperary are based on predicted sludge quantities at individual wastewater treatment plants. The reduction in sludge following transport to off-site sludge hubs with anaerobic digestion has not been taken into account.

There are substantial variations in the predicted and reported sludge volumes. This is due to a number of reasons. The main reasons are considered to be as follows:

- The predicted sludge loads have been calculated based on reported loads. There is uncertainty on the accuracy of this data as it is normally based on 6 to 12 samples per year with variation in the accuracy of the sampling and flow monitoring equipment.
- The reported sludge loads are based on estimates of sludge dry solids concentrations which are measured infrequently.
- The level of wastewater treatment at a large number of treatment plants is not in accordance with licenced requirements. Compliance with the ELV’s set by the EPA will lead to an increase in sludge production in many cases.
- Desludging at some wastewater treatment plants is infrequent, particularly at small septic tank treatment plants.
- The actual sludge produced is normally less than the predicted quantity where there is a high sludge age. This is common where a wastewater treatment plant is substantially underloaded.
- The quantity of sludge produced may increase where aeration systems are optimised to increase energy efficiency.

2.4.5 **Sludge Volume**

In order to assess sludge volumes for transport and disposal, it is essential to know the sludge dry solids concentration in addition to the dry solids production from each WWTP. The volume of sludge produced has been estimated based on the expected performance of sludge thickening and dewatering facilities on site. Ongoing monitoring of dry solids concentration is required to
ensure effective thickening performance so that volumes of sludge for transport are minimised where possible.

2.5 Domestic Wastewater Treatment Systems Sludge

Irish Water has no statutory obligations in relation to Domestic Waste Water Treatment System’s (septic tanks and individual single house WWTP’s). However, following the system of registration put into place over the last number of years, and ongoing inspections, it is expected that emptying of DWWT’s will become more frequent and the demand for acceptance of DWWTS sludge at wastewater treatment plants will increase. Up to 90% of DWWTS’s are septic tanks with the remainder being package plants. The WSSP adopted an EPA recommendation that Irish Water plan for reception of this type of sludge.

An EPA Strive Report, Strive Report Series No.123, on the Management Options for the Collection, Treatment and Disposal of Sludge Derived from Domestic Wastewater Treatment Systems identifies that upgrades are needed at existing wastewater treatment plants to provide for acceptance of sludge from individual septic tanks. A number of sites have been recommended in the Strive Report as suitable locations for accepting sludge from DWWTS’s. The number of WWTP sites required will depend on the type of desludging, i.e. where sludge is dewatered to 6-8% on a scheduled routine, the sustainable transport distance increases from approximately 25km to 80km.

In order to develop nationwide facilities for acceptance of sludge from DWWTS’s, a minimum of three new acceptance facilities are recommended by the Strive Report. If mobile dewatering is not used, approximately 13 new acceptance facilities would be required. The existing sludge reception facilities are not generally adequately sized to cater for all the Domestic WWTS’s sludge generated in the surrounding region and some level of upgrade would be required.

It is proposed that any new or upgraded sludge acceptance facilities to cater for sludge from DWWT’s, would be developed at those sites defined as satellite dewatering centres. This would provide efficiencies in terms of acceptance and blending infrastructure in addition to efficiencies in terms of manpower required for supervision, monitoring and reporting. However, the number and size of these facilities would be based on a commercial demand. Sludge acceptance facilities for DWWT’s sludge will need to generate an adequate income stream from the acceptance of DWWT’s sludge to fund initial investment and the ongoing CAPEX and OPEX costs associated with treating and disposing of DWWT’s sludge.

It is estimated that 20% to 30% of the estimated volume of DWWT’s sludge is currently collected by private contractors and treated at Irish Water facilities. It is likely that the recommended average desludging frequency of 2 years would only be complied with if new legislation and/or enforcement was undertaken. The implementation of scheduled desludging of septic tanks, as recommended in the Strive report referred to above, would provide transportation efficiencies and potential cost benefits to customers.

**Table 2.4 – Estimated Sludge Load per County from Domestic WWTS’s**

<table>
<thead>
<tr>
<th>Local Authority</th>
<th>Total DWWT’s</th>
<th>Sludge Production (tds/a)</th>
<th>Sludge Volume (m3/a) @ 2% D.S.</th>
<th>Sludge Volume (m3/a) @ 6% D.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carlow</td>
<td>7,190</td>
<td>142</td>
<td>7,100</td>
<td>2,367</td>
</tr>
<tr>
<td>Cavan</td>
<td>14,477</td>
<td>285</td>
<td>14,250</td>
<td>4,750</td>
</tr>
<tr>
<td>Clare</td>
<td>19,769</td>
<td>390</td>
<td>19,500</td>
<td>6,500</td>
</tr>
<tr>
<td>Cork City</td>
<td>586</td>
<td>12</td>
<td>600</td>
<td>200</td>
</tr>
<tr>
<td>Cork County</td>
<td>57,993</td>
<td>1143</td>
<td>57,150</td>
<td>19,050</td>
</tr>
<tr>
<td>Donegal</td>
<td>32,955</td>
<td>650</td>
<td>32,500</td>
<td>10,833</td>
</tr>
<tr>
<td>Dublin City</td>
<td>2,718</td>
<td>54</td>
<td>2,700</td>
<td>900</td>
</tr>
<tr>
<td>Dún Laoghaire-Rathdown</td>
<td>1,928</td>
<td>38</td>
<td>1,900</td>
<td>633</td>
</tr>
</tbody>
</table>
The spatial distribution of existing DWWT systems has been considered in assessing areas where future sludge acceptance facilities or upgrades of existing facilities are likely to be required. It is not expected that there will be significant increases in DWWT sludge produced over the duration of the NWSMP. Growth in rural areas is low.

2.6 Type of Sludge

There is a range of sludge produced at Irish Water wastewater treatment plants. This includes the following:

- Primary sludge
- Biological sludge – including activated sludge and humus sludge
- Chemical sludge
- Septic tank sludge

Sludge is also accepted at a number of wastewater treatment plants from Domestic Wastewater Treatment Plant Systems and industrial or commercial sludge subject to available capacity and compliance with import procedures.

2.6.1 Primary Sludge

Primary sludge is typically produced in Ireland in the very large or very small wastewater treatment plants, i.e. >10,000 PE and < 1,000 PE. Primary treatment is included on approximately 170 licenced wastewater treatment plants. Over 200 of the certified wastewater treatment plants (i.e. with a P.E. < 500) are estimated to have primary treatment. In larger wastewater treatment plants, primary settlement is normally included together with anaerobic digestion. In smaller agglomerations, there may be primary treatment only or primary treatment within a packaged wastewater treatment plant.

The addition of primary treatment at an existing wastewater treatment plant can provide a relatively straightforward and economic way of increasing the capacity of a wastewater treatment plant. The overall quantity of sludge increases where primary treatment is used as it is a
physical process to remove solids with no biological reduction of the sludge. The cost of treating and disposing of additional sludge in addition to the capacity of existing sludge treatment equipment should be considered in any proposal to add primary treatment.

Primary sludge is typically more odourous than biological sludge and sludge management of this type of sludge must take into account the potential for an odour nuisance.

2.6.2 Biological Sludge

Biological sludge is produced at approximately 80% of wastewater treatment plants accounting for over 94% of the population equivalent treated. Biological treatment is most commonly activated sludge but other processes including biological filters, rotating biological contactors and trickling filters are also utilised. The quantity of sludge produced decreases as the sludge age increases. The sludge age required for nitrogen removal is approximately 10 days whereas the sludge age required for BOD removal only is 3-4 days. Therefore where nitrogen removal is included the estimated sludge production is reduced. However, it should be noted that in some cases, existing wastewater treatment plants have been designed for longer sludge ages where nitrogen removal was not required. Therefore estimated sludge production must be based on an understanding of the wastewater treatment processes at each site.

2.6.3 Sludge from Phosphorus Removal

The most common method for removal of phosphorus is chemical dosing with ferric sulphate or ferric chloride. The removal of phosphorus from wastewater using chemical dosing leads to an increase in sludge production of up to 25%. Biological phosphorus removal is in place in a small number of WWTP's. However, due to the additional process control and infrastructure required for biological phosphorus removal, chemical removal is generally favoured. However, the number of WWTP's with biological phosphorus removal may increase due to the high cost of chemicals and high sludge production associated with chemical dosing for phosphorus removal.

2.6.4 Changes to Sludge Treatment Processes

The quantity of sludge produced and the consequent cost of treatment and disposal needs to be assessed in terms of both the volume and the total dry solids. A significant proportion of the costs associated with sludge relate to sludge transport. This ranges from <10% at larger wastewater treatment plants up to 40% of the cost for smaller wastewater treatment plants in areas remote from the final treatment and disposal locations. There is a balance to be achieved between the cost of sludge transport and the cost of treatment to reduce the volume of sludge. This is assessed in more detail in Section 6.

The main technology to reduce the quantity of sludge is anaerobic digestion including advanced anaerobic digestion processes which may include hydrolysis or pasteurisation. Sludge quantities may be reduced by up to 50% with advanced anaerobic digestion techniques which increase the level of destruction of volatile organic solids.

2.6.5 Desludging Small Wastewater Treatment Plants

There are a large number of small wastewater treatment plants in Ireland including municipal septic tanks. In some cases desludging is undertaken only when a problem occurs. It is more cost effective in terms of transport costs and operation and maintenance of the wastewater treatment plants to undertake scheduled desludging. This also reduces the potential for pollution incidents and allows more efficient operation of the wastewater treatment plant.

2.6.6 Domestic Wastewater Treatment Plant Sludge

Sludge from DWWTS's (septic tanks and individual private WWTP's) is not currently the responsibility of Irish Water. However, it is expected that following the introduction of legislation in regard to registration of septic tanks, that more frequent desludging of septic tanks will be
required. As detailed in Section 2.5, the most suitable way to provide suitable treatment and disposal of this sludge is within Irish Water controlled wastewater treatment plants. 90% of individual treatment systems are septic tanks with approximately 497,000 houses within Ireland reported in the 2011 census as having a septic tank or individual treatment system. The percentage of the population connected to public schemes varies widely across Ireland with over 98% reported as connected to public schemes in the main urban centres in the 2011 census. Many counties with a larger rural population reports less than 50% of houses connected to a public scheme in the 2011 census.

2.7 Constituents of Wastewater Sludge

Wastewater sludge consists of the organic residue of the wastewater treatment processes. Wastewater sludge contains organic matter and nutrients that can provide soil benefits. The sludge also, however, contains contaminants including metals, pathogens, and organic and emerging pollutants. Monitoring of sludge is required prior to use in agriculture with monitoring undertaken of both sludge and soils. Organic and emerging pollutants include persistent organic pollutants, pharmaceuticals and personal care products. The risks associated with the constituents of wastewater sludge are considered further in Section 9.12. Detailed information on the levels of organic and emerging pollutants in wastewater sludge is not readily available due to the large number of potential compounds and the variable factors contributing to them.

The legislation and other standards controlling the use of wastewater sludge in agriculture are detailed in Section 3. The amount of phosphorus in wastewater sludge is normally the limiting parameter in agricultural use based on the nutrient level needed for crops.

2.8 Value of Wastewater Sludge

Wastewater sludge can be considered to be a valuable resource due to its energy content in addition to its value for use on land. Anaerobic digestion of wastewater sludge produces methane gas which by conversion to electricity can significantly reduce energy costs for operating wastewater treatment plants with energy recovery increased where thermal hydrolysis is provided in addition to conventional anaerobic digestion.

Where sludge is used in agriculture or other land-use, there are benefits from provision of nutrient content in terms of phosphorus and nitrogen and also levels of potassium, sulphur, magnesium and micronutrients which are present in the sludge. In addition, the organic content of the sludge can improve soil quality.
3 Review of Standards and Plans

3.1 Introduction

The majority of sludge treatment standards and legislation relate to agricultural use of wastewater sludge. Waste management legislation is also relevant to the management of wastewater sludge.

In addition to legislation there are a number of guidance documents and plans both nationally and internationally in relation to sludge management. The regional waste management plans for Ireland, published in May 2015, consider the quantities of wastewater sludge being produced and the requirements for management. The European Committee for Standardisation (CEN) have issued a number of documents in relation to wastewater sludge. Sludge management plans were prepared by Local Authorities as a subset of their obligations for waste management planning.

3.2 Current Legislation

There are three main European Directives which significantly impact the management of wastewater sludge as follows:-

- Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture - referred to hereafter as the Sewage Sludge Directive

3.2.1 Sewage Sludge Directive


The main restrictions for disposal of wastewater sludge in agriculture are set out in terms of heavy metals and nutrients

| Table 3.1 – Maximum Annual Rates of Application of Parameters in Wastewater Sludge |
|-----------------------------------|-----------------|-----------------|
| Parameter                         | Limit Value     | Legislation     |
| Heavy Metals                      | (kgs per hectare per year) |               |
| Cadmium                           | 0.05            | SI 267 of 2001  |
| Copper                            | 7.50            | SI 267 of 2001  |
| Nickel                            | 3.00            | SI 267 of 2001  |
| Lead                              | 4.00            | SI 267 of 2001  |
| Zinc                              | 7.50            | SI 267 of 2001  |
| Mercury                           | 0.10            | SI 267 of 2001  |
| Chromium                          | 3.5             | SI 267 of 2001  |
| Nutrients                         |                 |                 |
| Nitrogen¹                         | 0.225           | SI 31 of 2014   |
| Phosphorus¹                       | 0.125           | SI 31 of 2014   |

Notes: 1. Nutrient application rates are dependent on land use and nitrogen and phosphorus indices as detailed in S.I. 34 of 2014
<table>
<thead>
<tr>
<th>Parameter</th>
<th>mg/kg of dry matter in a representative sample</th>
<th>Legislation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Metals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cadmium</td>
<td>1</td>
<td>SI 148 of 1998</td>
</tr>
<tr>
<td>Copper</td>
<td>50</td>
<td>SI 148 of 1998</td>
</tr>
<tr>
<td>Nickel</td>
<td>30</td>
<td>SI 148 of 1998</td>
</tr>
<tr>
<td>Lead</td>
<td>50</td>
<td>SI 148 of 1998</td>
</tr>
<tr>
<td>Zinc</td>
<td>150</td>
<td>SI 148 of 1998</td>
</tr>
<tr>
<td>Mercury</td>
<td>1</td>
<td>SI 148 of 1998</td>
</tr>
</tbody>
</table>

Notes: 1. Values applicable to soil with a pH from 5 to 7. Where the pH of the soil is consistently higher than 7, the values set may be exceeded by not more than 50%, provided that there is no resulting hazard to human health, the environment or, in particular, ground water.

### 3.2.2 Waste Framework Directive

The management of the sludge is governed by waste legislation. This legislation is based on European directives in relation to sludge. The Waste Framework Directive repealed previous EU Directives in relation to waste. The main waste legislation in Ireland impacting wastewater sludge management is as follows:

- S.I. 821 of 2007 Waste Management (Facility Permit and Registration) as amended by S.I. 86 of 2008 and S.I. 320 of 2014
- S.I. No. 32 of 2010 - Waste Management (Registration of Sewage Sludge Facility) Regulations
- Waste Management Act of 1996

Wastewater sludge is classified as a waste under EWC Codes EU and Irish Legislation. The Waste Management Act, 2006, states that a waste licence is not required for ‘the recovery of — (i) sludge from a facility operated by a local authority for the treatment of water or waste water. In the Waste Management Act ‘Sewage sludges, untreated or unsuitable for use in agriculture’ are classified as a Category II Waste, i.e. treated sludge or sludge suitable for use in agriculture is not classified. However, in S.I. No. 821/2007 - Waste Management (Facility Permit and Registration) Regulations 2007, sub-paragraph (i) of the Waste Management Act, quoted above is replaced by (i) sludge for use in agriculture. i.e. the use of wastewater sludge on non-agricultural land in Ireland, e.g. silviculture and biomass crops, is regulated by S.I. 821 of 2007 as amended.

S.I. No. 32 of 2010, Waste Management (Registration of Sewage Sludge Facility) Regulations 2010, introduced a requirement for registration of wastewater sludge facilities. This excludes wastewater treatment plants and as such does not apply to Irish Water facilities which are located at wastewater treatment plants. Facilities which are licenced under a Waste Licence are also excluded from these regulations.

### 3.2.3 Nitrates Directive


### 3.3 Proposed Legislation

As detailed in Section 3.2, the main European legislation in relation to use of wastewater sludge is the Sewage Sludge Directive. The European Commission is currently considering whether the current Directive should be revised. There have been ongoing reviews of the Sewage Sludge
Directive over the last 20 years. A detailed review of current sludge disposal was undertaken by Milieu Ltd, WRc and RPA for the European Commission, DG Environment under Study Contract DG ENV.G.4/ETU/2008/0076. Reports were issued in 2010\(^4\). This review considered the agricultural re-use of wastewater sludge in accordance with Directive 86/278/EEC and the options for changes to this directive as follows:

- Option 1: do-nothing: keeping the Directive as it is;
- Option 2: introduce certain more stringent standards, especially for heavy metals, standards for some organics and pathogens, and more stringent requirements on the application, sampling and monitoring of sludge;
- Option 3: introduce more stringent standards across all substances and bans on application of sludge to some crops;
- Option 4: total ban on the use of sludge on land; and

This review evaluates the cost impact of the options identified but does not make any specific recommendations apart from excluding repeal of the Directive as an option, i.e. Option 5. It has been noted that Option 4, total ban on the use of sludge on land would have a significant cost implication in addition to conflicting with the waste hierarchy in the Waste Directive which gives priority to the recovery and recycling of waste. The report notes that there is no evidence of problems due to the land application of wastewater sludge. However, its acceptance in terms of public perception is recognised. This is examined further in the SEA and in Sections 8 and 9 of this document, including assessment of alternatives.

The Commission has undertaken a review of EU waste policy and legislation under REFIT which was due to be concluded in 2014.\(^5\) It is expected that future legislation will provide a broader protection of soil, in addition to more stringent controls on the use wastewater sludge. A revision of the EU regulation on fertilisers is proposed, which will involve new measures to facilitate the EU wide recognition of organic and waste-based fertilisers, thus stimulating the sustainable development of an EU-wide market. Irish Water will undertake reviews of EU reports and proposed legislation on an ongoing basis to ensure that any new or upcoming requirements in relation to the management of wastewater sludge are complied with.

### 3.4 Legislation within other EU Member States

The Sewage Sludge Directive has been implemented in EU member states by national legislation. In some countries, more stringent requirements have been included in the legislation. In general, untreated sludge is no longer applied to land within the EU and in several member states it is prohibited. National, and in some cases regional requirements vary across the EU. In the Netherlands, the use of wastewater sludge in agriculture is banned and in regions of other countries including the Flemish region in Belgium and Bavaria in Germany, stringent standards have resulted in an effective ban on use of sludge for agriculture. Denmark, Finland and Sweden also have legislation in place which is substantially more stringent than that required by the Sewage Sludge Directive. In the UK and Sweden voluntary agreements set more stringent requirements than those in the Directive or in national regulations.


\(^5\) Communication from the Commission to the European Parliament, the Council, the European Social and Economic Committee and the Committee of the Regions; Regulatory Fitness and Performance (REFIT): Results and Next Steps
3.5 Sludge Treatment Standards and Guidance Documents

3.5.1 EU Standards

The European Committee for Standardisation, CEN, develops and publishes European Standards and technical specifications to meet the needs of European organisations to improve safety, quality and reliability of products, services, processes. CEN have produced a number of Technical Reports in relation to wastewater sludge. The main standards and reports taken into account in developing the wastewater sludge strategy for Irish Water are as follows:-

- CEN/TR 13097:2010 : Characterization of sludges - Good practice for sludge utilisation in agriculture 2010-06-02

3.5.2 Sludge Treatment Guidance Documents

The main guidance document referred to in current contracts for Irish Water in relation to sludge treatment is the Code of Good Practice for the Use of Biosolids in Agriculture COGP). This document provides detailed information on good practice for both treatment and disposal. The requirement for treatment is a more onerous requirement than current legislation requires. It is Irish Water policy to comply with the COGP. The sampling and analysis of sludge and soil is carried out in accordance with this document. Irish Water intend to liaise with the Department of the Environment, Community and Local Government in relation to a review of the Code of Good Practice for the Use of Biosolids in Agriculture to take into account current legislation. Irish Water propose to develop Standard Operating Procedures for sludge management which will include the requirements in relation to landspreading. These Standard Operating Procedures will incorporate the requirements of the COGP and current legislation and will be updated as necessary to taken into account any update of the COGP or legislation.

The requirement for additional sampling to ensure that there are no long-term impacts on soil quality where sludge is used in agriculture will be reviewed on an ongoing basis taking into account current legislation, guidance documents, EU standards and codes of practice and the latest available research.

The Food Safety Authority of Ireland (FSAI) produced a guidance document for landspreading in relation to food safety6. This document states that the use of untreated wastewater sludge in agriculture is a matter of concern for food safety and recommends that all sludge undergoes treatment.

3.5.3 International Guidance on Sludge Treatment and Disposal

The main other source of guidance documents and regulations in relation to treatment and disposal of wastewater sludge is the United States Environmental Protection Agency (US EPA). The terminology of ‘Class A’ and ‘Class B’ commonly used in Ireland originates from The Standards for the Use or Disposal of Sewage Sludge, CFR Part 503, issued by the US EPA. The treatment processes recommended in the Code of Good Practice for the Use of Biosolids in Agriculture provide a product equivalent to a Class A product.

6 Food Safety Implications of Land-spreading – Agricultural, Municipal and Industrial Organic Materials on Agricultural Land used for Food Production in Ireland, FSAI 2008
3.6 Waste Management Plans

Three Waste Management Planning Regions have been setup and draft plans prepared for each of the regions. The regions for the Waste Management Plans are the same as the regional split used by Irish Water, i.e. East-Midlands, North-West (Connacht-Ulster) and Southern. The Regional Waste Management Plans were launched on 18th November 2014 for public consultation. The final plans were published in May 2015.

The regional waste management plans refer to sludge management by Irish Water and propose that ongoing liaison is undertaken. Policy H1 of each of the Regional Waste Management Plans proposes that the regional waste authorities ‘Work with the relevant stakeholders and take measures to ensure systems and facilities are in place for the safe and sustainable management of sludges (sewage, waterworks, agricultural, industrial, and septic tank) generated in the region having due regard to environmental legislation and prevailing national guidance documents’. Ongoing liaison between Irish Water and the Regional Waste Authorities, Local Authorities and other stakeholders is necessary to ensure that all aspects of sludge management are properly controlled. This will include liaison in relation to the availability of alternative thermal treatment sludge outlets nationally.

3.7 Review of Sludge Management Plans

3.7.1 General

Previous guidance documents on sludge strategy and management included the Strategy Study On Options For The Treatment And Disposal Of Sewage Sludge In Ireland (DoELG 1993) and Sludge Management Plans: A Guide To Their Preparation and Implementation (DoELG 1998).

Sludge management plans were prepared by individual Local Authorities based on Sludge Management Plans: A Guide To Their Preparation And Implementation (DoELG 1998). The sludge management plans examined all non-hazardous sludge produced in each local authority area. The sludge management plans were intended to be a subset of the relevant waste management plan and in some cases were adopted as such. However, in most cases, the sludge management plan was referred to in the waste management plan but did not form part of the document.

The DoELG document, Sludge Management Plans: A Guide to Their ‘Preparation and Implementation recommended the adoption of a ‘Sludge Hub Centre and Satellite Site’ system for the treatment of wastewater sludge. Such a system provides for wastewater sludge from outlying rural works to be directed via intermediate WWTP’s (Satellite dewatering sites) where sludge is dewatered prior to transfer to a centralised treatment facility (the Sludge Hub Centre). The dewatering of sludge at the Satellite Sites reduces onward transport costs and traffic movements.

3.7.2 Recommendations of Sludge Management Plans

Each of the sludge management plans set out recommendations for sludge transport, use of satellite / hub centres and types of sludge treatment at each location. The sludge management plans also included information in relation to sludge loads, existing infrastructure and proposed upgrades. However, as the majority of these plans are over 10 years old, the information is not up-to-date.

A review of the main recommendations of the county sludge management plans and subsequent reviews has been undertaken. A summary of the recommended Sludge Hub Centres and satellites has been included in Table 3.3. A summary of the current status of Sludge Hub Centres is included in Table 3.4.
Table 3.3 Summary of the Recommended Hub Centres and Satellites in County Sludge Management Plans

<table>
<thead>
<tr>
<th>Local Authority</th>
<th>SMP Year</th>
<th>Proposed Sludge Hub(s)</th>
<th>Proposed Sludge Satellites(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carlow</td>
<td>2001 smp</td>
<td>Carlow</td>
<td>Tullow, Bagnalstown (short-term only)</td>
</tr>
<tr>
<td>Cavan</td>
<td>2009 review</td>
<td>Cavan</td>
<td>None</td>
</tr>
<tr>
<td>Clare¹</td>
<td>2003</td>
<td>Ennis</td>
<td>Lisdoonvarna, Kilkee, Mountshannon, Sixmilebridge, Scariff</td>
</tr>
<tr>
<td>Cork City¹</td>
<td>2002</td>
<td>Carrigrennan (no imports)</td>
<td>None</td>
</tr>
<tr>
<td>Cork¹</td>
<td>2002</td>
<td>Skibereen; Castletownbere; Ringaskiddy; Ballincollig; Midleton; Mallow and Mitchelstown</td>
<td>Bantry; Clonakilty; Blamey; Bandon; Fermoy; Buttevant and Kanturk</td>
</tr>
<tr>
<td>Donegal</td>
<td>2006</td>
<td>Donegal Town, Letterkenny</td>
<td>Buncrana, Gweedore, Carndonagh, Ballybofey/Stranorlar, Dunfanaghy/Portnablagh, Milford, Ballyshannon, Killybegs</td>
</tr>
<tr>
<td>Dublin City</td>
<td>-</td>
<td>Ringsend</td>
<td>None</td>
</tr>
<tr>
<td>Dun Laoghaire Rathdown</td>
<td>2002</td>
<td>Shanganagh (no imports)</td>
<td>None</td>
</tr>
<tr>
<td>Fingal</td>
<td>2013 review</td>
<td>GDD WWTP</td>
<td>Swords, Malahide, Barnageeragh, Portrane/Donabate and Oldtown. Cake only to be transferred to SHC.</td>
</tr>
<tr>
<td>Galway City¹</td>
<td>2011</td>
<td>Mutton Island (no imports)</td>
<td>None</td>
</tr>
<tr>
<td>Galway¹</td>
<td>2011</td>
<td>East Galway WWTP</td>
<td>Tuam, Loughrea, Oughterard, Clifden and Ballinasloe</td>
</tr>
<tr>
<td>Kerry</td>
<td>2003</td>
<td>Tralee, Killarney, Caherciveen and Waterville, Listowel</td>
<td>Castleisland, Kenmare, Killorglin and Dingle</td>
</tr>
<tr>
<td>Kildare</td>
<td>2001</td>
<td>Osberstown</td>
<td>Osberstown, Leixlip, Athy and Castledermot</td>
</tr>
<tr>
<td>Kilkenny</td>
<td>2003</td>
<td>Kilkenny City</td>
<td>None</td>
</tr>
<tr>
<td>Laois</td>
<td>2001</td>
<td>Portlaoise</td>
<td>Mountmellick and Portarlington</td>
</tr>
<tr>
<td>Leitrim</td>
<td>2009 review</td>
<td>Carrick-on-Shannon</td>
<td>Manorhamilton and Ballinamore</td>
</tr>
<tr>
<td>Limerick City and County¹</td>
<td>2003</td>
<td>Limerick City and Ennis</td>
<td>Rathkeale, Newcastlewest, Foynes / Shanagolden and Cappamore</td>
</tr>
<tr>
<td>Longford</td>
<td>2006 review</td>
<td>Longford</td>
<td>None</td>
</tr>
<tr>
<td>Louth</td>
<td>1999</td>
<td>Dundalk and Drogheda</td>
<td>None</td>
</tr>
<tr>
<td>County</td>
<td>Year</td>
<td>Landfill/Plan</td>
<td>Areas</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
<td>-----------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Mayo</td>
<td>2002 review</td>
<td>Ballina and Derrinumera Landfill</td>
<td>Westport, Ballinrobe, Claremorris, Swinford, Ballina, Achill Island, Achill Sound and Newport</td>
</tr>
<tr>
<td>Meath</td>
<td>2001</td>
<td>Navan</td>
<td>Kells, Castletown Tara, Duleek and Enfield</td>
</tr>
<tr>
<td>Monaghan</td>
<td>2002</td>
<td>Monaghan and Carrickmacross</td>
<td>Smithborough</td>
</tr>
<tr>
<td>North Tipperary</td>
<td>2003</td>
<td>Nenagh</td>
<td>Thurles</td>
</tr>
<tr>
<td>Offaly</td>
<td>2001</td>
<td>Tullamore</td>
<td>Birr, Fergane and Edenderry</td>
</tr>
<tr>
<td>Roscommon</td>
<td>2007 review</td>
<td>Roscommon</td>
<td>Castlerea</td>
</tr>
<tr>
<td>Sligo</td>
<td>2002</td>
<td>Sligo</td>
<td>Ballymote, Enniscrone, Tubbercurry, Collooney and Grange</td>
</tr>
<tr>
<td>South Dublin</td>
<td>-</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>South Tipperary</td>
<td>1999/2000</td>
<td>Clonmel</td>
<td>Fethard, Cashel, Cahir and Carrick-on-Suir</td>
</tr>
<tr>
<td>Waterford City</td>
<td>2003</td>
<td>Waterford</td>
<td>None</td>
</tr>
<tr>
<td>Waterford</td>
<td>2001</td>
<td>Dungarvan</td>
<td>Cappoquin and Portlaw</td>
</tr>
<tr>
<td>Westmeath</td>
<td>2002</td>
<td>Mullingar and Athlone</td>
<td>Castlepollard, Moate and Rochfordbridge</td>
</tr>
<tr>
<td>Wexford</td>
<td>2001</td>
<td>Wexford</td>
<td>Courtown, Enniscorthy, New Ross</td>
</tr>
<tr>
<td>Wicklow</td>
<td>2010 addendum</td>
<td>Wicklow</td>
<td>Blessington, Baltinglass, Carnew, Arklow and Rathdrum</td>
</tr>
</tbody>
</table>

Notes:
1. Single plans prepared for Limerick City and County and County Clare, Cork City and County, Galway City and County.
Table 3.4  Summary of the Current Status

<table>
<thead>
<tr>
<th>Local Authority</th>
<th>Sludge Satellites(s) / Hub(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carlow</td>
<td>Sludge import facilities at Carlow (Mortarstown WWTP), Tullow and Muinebheag. Temporary sludge treatment (lime stabilisation) at Carlow (Mortarstown WWTP).</td>
</tr>
<tr>
<td>Cavan</td>
<td>Sludge import facilities with screening at Cavan; off site treatment and disposal</td>
</tr>
<tr>
<td>Clare</td>
<td>Off site treatment and disposal. Sludge import facilities at Scariff</td>
</tr>
<tr>
<td>Cork City Council</td>
<td>Sludge treatment at Carrigrennan with no import facilities.</td>
</tr>
<tr>
<td>Cork County Council</td>
<td>Separate sludge contracts for four regions with off site treatment. Liquid sludge import facilities at Blarney and Buttevant.</td>
</tr>
<tr>
<td>Donegal County Council</td>
<td>Sludge hubs with thermal drying complete at Letterkenny and Donegal Town. Hubs include liquid and cake import facilities.</td>
</tr>
<tr>
<td>Dublin City Council</td>
<td>Sludge hub at Ringsend complete. Liquid sludge import facilities at Ringsend.</td>
</tr>
<tr>
<td>Dun Laoghaire Rathdown CC</td>
<td>Sludge treatment at Bray-Shanganagh with no import facilities.</td>
</tr>
<tr>
<td>Fingal County Council</td>
<td>Sludge hub planned as part of GDD WWTP.</td>
</tr>
<tr>
<td>Galway City Council</td>
<td>Sludge treatment with no sludge import facilities.</td>
</tr>
<tr>
<td>Galway County Council</td>
<td>Temporary sludge treatment (lime stabilisation) facilities at Tuam.</td>
</tr>
<tr>
<td>Kilkenny County Council</td>
<td>Kilkenny City operating as sludge hub with temporary lime stabilisation.</td>
</tr>
<tr>
<td>Kildare County Council</td>
<td>Sludge Hub Centre at Osberstown not currently operational. Upgrade of sludge hub including liquid and cake sludge import facilities ongoing.</td>
</tr>
<tr>
<td>Laois County Council</td>
<td>Portlaoise sludge hub complete. Liquid and cake sludge import facilities at hub.</td>
</tr>
<tr>
<td>Leitrim County Council</td>
<td>Liquid sludge import facilities at Carrick-on-Shannon. Off site treatment and disposal</td>
</tr>
<tr>
<td>Limerick City Council</td>
<td>Limerick SHC complete. Liquid and cake sludge import facilities at hub.</td>
</tr>
<tr>
<td>Limerick County Council</td>
<td>Limerick SHC complete. Liquid and cake sludge import facilities at hub.</td>
</tr>
<tr>
<td>Longford County Council</td>
<td>Temporary sludge treatment (lime stabilisation) provided at Longford.</td>
</tr>
<tr>
<td>Louth County Council</td>
<td>Sludge Hub Centres complete in Dundalk and Drogheda. Liquid and cake sludge import facilities at Dundalk hub.</td>
</tr>
<tr>
<td>Mayo County Council</td>
<td>Off site treatment and disposal</td>
</tr>
<tr>
<td>Meath County Council</td>
<td>Temporary sludge treatment (lime stabilisation) provided at Navan.</td>
</tr>
<tr>
<td>Monaghan County Council</td>
<td>Off site treatment and disposal</td>
</tr>
<tr>
<td>Offaly County Council</td>
<td>Sludge Hub Centre complete at Tullamore. Liquid and cake sludge import facilities at hub.</td>
</tr>
<tr>
<td>Roscommon County Council</td>
<td>Off site treatment and disposal</td>
</tr>
<tr>
<td>Sligo County Council</td>
<td>Sludge Hub Centre complete. No satellites proposed.</td>
</tr>
<tr>
<td>Tipperary CC</td>
<td>Thermal dryer at Clonmel for sludge from South Tipperary. Liquid and cake sludge import facilities at hub, liquid sludge acceptance facilities at Cahir, Carrick-on-Suir, Cashel, Fethard and Tipperary Town. North Tipperary sludge treated off-site</td>
</tr>
<tr>
<td>Council</td>
<td>Details</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Waterford City Council</td>
<td>Sludge Hub Centre complete at Waterford City WWTO; no import facilities</td>
</tr>
<tr>
<td>Waterford County Council</td>
<td>Sludge Hub Centre complete at Dungarvan with import facilities</td>
</tr>
<tr>
<td>Westmeath County Council</td>
<td>Sludge Hub Centre complete at Mullingar. Liquid and cake sludge import facilities at hub.</td>
</tr>
<tr>
<td>Wexford County Council</td>
<td>Sludge Hub Centre complete at Wexford. Liquid and cake sludge import facilities at hub.</td>
</tr>
<tr>
<td>Wicklow County Council</td>
<td>Sludge hub complete at Wicklow with import facilities for sludge cake only. Liquid sludge imports discharged to WWTP.</td>
</tr>
</tbody>
</table>
4 Consultation Process

4.1 Introduction
In order to successfully implement a long term sustainable sludge management strategy it is important not only to comply with legislation but also to ensure confidence of stakeholders including government departments, agricultural and food bodies, local communities, environmental bodies, users of the final product and any other stakeholders impacted by the strategy.

4.2 Stakeholders / Consultees
A list of statutory and other interested parties to be consulted was prepared at an early stage prior to publication of the Strategic Environmental Assessment Scoping Report. In addition to the identified consultees, Irish Water placed a newspaper advertisement in the Irish Independent on 12th May 2015 and published information on the Irish Water website in order to inform the public and any other interested parties of the development of the NWSMP, SEA and AA.

The Consultation Report from the first stage of consultation is included in Appendix 1. The consultation report provides further details of the consultation process.

4.3 Public Information Strategy
There are three phases to the public information strategy for the NWSMP as follows:

- Non-statutory public consultation at SEA Scoping stage;
- Statutory consultation on the Draft NWSMP and associated environmental reports and;
- Publication of the finalised NWSMP and SEA Statement.

A project roadmap has been prepared to provide a synopsis of the project activity, what it will involve and how and when the public can participate. A copy of this is included in Figure 4.1. Submissions from the first stage of consultation at the SEA Scoping stage, have been reviewed and taken into account in the development of the Draft NWSMP and associated environmental reports. Submissions on the Draft NWSMP and associated environmental reports will be taken into account, following the statutory public consultation period, in the final documents.
The next step in the NWSMP and SEA process is an eight-week consultation period commencing on 23rd March 2016. During this time comment on the content of the Draft
NWSMP, the Environmental Report and the Natura Impact Statement may be submitted for consideration.

All feedback received as part of this second consultation – Consultation 2 - will be reviewed by the project team and the issues raised will be published in the NWSMP Consultation 2 Report and will be published on the website [www.water.ie/wastewater-sludge-management](http://www.water.ie/wastewater-sludge-management).

Submissions from individuals will be reported anonymously in the Consultation Reports, while feedback from organisations will be attributed to them. While submissions will not be responded to individually, relevant feedback will be incorporated into the final National Wastewater Sludge Management Plan.
5  Sludge Treatment Processes

5.1  Introduction

Sludge processes can be generally divided into the following main categories:

- Sludge volume reduction
- Sludge quantity reduction
- Sludge biosolids production

These categories are not mutually exclusive, e.g. thermal drying substantially reduces sludge volume and also produces a microbiologically safe and stable biosolid. Anaerobic digestion when carried out in conjunction with pasteurisation or hydrolysis reduces the quantity of sludge, in terms of TDS, and produces a biosolid product.

A schematic showing the recommended processes for sludge treatment is included in Figure 5.1. Note that alternative processes that can demonstrate the same level of pathogen reduction will also be considered. Further details of options and alternatives are included in Section 9. The extent of sludge volume reduction at a WWTP, is dependent on the size and location of the WWTP. The main purpose of volume reduction is to reduce transportation costs. This is assessed in further detail in Section 6.

5.2  Sludge Volume Reduction

Sludge volume reduction is provided at wastewater treatment plants to reduce the cost of transport of waste sludge from the treatment process. The reduction of sludge volumes is provided mainly by sludge thickening and dewatering processes. The main processes currently in use in Ireland are as follows:

Sludge thickening technologies:
- Picket fence thickeners
- Consolidation tanks
- Drum thickeners
- Gravity belt

Sludge dewatering technologies:
- Belt presses
- Centrifuges
- Sludge drying beds
- Sludge reed beds

There is a balance which needs to be achieved between the capital and operating costs of sludge thickening and dewatering and the cost of sludge transport. Recommendations for the level of thickening and dewatering are included in Section 6. In some cases, technologies such as containerised dewatering units or mobile dewatering are suitable for reducing sludge volumes where a permanent dewatering installation is not economically justified.
5.3 Treatment Processes to Produce Biosolids

A number of treatment processes have been accepted as providing pathogen reduction to ensure sludge is suitable for use in agriculture. These processes, which have been incorporated
into the *Code of Good Practice for Use of Biosolids in Agriculture* are listed in Table 5.1. The options for treatment are all considered to be acceptable in relation to suitability for use in agriculture.

The preferred option for production of biosolids identified in the majority of sludge management plans prepared for Local Authorities was thermal drying. The main reason identified for this was the potential for use as an alternative fuel if agricultural re-use was not possible.

Further details on each of the options for production of biosolids, identified in Table 5.1, is included in Section 5.3.1 to 5.3.6.

**Table 5.1 - Recommended Sludge Treatment Processes (from the Code of Good Practice, Appendix 3 Table 1)**

<table>
<thead>
<tr>
<th>Process</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mesophilic Anaerobic Digestion with pre- or post-pasteurisation</td>
<td>Mean retention period of at least 12 days primary digestion in temperature range 35°C +/- 3°C or of at least 20 days primary digestion in temperature range 25°C +/- 3°C. Pasteurisation phase must achieve a retention period of at least 1 hour at a temperature of ≥70°C or for 2 hours at a temperature ≥55°C.</td>
</tr>
<tr>
<td>Thermophilic Anaerobic Digestion</td>
<td>Mean retention period of at least 48-72 hours in temperature range 50-55°C. Must include a retention period of at least 1 hour at a temperature greater than 70°C followed by a minimum retention period of at least 2 hours at a temperature ≥55°C or of at least 4 hours at a temperature ≥50°C.</td>
</tr>
<tr>
<td>Thermophilic Aerobic Digestion</td>
<td>Mean retention period of at least 7 days. All sludge to be subject to a temperature of ≥55°C for at least 4 hours. Must achieve a reduction of volatile solids of ≥38%.</td>
</tr>
<tr>
<td>Composting</td>
<td>Windrows: To be held at 55°C for at least 15 days, during which time a temperature of ≥55°C must be maintained over 5 turnings of the windrow. Static Pile or In-vessel: A temperature of ≥55°C must be achieved and maintained uniformly for at least 3 days.</td>
</tr>
<tr>
<td>Alkaline Stabilisation</td>
<td>Addition of lime to raise pH to greater than 12.0 with an accompanying rise in temperature to 70°C for 30 minutes. Addition of lime to raise pH to greater than 12.0 and to maintain pH above 12 for 72 hours and to achieve a temperature of ≥52°C for at least 12 hours. At the end of the 72 hour period, air dry to a dry solid content of ≥50%.</td>
</tr>
<tr>
<td>Thermal Drying</td>
<td>Drying by direct or indirect contact with hot gases. Moisture content of the dried Biosolids to be ≤10%. Either the temperature of the Biosolids &gt;80°C or the wet bulb temperature of the gas in contact with the Biosolids as the Biosolids leaves the drier &gt;80°C</td>
</tr>
</tbody>
</table>

In addition to the sludge treatment processes described above, there are emerging technologies, such as ultrasonic treatment which may provide an alternative means of achieving the required level of pathogen destruction.

**5.3.1 Mesophilic Anaerobic Digestion with pre- or post-pasteurisation**

Anaerobic digestion of sludge can be either mesophillic or thermophillic. Mesophillic and thermophillic refer to the temperature at which the digestion occurs. Mesophillic anaerobic digestion is insufficient on its own to provide full pasteurisation of sludge. A pre or post
pasteurisation stage, where sludge is retained at a temperature ≥ 70°C for 1 hour or 55°C for 2 hours is required. A number of wastewater treatment plants currently have pasteurisation and mesophillic anaerobic digestion in operation. Thermal hydrolysis with mesophillic anaerobic digestion followed by agricultural re-use has been evaluated to be the most sustainable solution for wastewater sludge treatment and disposal. However, the minimum size for a thermal hydrolysis plant is approximately 2,500 tds/a (equivalent to sludge from approximately 100,000 PE). Typically thermal hydrolysis is not considered economic below about 200,000 PE. However, smaller, more efficient thermal hydrolysis plants are currently being developed making smaller plants more economically viable. There are a number of options for advanced anaerobic and aerobic digestion processes which are normally proprietary processes.

5.3.2 **Thermophilic Anaerobic Digestion**

There are no thermophilic anaerobic digestion facilities in operation by Irish Water. Thermophilic digestion is usually more expensive to operate as it requires additional energy to maintain the higher operating temperatures and has a greater sensitivity to operational and environmental conditions. As such thermophilic anaerobic digestion is unlikely to be a practical option for any future developments by Irish Water.

5.3.3 **Thermophilic Aerobic Digestion**

There is one thermophilic aerobic digestion facility in operation by Irish Water at the Killarney WWTP. The process is operated in a batch fashion making it suitable for the significant variation between winter and summer loads in Killarney. Due to the energy requirement of aerobic digestion processes, they are not commonly used and are unlikely to be a preferred option for any future developments by Irish Water.

5.3.4 **Composting**

Composting is undertaken by mixing dewatered sludge with a bulking agent to provide carbon and increase porosity. The resulting mixture is placed in windrows, static piles or a vessel where microbial activity causes the temperature of the mixture to rise. In order to achieve the required level of pasteurisation, a minimum temperature of 55°C must be maintained. In the case of windrow composting the temperature must be maintained for at least 15 days over 5 turnings of the windrow. For static pile or in-vessel composting, the temperature must be maintained uniformly for a minimum of 3 days.

The main advantages of this process are relatively low operating costs and an easily handled product. The main disadvantages are the higher capital cost compared to alkaline stabilisation, potential for inadequate treatment if not properly controlled and potential for odours.

There are no composting facilities owned by Irish Water. However, a number of private composting facilities have been developed in Ireland to treat wastewater sludge produced by Irish Water. These facilities may be used for treatment of wastewater sludge only or combined with green waste for composting.

5.3.5 **Alkaline Stabilisation**

Alkalise stabilisation is undertaken by mixing an alkaline additive with dewatered sludge. Normally hydrated lime or quicklime are used as alkaline stabilisers. In order to achieve the required level of pasteurisation, the pH must be >12 with a minimum temperature of 70°C for 30 minutes or, maintain a pH > 12 for 72 hours and a minimum temperature of 52°C for at least 12 hours. A higher dose of lime or external heating is required to reach the higher temperatures. The main advantage of this process is relatively low capital and operating costs. In addition, a large proportion of land in Ireland is lime deficient and the use of lime stabilised sludge can provide an additional benefit in agriculture. The main disadvantages are the higher volume of sludge for disposal, potential for inadequate treatment if not properly controlled and monitored, low nitrogen content and odours due to ammonia release.
There are a large number of lime stabilisation facilities currently being used for treatment of wastewater sludge. Four of these are located at wastewater treatment plants with the remainder being operated at off-site private facilities taking wastewater sludge on a contract basis.

5.3.6 Thermal Drying

Thermal drying is undertaken by direct or indirect application of an external heat source to dewatered sludge to evaporate water from the sludge. Thermal drying produces a fully pasteurised granular product with a dry solids content greater than 90%. The main advantages of this process are the significant volume reduction of sludge and the potential for alternative outlets to land-spreading. The main disadvantages are the high capital and operating costs, with high energy costs in particular. There is also a relatively high risk of fire associated with thermal drying.

5.4 Advanced Thermal Sludge Treatment Processes

5.4.1 General

The main process for thermal conversion of wastewater sludge is currently incineration which is widely used internationally. Wastewater sludge is not currently incinerated in Ireland. However, restrictions on agricultural landspreading due to quality assurance schemes implemented by the agricultural sector may lead to incineration being the only viable option for sludge treatment.

There are a number of thermal conversion technologies for the treatment of sludge. Advanced thermal treatment processes for sludge, leading to destruction of the sludge, normally with energy recovery and an ash product have been under development for a number of years. These processes include the following:

- Wet oxidation
- Pyrolysis
- Gasification
- Melting furnace
- Incineration

To date, incineration is the only thermal treatment process which has been generally commercially available for wastewater sludge. However, recent developments are likely to make more advanced technologies such as pyrolysis and gasification available on a commercial basis. Due to the relatively small scale of wastewater installations in Ireland, it is likely to take longer before these technologies are commercially available to Irish Water. However, if restrictions on land application increase, it may be necessary to provide for this type of technology in Ireland.

Other similar technologies which produce a fuel as an end-product have been developed. These technologies are not generally commercially available. Commercially viable pyrolysis and gasification treatment processes are being developed and are likely to offer viable alternatives to incineration in the short-term. The cost for any advanced thermal treatment is typically 30 to 50% more than the current practice of re-use in agriculture. However, they are likely to provide a sustainable outlet in the future, if insufficient agricultural land is available for use of sludge. In the longer term, as energy costs continue to rise, it is likely that pyrolysis and gasification will provide viable options.

5.4.2 Incineration

Incineration of wastewater sludge requires sludge to be dewatered to a minimum of 25 to 30% dry solids for the process to be self-sustaining, i.e. no external heat input is required after start-up. Fuel is always required during start-up and is normally required intermittently as the solids
content and calorific value of the feed varies. 65% to 75% of the wastewater sludge is combustible. The ash is typically disposed of to landfill. There is a potential for recovery of struvite from the ash. However, this is normally only viable in large-scale installations with mono-incineration of wastewater sludge only. Incineration has high capital and operating costs with limited energy recovery. A recent review by United Utilities in the UK concluded that energy recovery is optimised by using advanced anaerobic digestion upstream of incineration rather than incineration of raw sludge.

5.4.3 Pyrolysis and Gasification

The gasification process converts carbonaceous materials by partial oxidation of the wastewater sludge in a reducing atmosphere in the presence of steam at high temperatures to convert the feedstock to synthesis gas (syngas). Pyrolysis is a similar process to gasification but the decomposistion of organic material takes place in anaerobic conditions to produce a fuel which may be in gaseous or liquid form and a solid biochar product.

As there is potential for sludge gasification or pyrolysis to provide net energy recovery, there is a potential for a lower carbon footprint than other sludge management techniques. However, at present, there is insufficient information on commercial scale systems to assess the potential viability of sludge gasification or pyrolysis in Ireland. However, it is expected that these technologies will become economically viable option in the coming years.

5.5 Emerging Sludge Treatment Processes

Emerging processes for sludge treatment being developed are largely related to sludge minimisation and increasing energy recovery. Anaerobic digestion is very effective on primary sludge at reducing solids. However, the level of solids reduction on waste activated sludge is low without pre-treatment. A number of technologies have been developed or improved in recent years in order to provide disintegration and cell lysis upstream of anaerobic digestion. Technologies for advanced digestions include:

- Thermal hydrolysis
- Enhanced enzyme hydrolysis
- Thermophilic digestion
- Ultrasound
- Microsludge
- OpenCEL
- Cell Rupture

Thermal hydrolysis of sludge is a well known technology for a number of years and a large number of plants have been developed in recent years. Other technologies to improve disintegration of sludge upstream of digestion have been developed to commercial use in recent years and may be a viable option for Sludge Hub Centres in Ireland.

New and emerging technologies in wastewater treatment impact the quantity of sludge produced. Treatment processes such as the granular activated sludge process recently installed in the Clonakilty WWTP produces a lower quantity of sludge than conventional activated sludge. Similarly, other proprietary wastewater treatment processes developed in recent years, which allow a higher level of treatment or higher sludge age without increasing the activated sludge volume, lead to a lower level of sludge production.
The sludge treatment processes in use in Ireland include all of the processes detailed in Table 5.1 and Figure 5.3. The breakdown in Table 5.1 details all sludge treatment for stabilisation. Figure 5.3 details the final treatment to produce biosolids. The proportion of sludge being treated by each of the treatment processes has been estimated below based on the 2014 sludge returns.
Table 5.2 – Type of Sludge Treatment, 2014

<table>
<thead>
<tr>
<th>Treatment Type</th>
<th>TDS/Annum</th>
<th>% of Total TDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autothermal Thermophilic Aerobic Digestion (ATAD)</td>
<td>226</td>
<td>0.4%</td>
</tr>
<tr>
<td>Anaerobic Digestion &amp; Thermal Drying</td>
<td>2,124</td>
<td>4.0%</td>
</tr>
<tr>
<td>Anaerobic Digestion &amp; Lime Stabilisation</td>
<td>4,529</td>
<td>8.5%</td>
</tr>
<tr>
<td>Anaerobic Digestion &amp; Pasteurisation</td>
<td>4,239</td>
<td>7.9%</td>
</tr>
<tr>
<td>Composting</td>
<td>6,206</td>
<td>11.6%</td>
</tr>
<tr>
<td>Lime Stabilisation</td>
<td>14,815</td>
<td>27.7%</td>
</tr>
<tr>
<td>Thermal Drying</td>
<td>4,904</td>
<td>9.2%</td>
</tr>
<tr>
<td>Thermal Hydrolysis, Anaerobic Digestion, Thermal Drying</td>
<td>14,220</td>
<td>26.6%</td>
</tr>
<tr>
<td>Thermal Hydrolysis, Anaerobic Digestion</td>
<td>1,543</td>
<td>2.9%</td>
</tr>
<tr>
<td>No treatment</td>
<td>737</td>
<td>1.4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>53,543</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

The type of treatment varies from year to year. There are thermal drying facilities available at thirteen wastewater treatment plants which have a sludge drying capacity of approximately 60,000 tds/annum. However, less than a third of this capacity is currently used, due mainly to the high cost and operational difficulties with thermal drying.
6  Sludge Transport Strategy

6.1  General

Transportation is a significant part of sludge management in terms of environmental impacts and cost. The transportation strategy must be sustainable taking into account carbon footprint and potential impacts in terms of traffic, odour and noise. The cost of sludge transport has been assessed by the EU as approximately 30% of the total cost. In smaller wastewater treatment plants in Ireland, transport accounts for a substantially larger proportion of the costs associated with sludge treatment.

The need for sustainable transportation of sludge produced in plants is identified in the WSSP which states that ‘Transport and re-use/disposal of all wastewater sludge will be managed by Irish Water to ensure compliance with our standards for treatment and disposal by registered contractors with full traceability.’

Procedures for removing liquid sludge from the wastewater treatment process are an important factor in ensuring compliance of final effluent from WWTP’s. Standard operating procedures being developed by Irish Water will include procedures for on-site sludge management. In order to optimise desludging the sludge infrastructure at the WWTP needs to be adequate and a transportation strategy in place to remove sludge from the site. Infrastructure upgrades will be undertaken in accordance with Irish Water Standard Specifications currently being developed.

6.2  Existing Sludge Transport

The total volume of sludge from wastewater treatment plants is estimated as up to 900,000 m³/annum. Over 80% of this is from WWTP’s being operated by Local Authorities with the remainder from plants being operated by DBO contractors. Approximately 75% of the sludge, in terms of tonnes dry solids, is produced at WWTP’s operated by DBO contractors as these include the majority of larger WWTP’s. The volume of sludge from DBO plants varies largely depending on the use of thermal drying facilities. The majority of wastewater treatment plants being operated by DBO contractors include sludge dewatering as a minimum with thermal drying at the larger wastewater treatment plants and the majority of existing sludge hubs.

The cost for transport of sludge varies widely from approximately €8 to €25 per wet tonne, with 1 tonne approximately equal to 1 m³ of sludge for liquid sludge. The annual transport cost is estimated as approximately €8-10 million. There is substantial variation in transport costs depending on the location of the particular wastewater treatment plant.

6.3  Sludge Transport Strategy

There are a number of options to reduce the volume of sludge currently being transported. This is to have benefits in terms of environmental, social and financial impacts. Reducing sludge transport has the benefit of reducing greenhouse gas emissions due to reduced transport. This must be balanced against the lifecycle cost, environmental and social impacts of additional sludge infrastructure at a high number of sites, with additional staff transportation required to operate and maintain equipment. Similarly the transport of sludge to the final disposal location is dependent on the availability of suitable land for landspreading and agreements between individual landowners and sludge management contractors. Contracts should ensure that, where practicable, sludge is transported and spread on the nearest suitable spread lands to the source of the treated sludge.

The lifecycle cost for transport versus further on-site thickening, dewatering and/or treatment prior to final disposal has been reviewed to establish economically viable transport distances. This initial assessment of the recommended maximum transport distances depend on size of

---

7 Disposal and recycling routes for sewage sludge, European Communities, 2002
plant, distance to satellite centre and type of treatment process. Where transport of liquid sludge is not viable, the options in terms of fixed plant and mobile thickening or dewatering plant have been assessed.

An assessment of the cost of provision of a satellite centre versus transport directly to a Sludge Hub Centre has also been undertaken to provide an initial assessment of where additional Satellite Sites for dewatering are justified. The estimated cost for upgrade of a wastewater treatment plant to act as a satellite dewatering site is in the order of €500,000. This cost may increase substantially in some cases, e.g. if additional buildings are required to accommodate dewatering plant upgrades or if an access road upgrade would be required to provide the satellite dewatering site.

The transport cost saving of using a satellite dewatering plant to reduce the volume of sludge can be up to €100,000 per annum versus transport directly to the proposed Sludge Hub Centre. In some cases, it is considered more economic to continue to accept sludge at the inlet works to a treatment plant rather than provide a full sludge acceptance facility.

The selection of the location and number of Satellite Sites requires a detailed assessment on a site by site basis to establish suitability. This assessment must take into account the environmental, social and financial impacts of any proposal. A review of other constraints such as an existing operational contract must also be taken into account.
Figure 6.1 – Location of Wastewater Treatment Plants in Ireland
6.4 Sludge Infrastructure to Optimise Transport Volumes

6.4.1 General

An overall assessment of sludge infrastructure requirements has been carried out based on the sludge transport assessment and operating requirements. The recommendations below provide a general guide to the type of infrastructure, relative to the size and location of the WWTP. This may vary depending on particular WWTP requirements.

The design and operation of the sludge infrastructure can have a significant impact on the operation of the wastewater treatment plant main treatment process. Inadequate sludge management, in terms of either plant design or operation, including frequency of desludging, can potentially lead to breaches of emission limit values, odours and high operating cost. A desludging schedule is proposed for all WWTP sites taking into account the treatment process, sludge production and site location. Upgrades and/or changes to operational procedures will be required where the requirements set out below to optimise transportation are not currently being met. This may include upgrades to access to individual sites.

6.4.2 Sludge Storage

In order to optimise sludge transport costs, sludge storage is required at wastewater treatment plants. For smaller wastewater treatment plants (< 500 p.e), it is adequate if sludge storage is provided within the treatment process providing adequate storage is available. The frequency of sludge removal will depend on the treatment process in addition to the storage volume. It is reported that digestion of sludge in a storage tank can commence after 3 weeks in some cases but may take as long as six weeks for sludge from trickling filters. The volume of storage may need to be increased in order to optimise the desludging schedule. Removal of sludge every 2 weeks is recommended for wastewater treatment plants with secondary treatment. This frequency may be decreased for septic tanks and will need to be assessed on an individual basis. However, it is recommended that all septic tanks operated by Irish Water are desludged annually as a minimum.

Following a review of sludge transport costs the minimum recommended provisions for sludge storage are summarised in Table 6.1:-

Table 6.1 – Recommended Minimum Storage

<table>
<thead>
<tr>
<th>Population Equivalent</th>
<th>Minimum Storage (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 500</td>
<td>28 days</td>
</tr>
<tr>
<td>500 – 1,000</td>
<td>14 - 28 days</td>
</tr>
<tr>
<td>1,000 – 3,000</td>
<td>14 days</td>
</tr>
<tr>
<td>3,000 – 10,000</td>
<td>7 days – no dewatering</td>
</tr>
<tr>
<td></td>
<td>4 days – with dewatering</td>
</tr>
<tr>
<td>&gt; 10,000 (1)</td>
<td>3 days</td>
</tr>
</tbody>
</table>

Notes: (1) The particular requirements for wastewater treatment plants greater than 10,000p.e.

6.4.3 Sludge Thickening

Sludge from secondary treatment is normally removed from the process stream at less than 1% dry solids (d.s.), i.e. 99% water content, with primary sludge removed at approximately 2-3% d.s. In general, sludge should be thickened to a minimum of 2% dry solids prior to removal from site. This can be achieved by decanting from a sludge holding tank with no mechanical equipment required.

UKWIR report that the use of picket fence thickeners is only considered cost effective for WWTP’s greater than 2,000 PE. For WWTP’s less than 1,000 PE, the distance to the closest

---

8 UKWIR Sustainable Sludge Thickening and Treatment at Small WwTWs, 2013
satellite dewatering sites should be reviewed prior to carrying out any capital upgrades as the sludge volumes will be low. For wastewater treatment plants from 1,000 to 2,000 PE, thickening should be provided by gravity consolidation tanks with decanting. This provides a guide only as dry solids concentration of sludge from a wastewater treatment process varies substantially. Other considerations such as available space on the site, environmental impacts and options for on-site treatment options, such as sludge reed beds should be considered prior to any upgrade to provide sludge thickening.

WWTP’s with a population equivalent greater than 2,000p.e. should include sludge thickening to a minimum of 3% dry solids. Where transport distances exceed 25km, consideration should be given to chemical dosing to increase sludge dry solids concentration to a minimum of 4% dry solids. Picket fence thickeners should be designed to achieve a minimum dry solids of 4%. However, in practice, this can be difficult to achieve consistently with activated sludge.

There is the potential to reduce the volume of sludge for transport by 20 to 25% by optimising sludge thickening at smaller wastewater treatment plants. There are a large number of sites with existing sludge storage tanks where sludge thickening could be optimised by automating the decant process. A review of existing technologies is recommended in order to identify the most suitable technologies to achieve this. Where automatic decanting is not economically justified, manually decanting sludge tanks prior to removal of sludge from a WWTP should be undertaken. The option of provision of a sludge reed bed should be considered in each case for remote sites. The additional data being gathered in the asset register, as further detailed in Section 10.5 will be used to inform the site specific upgrade requirements.

For wastewater treatment plants with a population equivalent of less than 2,000p.e., sludge thickening or alternative sludge disposal should be considered where:

- Transport distance to satellite is > 20km for a p.e. < 1,000 – 2,000
- Transport distance to satellite is > 30km for a p.e. 500 – 1,000
- Transport distance to satellite is > 50km for p.e. > 500

### 6.4.4 Sludge Reed Beds

On-site sludge reed beds provide a viable economic alternative to sludge transport. A number of sludge reed beds have been provided in Ireland in recent years and are operating successfully. Sludge reed beds are particularly beneficial in smaller remote wastewater treatment plants where the cost of transport of sludge to a satellite dewatering site is unsustainable. There is a higher risk of odours where a treatment plant includes primary sludge which should be taken into account in assessing the suitability of a site for reed beds. Also, in order to ensure that the final sludge product is suitable for use in agriculture, it is recommended that sludge reed beds are used only where inlet screens are in place at a WWTP. A further study of the feasibility of sludge reed beds at potentially suitable sites is recommended. This will take into account the siting criteria detailed in Section 9.5.

### 6.4.5 Sludge Dewatering

All wastewater treatment plants with a population equivalent greater than 10,000p.e. should include sludge dewatering to a minimum of 18% dry solids. For population equivalents greater than 5,000p.e. and transport distances of >20km to a satellite, sludge dewatering should also be provided. Sludge dewatering is currently in place at all wastewater treatment plants greater than 5,000 PE and at a number of smaller wastewater treatment plants.

There are substantial operating costs associated with sludge dewatering which can out-weigh the benefits in reduced sludge volumes for transport in smaller WWTP’s. Other considerations such as available space on the site, environmental impacts and options for on-site treatment
options, such as sludge reed beds, should be considered prior to installation of sludge dewatering.

A programme of review of sludge dewatering performance is proposed for all dewatering sites to assess whether dry solids concentrations can be improved. In some cases, older single belt presses have been installed which provide inadequate dewatering and replacement or decommissioning of these should be considered. The option of containerised dewatering units or mobile dewatering will be considered in cases where fixed dewatering is not economically justified taking into account the environmental impacts, in addition to an economic evaluation of options.

In general, sludge cake storage should have a minimum capacity of 7 days up to a maximum skip size of 20m³. The replacement of existing sludge skips should be considered where inadequate storage is provided as this can be justified based on the transportation cost savings, particularly at larger sites.
7 Sludge Satellite and Hub Infrastructure

7.1 General

The use of a ‘Sludge Hub Centre and Satellite Site’ system for the management of wastewater sludge has been implemented in a number of counties in Ireland. As detailed in Section 3.7, this use of a Sludge Hub Centre and Satellite dewatering site system allows for economies of scale and greater flexibility in the selection of treatment processes, particularly energy recovery and also assists in the maintenance of quality control over the outputs from any selected treatment processes.

This system of satellite and hubs is commonly used internationally and is considered to be appropriate for use by Irish Water. However, local authority areas will no longer be considered individually allowing greater flexibility and efficiency. Location for sludge satellite and hub centres were identified in the county sludge management plans undertaken in the late 1990’s and early 2000’s. An outline of the recommended satellite and hub centres, from the county sludge management plans, is included in Section 3.7.

![Figure 7.1 – Schematic of Hub and Satellite System](image)

7.2 Sludge Satellite Infrastructure

7.2.1 Liquid Sludge Imports

Liquid sludge imports to wastewater treatment plants consist of liquid sludge from smaller wastewater treatment plants and septic tank sludge from private contractors. In some cases, wastewater treatment plants have installed sludge acceptance facilities with screening and storage facilities. In order to accept sludge from smaller wastewater treatment plants without fine screening and septic tank sludge, a sludge acceptance screen at the sludge Satellite Site is
needed. There are currently thirty wastewater treatment plant sites which have been identified as having sludge screening equipment.

The requirement for new imported liquid sludge facilities in each local authority is assessed further in Section 7.4. All liquid sludge acceptance sites should, where feasible, include acceptance of DWWTS sludge. Due to the high level of screenings in the DWWTS sludge, this sludge is frequently unsuitable for discharge to a sludge acceptance screen. The option of discharge to the inlet works, via a balancing tank, should be considered.

It is proposed to increase the number of satellite dewatering sites and to provide for balancing of sludge, with discharge to the inlet works, at sites where the proposed level of imports is insufficient to justify a full liquid sludge acceptance facility. This will have the benefit of reducing sludge transport costs and reduce the traffic impacts if all sludge were to be transported directly to Sludge Hub Centres.

### 7.2.2 Sludge Imports from External Sources

There are a number of external sources of sludge imports to wastewater treatment plants from sources outside the responsibility of Irish Water. The main external source of imported sludge is Domestic Wastewater Treatment Systems (DWWTS), i.e. single house septic tanks or treatment systems. It is likely that, in the coming years, there will be a significant increase in demand for acceptance of this type of sludge. There is an opportunity for Irish Water to accept this sludge on a commercial basis. The EPA published, in April 2014, a document on *Management Options for the Collection, Treatment and Disposal of Sludge Derived from Domestic Wastewater Treatment Systems*, Strive Report Series 123.

Further to the implementation of the Water Services (Amendment) Act 2012 (No. 2 of 2012) regarding the registration and inspections of DWWTS’s, it is anticipated that the volume of sludge from DWWTS’s requiring disposal will increase substantially over the next number of years. The report prepared on behalf of the EPA estimates that there is capacity for approximately 50% of the existing septic tank sludge within existing wastewater treatment plants. This would increase where the sludge is increased up to 6-8% dry solids, prior to transport using mobile dewatering units.

### 7.2.3 Requirements for Satellite Sites

Designated sludge Satellite Sites require suitable reception facilities for importation of liquid sludge. This includes as a minimum:

- Screening and screenings handling
- Flow measurement of imported sludge
- Sludge balancing tank
- Capacity for mechanical thickening of imported sludge
- Dewatering facilities with sufficient capacity
- Tanker unloading bays with a tanker turning circle
- Odour control equipment

For Sludge Hub Centres and larger Satellite Sites, additional facilities may be required including additional tanker unloading bays, sludge blending tank, weighbridge etc. All sites with sludge imports will require operating procedures to control the quantity and type of sludge imported. Inadequate control of sludge imports may impact the final effluent and sludge quality. These procedures will be developed as part of Irish Water’s Standard Operating Procedures.

There are imported liquid sludge facilities at approximately 30 existing wastewater treatment plants which are currently acting as Satellite Sites with 20 of these sites also acting as sludge hubs. Over 100 WWTP’s reported accepting liquid sludge imports in 2014. However, in the
majority of cases, the sludge was discharged directly to the inlet works. These sites have not been classified as existing ‘Satellite Sites’ as the appropriate infrastructure is not in place. In order to optimise sludge transport and dewatering, it is expected that a further 20-30 Satellite Sites are required. An individual assessment is required of each proposed Satellite Site and any existing Satellite Sites where it is proposed to upgrade the capacity. The following should be assessed as a minimum:-

- Accessibility and traffic impacts
- Impact on wastewater treatment plant and final effluent quality
- Potential odour and noise impacts
- Availability of space within or adjacent to the existing site
- Capacity and condition of existing sludge treatment facilities
- Site suitability and consideration of alternatives

There are potential requirements for planning permission and/or review of the wastewater discharge licence for the particular site. These requirements will be identified as part of the site assessment.

7.3 Sludge Hubs and Treatment Centres

7.3.1 Existing Sludge Hub Centres

There are 24 existing wastewater treatment plants where full sludge treatment to produce biosolids is provided. 20 of these plants currently act as Sludge Hub Centres, i.e. have full sludge treatment and the site accepts imports. This includes five sites where temporary lime stabilisation equipment has been installed to produce biosolids. It is considered necessary to upgrade the Sludge Hub Centres that have temporary lime stabilisation to provide an alternative long-term sustainable solution.

It is considered that an additional two to three Sludge Hub Centres are required, in addition to upgrade of existing Sludge Hub Centres. This will provide the required capacity for sludge treatment for long-term sustainable treatment. The capacity of existing sludge hubs at Limerick is insufficient, at present, to accept sludge from County Clare, as proposed. Existing sludge treatment centres at Waterford and Cork may provide a cost effective way to provide sludge hub capacity for these areas. Upgrade of existing Sludge Hub Centres to provide anaerobic digestion or advanced anaerobic digestion should be considered at all sites. In general all Sludge Hub Centres should also act as Satellite Sites with upgrades required to allow this where the required facilities are not in place at present.

A detailed individual assessment is required for sludge treatment centres or Sludge Hub Centres where it is proposed to upgrade the capacity or provide for importation of sludge. The assessment required will be similar to the assessment required for a Satellite Site as detailed in Section 7.2.3.

Table 7.1 – Existing Sludge Hub and Treatment Centres

<table>
<thead>
<tr>
<th>Local Authority</th>
<th>Agglomeration</th>
<th>Sludge Treatment Process</th>
<th>Current Sludge Treatment Capacity (PE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carlow</td>
<td>Carlow</td>
<td>Lime stabilisation</td>
<td>70,000</td>
</tr>
<tr>
<td>Cork</td>
<td>Cork City³</td>
<td>AD and Thermal Drying</td>
<td>413,000</td>
</tr>
<tr>
<td>Donegal</td>
<td>Letterkenny</td>
<td>Thermal Drying</td>
<td>120,000</td>
</tr>
<tr>
<td>Donegal</td>
<td>Donegal Town</td>
<td>Thermal Drying</td>
<td>83,000</td>
</tr>
<tr>
<td>Dublin</td>
<td>Ringsend</td>
<td>AAD and Thermal Drying</td>
<td>1,640,000</td>
</tr>
<tr>
<td>Dun Laoghaire R</td>
<td>Shanganagh³</td>
<td>AD and Thermal Drying</td>
<td>186,000</td>
</tr>
<tr>
<td>County</td>
<td>Town</td>
<td>Treatment Process</td>
<td>Capacity</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td>-------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Galway</td>
<td>Tuam</td>
<td>Lime stabilisation</td>
<td>170,000</td>
</tr>
<tr>
<td>Galway City</td>
<td>Galway City³</td>
<td>AD and pasteurisation</td>
<td>170,000</td>
</tr>
<tr>
<td>Kerry</td>
<td>Killarney</td>
<td>ATAD</td>
<td>54,000</td>
</tr>
<tr>
<td>Kildare</td>
<td>Upper Liffey Valley</td>
<td>Thermal Drying</td>
<td>400,000</td>
</tr>
<tr>
<td>Kilkenny</td>
<td>Kilkenny City</td>
<td>Lime stabilisation</td>
<td>50,000</td>
</tr>
<tr>
<td>Laois</td>
<td>Portlaoise</td>
<td>Thermal Drying</td>
<td>80,000</td>
</tr>
<tr>
<td>Limerick</td>
<td>Limerick</td>
<td>Thermal Drying</td>
<td>160,000</td>
</tr>
<tr>
<td>Longford</td>
<td>Longford</td>
<td>Lime stabilisation</td>
<td>80,000</td>
</tr>
<tr>
<td>Louth</td>
<td>Dundalk</td>
<td>AD and Thermal Drying</td>
<td>179,000</td>
</tr>
<tr>
<td>Meath</td>
<td>Navan</td>
<td>Lime stabilisation</td>
<td>90,000</td>
</tr>
<tr>
<td>Offaly</td>
<td>Tullamore</td>
<td>AD and Thermal Drying</td>
<td>80,000</td>
</tr>
<tr>
<td>Sligo</td>
<td>Sligo</td>
<td>AD and pasteurisation</td>
<td>83,000</td>
</tr>
<tr>
<td>Tipperary</td>
<td>Clonmel</td>
<td>Thermal Drying</td>
<td>90,000</td>
</tr>
<tr>
<td>Waterford</td>
<td>Dungarvan</td>
<td>Thermal Drying</td>
<td>80,000</td>
</tr>
<tr>
<td>Waterford</td>
<td>Waterford city³</td>
<td>AD and pasteurisation</td>
<td>190,000</td>
</tr>
<tr>
<td>Westmeath</td>
<td>Mullingar</td>
<td>Thermal Drying</td>
<td>70,000</td>
</tr>
<tr>
<td>Wexford</td>
<td>Wexford town</td>
<td>Thermal Drying</td>
<td>80,000</td>
</tr>
<tr>
<td>Wicklow</td>
<td>Wicklow</td>
<td>Thermal Drying</td>
<td>50,000</td>
</tr>
</tbody>
</table>

Notes:
1. Sites for sludge treatment are at licenced wastewater treatment plants. Private sludge treatment facilities and sludge treatment locations where additional treatment is provided off-site are not included.
2. Population equivalent has been estimated based on sludge production of 55g/PE/day.
3. The existing sludge treatment centres at Cork City, Galway City, Shanganagh and Waterford City have no sludge imports. All other sites act as sludge hubs.

7.3.2 Sludge Cake Imports

Importation of sludge cake has been provided for at a number of larger wastewater treatment plants which are currently operating as Sludge Hub Centres. Additional sludge cake import facilities are needed where temporary Sludge Hub Centres or sludge treatment centres are to be developed to accept sludge cake.

7.3.3 Current On-Site Sludge Treatment

The main treatment process for pathogen reduction in sludge installed since the late 1990’s to date has been thermal drying. Thermal dryers were installed following recommendations in the county sludge management plans. The provision of sludge driers was regarded as beneficial, based on providing a sustainable product with re-use options as a fuel in addition to agricultural use. However, thermal dryers have high energy consumption and high operation and maintenance costs. Due to the significant cost of operating the sludge driers, they are not all currently in operational use.

The other sludge treatment processes currently in use include the following:-

- Anaerobic digestion with lime stabilisation
- Anaerobic digestion and pre-pasteurisation / hydrolysis
- Anaerobic digestion and post-pasteurisation
- Autothermal thermophilic aerobic digestion
- Lime stabilisation
- Composting
Further details of sludge treatment processes to produce biosolids are included in Section 5.3.

7.3.4 Current Off-Site Sludge Treatment

There are a number of standalone privately owned sludge treatment facilities. The majority of these use lime stabilisation. There are also composting and advanced anaerobic digestion facilities being used for wastewater sludge, with sludge being imported from municipal wastewater treatment plants under service contracts.

There are 16 No. such composting/anaerobic digestion facilities licenced by the EPA under waste licencing. There are also 22 facilities registered with the EPA for wastewater sludge treatment and storage under the Waste Facility Permit and Certification of Registration system. Off-site sludge storage, not licenced under a waste licence or Waste Facility Permit and Certification of Registration must be registered under the Certification of Registration system for wastewater sludge storage with the Local Authority. This requirement does not apply to temporary storage at the place of use.

7.3.5 Current Sludge Contracts

Responsibility for operation of existing wastewater treatment plants and associated for sludge treatment and/or disposal has been reviewed. The majority of wastewater treatment plants, over 77% in terms of the number of plants are operated and maintained directly by Local Authorities (LA’s) through a Service Level Agreement with Irish Water. However, the majority of sludge produced from wastewater treatment plants over 500p.e. (approximately 70%) is dealt with by DBO contractors representing the larger plants nationally. The disposal of sludge from the DBO and LA operated plants is normally subcontracted to specialist sludge management contractors.

There are approximately 500 wastewater treatment plants serving agglomerations less than 500p.e. Over 90% of these are operated by Local Authorities with the remainder being operated under DBO contracts. These plants account for less than 3% of the total population equivalent served by municipal wastewater treatment with the proportion of sludge being even lower as a significant number of these treatment plants are primary or septic tank type treatment plants.

7.3.6 Sludge Transport Contracts

Sludge transport from WWTP’s operated by the Local Authorities is undertaken either by a transport contractor or directly by the local authority. This accounts for over 80% of the volume of sludge transport. DBO Contracts may include responsibility for transport of sludge to a Sludge Hub Centre. DBO Contracts for wastewater treatment plants with full sludge treatment always include responsibility for sludge transport from the sludge treatment to the final disposal location.

7.3.7 DBO Contracts

The majority of permanent Sludge Hub Centres and sludge treatment centres are currently operated under DBO Contracts. These contracts include full responsibility for sludge treatment and disposal. Over 150 wastewater treatment plants are currently being operated by DBO contractors. These include most of the larger plants in the country. Sludge from DBO operated plants accounts for over 70% of wastewater sludge produced in Ireland.

7.4 Sludge Hub and Satellite Centre Assessment by Local Authority Area

7.4.1 General

Each local authority area has been reviewed to assess the current situation and recommendations for the future. It is intended that existing Sludge Hub Centres should be used to their maximum capacity unrestricted by county boundaries. In particular, the use of existing anaerobic digestion infrastructure should be maximised to increase energy recovery. In the case of thermal drying facilities, the maximum use of the Sludge Hub Centre may not be the most economically advantageous solution.
The overall strategy is to allow flexibility in the use of sludge hub infrastructure to allow diversion of sludge loads to alternative sites during periods of maintenance or peak loading. A number of existing sludge treatment sites being operated by Design Build Operate contractors are recommended for upgrade to facilitate the acceptance of sludge from outside the local authority area.

There are over 100 wastewater treatment plants currently reporting imports of wastewater sludge. In most cases the facilities on the wastewater treatment plant sites are inadequate to properly manage and control these imports, particularly where they are discharged directly to the inlet works. Particular sites which are considered geographically suitable as satellite dewatering sites or sludge hubs have been identified. These sites will be subject to detailed assessments on a site by site basis to establish suitability. This assessment must take into account the environmental, social and financial impacts of any proposal. A review of other constraints such as an existing operational contract must also be taken into account. Particular site issues such as restricted access, risk to Natura 2000 sites, impacts on receptors, availability of space and economic feasibility need to be considered in the final site selection.

7.4.2 Carlow County Council

Sludge within County Carlow is currently lime stabilised at the Mortarstown Wastewater Treatment Plant under a contract with Irish Water. The Mortarstown WWTP also acts as both a sludge hub and a Satellite Site for sludge dewatering. The Sludge Hub Centre at Osberstown was designed to accept sludge from County Kildare over a 20 year growth period. It is proposed to upgrade the Osberstown hub to advanced anaerobic digestion, with the works due to commence in 2016. It is recommended, that the energy recovery at Osberstown is maximised by importing sludge from Carlow until the capacity of the Sludge Hub Centre is reached.

The wastewater treatment plants at Carlow, Tullow and Muinebeag currently accept imports of liquid sludge. However, the Tullow and Muinebeag sites do not currently have adequate facilities for efficient sludge acceptance. In order to continue to accept sludge at these sites, improved sludge acceptance facilities are recommended.

7.4.3 Cavan County Council

There are no WWTP sites in Cavan reported as being used as sludge hubs. Sludge within County Cavan was lime stabilised at the Cavan WWTP, for a number of years, under a temporary contract. Due to the current upgrade works contract, this lime stabilisation now takes place off-site. The quantity of sludge produced in Cavan is not sufficient to economically justify advanced anaerobic digestion. A Sludge Hub Centre to cater for sludge from Cavan and surrounding counties is recommended. Longford Town has been assessed to be suitably located for a sludge hub for sludge from Cavan.

The new Cavan WWTP is considered to be in a suitable location to act as a Satellite Site. It is intended that the Cavan WWTP should accept liquid sludge from the smaller wastewater treatment plants in the county for dewatering. The upgrade of the wastewater treatment plant includes facilities for the acceptance of liquid sludge including a balancing tank and sludge acceptance screen. No further works are considered to be necessary.

7.4.4 Clare County Council

There are no WWTP sites in Clare being used as sludge hubs. The sludge management plan for Clare and Limerick proposed that sludge from Clare would be treated in Limerick. At present, a framework contract for sludge treatment and disposal from sites in Clare is in operation. However, the Limerick City WWTP should be considered in the future as a sludge hub for County Clare.
The wastewater treatment plants at Clareabbey, Scarriff, Shannon Town, Corofin, Lahinch and Sixmilebridge were reported as accepting imports in 2014. It is considered more economic to reduce the number of sites accepting imports and to provide appropriate facilities at these sites. The wastewater treatment plants at Ennis and Lahinch have been considered for acceptance of imports of liquid sludge. In order to cater for septic tank sludge an additional sludge satellite should be considered at Kilrush. These sites do not currently have sludge acceptance facilities and these are recommended.

7.4.5 Cork City Council

The Cork City wastewater treatment plant is located at Carrigrennan, Co Cork. The plant currently has anaerobic digestion and thermal drying of sludge. There is a potential for upgrade of this facility to include advanced anaerobic digestion to increase energy recovery. The import of sludge to the existing Carrigrennan WWTP was excluded from the planning granted. However, as there is substantial spare organic capacity at the wastewater treatment plant and within the sludge stream which could be utilised for sludge imports from the Cork county area a review of the planning and infrastructure requirements including an assessment of potential traffic impacts is proposed to assess feasibility of importing sludge to this site.

7.4.6 Cork County Council

There are no WWTP sites in Cork county being used as sludge hubs. At present, framework contracts for sludge treatment and disposal from sites in Cork are in operation. As detailed in Section 7.4.5, the Cork City wastewater treatment plant at Carrigrennan is considered to be in a suitable location to be used as a sludge hub. A detailed assessment of this option is recommended in order to establish the suitability of the site and feasibility of developing a Sludge Hub Centre with advanced digestion.

The wastewater treatment plants at Fermoy, Mallow, Macroom, Dunmanway, Skibbereen, Rosscarbery-Owenincha, Castletownbere, Glengarriff, Ballineen-Enniskane, Durrus, Buttevant, Ballincollig, Carrigtwohill and Bandon are reported as accepting imports of liquid sludge. There are existing sludge acceptance facilities at Buttevant and Blarney. Mallow and Fermoy have sludge import screens which are currently not in use. It is considered more economic to reduce the number of sites accepting imports and to provide appropriate facilities at these sites. Additional sludge acceptance facilities are recommended at:

- Ballincollig
- Bantry
- Carrigtwohill
- Clonakilty
- Fermoy
- Mallow
- Midleton
- Skibbereen

7.4.7 Donegal County Council

There are currently two sludge hubs in operation in County Donegal, at Donegal Town and Letterkenny. Both of these sludge hubs have import facilities and treatment by thermal drying. Letterkenny also has a facility for anaerobic digestion which is currently not in use. The Sludge Hub Centres in Donegal were both constructed in the last 10 years and are considered to have sufficient capacity for the foreseeable future.

The wastewater treatment plant at Buncrana currently accepts imports of liquid sludge. However, this site does not currently have adequate facilities to allow efficient sludge
acceptance. In order to continue to accept sludge here, improved sludge facilities are recommended. No additional sludge satellites are considered to be required in Donegal.

### 7.4.8 Dublin City Council

The Ringsend WWTP currently acts as a sludge hub for the Dublin City area. Sludge treatment is provided by thermal hydrolysis and anaerobic digestion followed by thermal drying. The Sludge Hub Centre in Ringsend will be retained and upgraded, as necessary, during the upgrade of the wastewater treatment plant. The selected treatment process and any chemical dosing for phosphorus removal may impact the quantity of sludge produced. The predicted sludge quantity from the Ringsend wastewater treatment plant will be reviewed on completion of detailed design for the works.

There is a potential for use of the waste-to-energy plant currently under construction adjacent to the Ringsend Wastewater Treatment Plant. Other alternatives, such as use of dried sludge in industry may also be considered. In accordance with the waste hierarchy, it is preferable to recycle rather than incinerate wastewater sludge. However, due to current pressures on the agricultural outlet for wastewater sludge, it is considered important to consider alternative outlets. This is considered further in Section 8.

### 7.4.9 Fingal County Council

Sludge produced in Fingal is currently exported and treated off-site under a framework contract. A sludge management plan prepared on behalf of Fingal County Council recommended that the proposed new North Dublin WWTP (Greater Dublin Drainage Scheme [www.greaterdublindrainage.ie](http://www.greaterdublindrainage.ie)) should include a Sludge Hub Centre for treatment of wastewater sludge produced in the Fingal area. This proposal has been reviewed by Irish Water and is considered to provide the most appropriate option for a sludge hub in Fingal.

The Fingal sludge management plan recommended anaerobic digestion and thermal drying. It is recommended that advanced digestion is provided to maximise energy recovery and that the design of the site allows for the provision of thermal drying. The whole life cost for thermal drying is high and may not be justified, at the present time, but should be allowed for in the design of the plant. The availability of land-use outlets may decrease prior to construction of the wastewater treatment plant and it is important that provision is made for thermal drying. The timing of the thermal drying element of the plant should be reviewed as the scheme progresses.

There are no existing imported liquid sludge facilities in Fingal. The proposed Sludge Hub Centre for Fingal should include a full liquid sludge acceptance facility with screening to allow for acceptance of liquid sludge from small wastewater treatment plants in the Fingal area and septic tank sludge. No additional imported liquid sludge facilities are considered to be necessary in the Fingal area.

### 7.4.10 Dún Laoghaire-Rathdown County Council

There is currently only one wastewater treatment plant in Dun Laoghaire-Rathdown, located at Shanganagh which also serves Bray, Co. Wicklow. The treatment plant currently has anaerobic digestion and thermal drying of sludge. The Bray-Shanganagh WWTP is marginal in size relative to the typical minimum economic size for thermal hydrolysis, so provision of advanced anaerobic digestion may not be economically feasible at this stage but may be considered in the future.

### 7.4.11 Galway City Council

The wastewater treatment plant for Galway City is located at Mutton Island. The treatment plant currently has anaerobic digestion and pasteurisation of sludge. However, the pasteurisation unit is not currently in use and the sludge produced undergoes additional treatment off-site prior to disposal. An ultrasonic sludge treatment unit was recently installed to increase the sludge reduction in anaerobic digestion. There is a potential for upgrade of this facility to include
advanced anaerobic digestion to increase energy recovery. Thermal hydrolysis may be marginal at this site and should be considered from an economic perspective.

7.4.12 Galway County Council

There is currently a temporary sludge hub in operation in County Galway at Tuam with lime stabilisation facilities for sludge treatment. This treatment was provided on an interim basis until a long-term sludge hub was developed. Sludge import facilities are due to be provided in 2016 to improve operations at the Tuam site.

There is a requirement for a new Sludge Hub Centre in the Galway county area as the wastewater treatment plant at Mutton Island is not considered to be suitable as a Sludge Hub Centre. A Sludge Hub Centre is required for the Galway/ Mayo region. Tuam is considered to be a suitable location for a Sludge Hub Centre. However, a detailed site assessment is required in order to confirm suitability. It is proposed that the new Sludge Hub Centre would serve parts of County Mayo with sludge from plants in north Mayo transferred to the existing hub in Sligo. A Sludge Hub Centre to include advanced anaerobic digestion is recommended. A detailed assessment is required in order to confirm the most economically feasible treatment option and to confirm the most appropriate site.

The wastewater treatment plants at Tuam, Gort, Ballinasloe and Dunmore are reported as taking imports of liquid sludge. However, these sites do not currently have adequate facilities to allow efficient sludge acceptance. In order to continue to accept sludge at these sites, improved sludge acceptance facilities are recommended. It is recommended that Satellite Sites are developed at Ballinasloe and Moycullen. Imported liquid sludge facilities should be provided at these sites and at Tuam. There are sludge reed beds in place at a number off WWTP sites in Galway reducing sludge transport costs from these sites. Additional sites in Galway may also be suitable for this technology.

7.4.13 Kerry County Council

There are no sludge hubs in operation in County Kerry. The wastewater treatment plant in Killarney has an autothermal thermophillic aerobic digestion process which fully treats sludge from that plant. Sludge produced in the remainder of Kerry is currently exported and treated off-site under a framework contract.

Sludge imports of liquid sludge are currently reported as accepted at a number of wastewater treatment plants in the county including:

- Killarney WWTP
- Tralee WWTP
- Dingle WWTP
- Castleisland WWTP
- Listowel WWTP
- Cahersiveen WWTP
- Killorglin WWTP

However, the facilities for accepting sludge at these sites are not adequate to efficiently accept sludge from the surrounding plants. There is a substantial cost associated with the management of sludge across County Kerry and satellite dewatering centres with liquid sludge acceptance facilities are recommended at Killarney and Tralee. The sites at Dingle, Listowel, Castleisland and Kenmare should be provided with sludge acceptance facilities to allow sludge to be balanced and discharged to the inlet works. On-site treatment using sludge reed beds may be appropriate at a number of sites and its feasibility should be assessed.

There is a requirement for a new Sludge Hub Centre in Kerry. It is proposed that the Sludge Hub Centre could be located at Tralee. The potential for transferring sludge from Kerry to Cork
should also be considered. A full detailed site assessment is required in order to confirm suitability. A Sludge Hub Centre to provide advanced anaerobic digestion is recommended. A detailed assessment is required in order to confirm the most economically feasible treatment option and to confirm the most appropriate site.

7.4.14 **Kildare County Council**

There is currently one Sludge Hub Centre in operation in County Kildare, at Osberstown (Upper Liffey Valley) operated under a DBO contract. The sludge hub has import facilities for liquid and cake sludge and treatment by thermal drying. The thermal drying plant has been out of use for a number of years and sludge is currently lime stabilised prior to disposal. A proposal to upgrade the hub to advanced anaerobic digestion has been approved.

The Athy, Derrinturn, Leixlip and Osberstown WWTP’s currently accept imports of liquid sludge and sludge cake. There are existing liquid sludge acceptance facilities in Leixlip and Osberstown. In order to reduce liquid sludge transport costs and to allow for acceptance of septic tank sludge a liquid sludge acceptance facilities are recommended at Athy.

7.4.15 **Kilkenny County Council**

There is currently a sludge hub in operation at the Kilkenny City (Purcellsinch) treatment plant with lime stabilisation facilities for sludge treatment. This treatment was provided on an interim basis until a long-term sludge hub was developed. However, there are currently no suitable sludge import facilities.

It is proposed to provide liquid sludge acceptance facilities at the Kilkenny City as part of the wastewater treatment plant upgrade. This site should be considered as a potential long-term Sludge Hub Centre with advanced anaerobic digestion along with liquid and cake sludge acceptance facilities. The upgrade of the Waterford City plant is considered to be a suitable alternative site to cater for sludge from County Kilkenny and the Waterford City area. A detailed assessment is recommended to identify the optimal solution. It is proposed that sludge from County Carlow will also be treated at this Sludge Hub Centre once the capacity of the existing Kildare Sludge Hub Centre is reached. It is not considered necessary to provide any additional sludge Satellite Sites within County Kilkenny.

7.4.16 **Laois County Council**

There is currently one Sludge Hub Centre in operation in County Laois, at Portlaoise. The sludge hub has import facilities for liquid and cake sludge and treatment by thermal drying. The Sludge Hub Centre in Portlaoise was constructed in the last 10 years and is considered to have sufficient capacity for the foreseeable future. No additional sludge satellites are considered to be required in Laois.

7.4.17 **Leitrim County Council**

Sludge produced in Leitrim is currently exported and treated off-site under a framework contract. The Carrick-on-Shannon wastewater treatment plant acts as a satellite dewatering site and accepts liquid sludge from WWTP’s in the county.

It is not considered that there is sufficient sludge produced in Leitrim to economically justify a Sludge Hub Centre. It is recommended that sludge in Leitrim is transferred to the Sligo Sludge Hub Centre or the proposed Sludge Hub Centre in Longford depending on location within the county. Liquid sludge in the north-west of the county should be transferred directly to Sligo with the remainder accepted at Carrick-on-Shannon or transferred directly to Longford.
7.4.18 **Limerick City and County Council**

There is currently one Sludge Hub Centre in operation in County Limerick, at Limerick City (Bunlicky). The sludge hub has import facilities for liquid and cake sludge and treatment by thermal drying. The plant is currently being upgraded to provide anaerobic digestion and has sufficient capacity for sludge produced in Limerick. It is recommended that the Sludge Hub Centre in Limerick will also cater for sludge from County Clare and is upgraded to advanced anaerobic digestion.

The Sludge Hub Centre in Limerick currently accepts imports of liquid sludge including septic tank sludge. In order to reduce liquid sludge transport costs a satellite dewatering centre with liquid sludge import facilities is recommended at Newcastle West. In order to reduce the volume of traffic to the Limerick City wastewater treatment plant, consideration should be given to a future satellite dewatering centre at Castletroy.

7.4.19 **Longford County Council**

There is currently a sludge hub in operation in County Longford at Longford Town with lime stabilisation facilities for sludge treatment. This treatment was provided on an interim basis until a long-term sludge hub was developed.

It is recommended that the existing site in Longford be assessed as the location for a long-term Sludge Hub Centre with advanced anaerobic digestion and liquid and cake sludge acceptance facilities. It is proposed that sludge from suitably located sites in Cavan, Leitrim and Roscommon is also treated at this Sludge Hub Centre in order to make advanced anaerobic digestion economically viable. It is not considered necessary to provide any additional sludge Satellite Sites within County Longford.

7.4.20 **Louth County Council**

There are currently two sludge hubs in operation in County Louth, at Dundalk and Drogheda. Both these sludge hubs have liquid sludge import facilities and anaerobic digestion and currently accept sludge imports. There is additional sludge treatment by thermal drying at Dundalk with lime stabilisation facilities at both Drogheda and Dundalk.

The Sludge Hub Centres in Louth were both constructed in the last 15 years and are considered to have sufficient capacity for the foreseeable future. There is spare capacity at the Sludge Hub Centre in Dundalk which has the potential to be used for sludge imports from Monaghan. However, it should be noted that new industrial discharges may limit the available spare capacity. The capacity of the Sludge Hub Centre should be reviewed as part of any proposal for industrial discharges and consideration given to upgrading the hub to advanced anaerobic digestion if the existing capacity is exceeded. No additional sludge satellites are considered to be required in Louth.

7.4.21 **Mayo County Council**

Sludge produced in Mayo is currently exported and treated off-site under a framework contract. Sludge imports of liquid sludge are currently reported as accepted at a number of wastewater treatment plants in the county including:

- Westport WWTP
- Castlebar WWTP
- Ballina WWTP
- Ballyhaunis WW
- Bangor Erris WWTP
- Crossmolina WWTP
- Knock WWTP
- Swinford WWTP
- Achill Island WWTP

However, the existing sludge acceptance facilities are not adequate to efficiently accept sludge from the surrounding plants. There is a substantial cost associated with the management of sludge from County Mayo and a number of satellite dewatering centres with liquid sludge acceptance facilities are recommended. It is considered more economic to reduce the number of sites accepting imports and providing appropriate facilities at these sites. It is recommended that sludge acceptance facilities are provided at the Westport, Ballina and Castlebar. The WWTP site at Achill should be provided with sludge acceptance facilities to allow sludge to be balanced and discharged to the inlet works. In addition to this, on-site treatment of sludge using sludge reed beds may be appropriate at a number of sites.

It is considered more economically feasible to develop a Sludge Hub Centre in Galway to cater for sludge from the southern part of County Mayo with sludge from North Mayo transferred to the Sligo Sludge Hub Centre.

7.4.22 **Meath County Council**

There is currently a sludge hub in operation in County Meath at Navan with lime stabilisation facilities for sludge treatment. This treatment was provided on an interim basis until a long-term sludge hub was developed. The sludge treatment facility is being operated under a framework contract.

It is recommended that the existing site in Navan be developed as a long-term Sludge Hub Centre with advanced anaerobic digestion and liquid and cake sludge acceptance facilities. There is existing sludge infrastructure in place, including anaerobic digestion, which may reduce the overall cost of this facility. It is proposed that sludge from suitably located sites in Cavan is also treated at the Navan Sludge Hub Centre in order to make advanced anaerobic digestion economically viable.

Sludge imports of liquid sludge are currently reported as accepted at a number of wastewater treatment plants in the county including:

- Athboy WWTP
- Castletown Tara WWTP
- Duleek WWTP
- Navan WWTP
- Summerhill WWTP

The Athboy, Castletown Tara, Duleek and Navan sites have facilities for accepting sludge which are not adequate at present. These existing facilities should be reviewed to assess the scope of upgrades required. Additional sludge Satellite Sites are proposed for the Kells and Trim WWTP’s to accept liquid sludge.

7.4.23 **Monaghan County Council**

Sludge produced in Monaghan is currently exported and treated off-site under a framework contract. Sludge imports of liquid sludge are currently reported as accepted at a number of wastewater treatment plants in the county including Monaghan, Castleblayney, Carrickmacross and Glaslough. However, the facilities for accepting sludge at these sites are not adequate. Satellite dewatering centres with liquid sludge acceptance facilities are recommended at Monaghan and Carrickmacross.

It is considered more economically feasible to transfer sludge to the existing Sludge Hub Centre in Dundalk than to develop a Sludge Hub Centre for sludge produced in Monaghan.
7.4.24 Offaly County Council

There is currently one Sludge Hub Centre in operation in County Offaly, at Tullamore. The sludge hub has import facilities for liquid and cake sludge and treatment by thermal drying. The Sludge Hub Centre in Tullamore was constructed in the last 10 years and is considered to have sufficient capacity for the foreseeable future.

The wastewater treatment plants at Birr, Ferbane and Clara currently accept imports of liquid sludge. However, these sites do not currently have adequate facilities to allow efficient sludge acceptance. In order to continue to accept sludge at these sites, a full imported sludge facility is recommended. It is recommended that the sites at Birr and Ferbane are provided with imported sludge facilities and that sludge currently being delivered to Clara should be diverted to the Sludge Hub Centre in Tullamore.

7.4.25 Roscommon County Council

Sludge produced in Roscommon is currently exported and treated off-site under a framework contract. Sludge imports of liquid sludge are currently reported as accepted at a number of wastewater treatment plants in the county including Ballaghaderreen, Castlerea and Monksland. However, there facilities for accepting sludge are not adequate. An upgrade of the existing sludge acceptance facilities at Castlerea and Monksland is recommended with new sludge acceptance facilities provided at Ballaghaderreen.

It is considered more economically feasible to transfer sludge to the proposed Sludge Hub Centre in Longford than to develop a Sludge Hub Centre for sludge produced in Roscommon. In the short-term it is recommended that sludge from Roscommon is diverted to the existing Sludge Hub Centre in Sligo until it reaches full capacity with the remaining sludge going to the temporary Sludge Hub Centre in Longford.

7.4.26 Sligo County Council

There is currently one Sludge Hub Centre in operation in County Sligo, at Sligo. The sludge hub has import facilities for liquid and cake sludge and treatment by anaerobic digestion and pasteurisation.

The Sludge Hub Centre in Sligo was constructed in the last 15 years and is considered to have sufficient capacity for the foreseeable future. The Enniscrone WWTP has liquid sludge import facilities and is operated as part of a DBO scheme. The WWTP at Ballysadare is reported as accepting imported sludge. No additional sludge satellites are considered to be required in Sligo. However, the provision of a sludge acceptance tank with discharge to the inlet works should be considered at Ballysadare to reduce the volume of liquid sludge to be transferred to Sligo. There is spare capacity available in the Sligo Sludge Hub Centre. It is recommended that this spare capacity is used to treat sludge from surrounding counties including suitably located sites in Mayo, Leitrim and Roscommon.

The existing anaerobic digestion in Sligo does not have energy recovery. The economic feasibility of this should be reviewed taking into account the proposal to maximise the use of the existing Sludge Hub Centre.

7.4.27 Tipperary County Council

There is currently one Sludge Hub Centre in County Tipperary at Clonmel. Clonmel acts as a sludge hub for South Tipperary with imported sludge facilities for liquid and cake sludge imports and treatment by thermal drying. The sludge hub/treatment centre in Clonmel was both constructed in the last 10 years and is considered to have sufficient capacity for the foreseeable future.
Sludge from North Tipperary is currently managed under a framework contract and is treated by anaerobic digestion and pasteurisation at a privately owned off-site facility. The wastewater treatment plant at Roscrea accepts sludge from smaller plants in North Tipperary and sludge is anaerobically digested prior to further treatment off-site.

The following wastewater treatment plants are reported as currently accepting imports of liquid sludge:

- Nenagh
- Thurles
- Roscrea
- Cashel WWTP
- Caher WWTP
- Fethard WWTP
- Carrick-on-Suir WWTP
- Tipperary WWTP

However, these sites do not all currently have adequate facilities to allow efficient sludge acceptance. In order to continue to accept sludge at these sites, a review of the existing infrastructure should be undertaken and upgrading to ensure that there is a complete imported sludge facility is recommended. It is recommended that the sites at Nenagh, Thurles, Roscrea, Cashel and Tipperary Town are upgraded to have full imported sludge facilities and that consideration should be given to diverting the sludge currently being delivered to Cahir, Fethard and Carrick-on-Suir to the other sludge import facilities.

### 7.4.28 Waterford City and County Council

There is currently one sludge hub and one stand-alone sludge treatment centre in operation in County Waterford. The Waterford City WWTP acts as a sludge treatment centre for sludge produced at the Waterford City WWTP. Dungarvan acts as a sludge hub for the remainder of the county with imported sludge facilities for liquid and cake sludge imports.

The sludge hub/treatment centres in Waterford were both constructed in the last 10 years and are considered to have sufficient capacity for the foreseeable future.

The Dungarvan Sludge Hub Centre currently accept imports of liquid sludge and sludge cake. There are no other import facilities in Waterford. It is recommended that the Tramore WWTP is also used as a satellite dewatering site and that a full imported sludge facility is provided. No additional sludge satellites are considered to be required in Waterford.

The Waterford City WWTP currently has substantial spare organic capacity at the wastewater treatment plant and within the sludge stream which could be utilised for sludge imports from the region subject to a review of the planning and infrastructure requirements including an assessment of potential traffic impacts. The sludge treatment process in place is anaerobic digestion and pasteurisation of sludge. There is no energy recovery from the gas produced in digestion. There is a potential for upgrade of this facility to add energy recovery. In the short to medium term sludge from Kilkenny could be imported to the Waterford City plant to optimise use of the existing infrastructure. Sludge acceptance facilities would be required in order to proceed with this. Future industrial and commercial developments in the Waterford City area may reduce the level of spare capacity at this site.

### 7.4.29 Westmeath County Council

There is currently one Sludge Hub Centre in operation in County Westmeath, at Mullingar. The sludge hub has import facilities for liquid and cake sludge and treatment by thermal drying.
The Sludge Hub Centre in Mullingar was constructed in the last 10 years and is considered to have sufficient capacity for the foreseeable future. No additional sludge satellites are considered to be required in Westmeath. The existing wastewater treatment plant in Athlone accepts small quantities of septic tank sludge. The quantity is insufficient to warrant provision of a sludge import facility. However, a sludge acceptance tank discharging to the inlet works should be provided. Liquid sludge import facilities at Monksland will provide sufficient capacity for imports in the area surrounding Athlone with the remainder of the liquid sludge arisings from County Westmeath going directly to the Sludge Hub Centre.

7.4.30 Wexford County Council

There is currently one Sludge Hub Centre in operation in County Wexford, at Wexford Town. The sludge hub has import facilities for liquid and cake sludge and treatment by thermal drying. This sludge hub was completed in 2003 and is considered to have sufficient capacity for the foreseeable future.

The Sludge Hub Centre in Wexford currently accepts imports of liquid sludge. In order to reduce liquid sludge transport costs and to allow for acceptance of septic tank sludge satellite dewatering centres with liquid sludge import facilities are recommended at Enniscorthy, New Ross and Gorey.

7.4.31 Wicklow County Council

There is currently one Sludge Hub Centre in operation in County Wicklow, at Wicklow Town. The sludge hub has import facilities for cake sludge and treatment by thermal drying. This sludge hub was completed in the last 10 years and is considered to have sufficient capacity for the foreseeable future.

Sludge imports are currently reported at Baltinglass, Carnew, Blessington, Enniskerry and Wicklow. There are no liquid sludge acceptance facilities at these sites and sludge is accepted directly to the inlet works. It is recommended that liquid sludge acceptance facilities are provided at Wicklow Town. In order to reduce liquid sludge transport costs and the volume of liquid sludge imported to Wicklow town, liquid sludge acceptance facilities are recommended at Blessington. It is further recommended that liquid sludge in the south and west of County Wicklow be diverted to liquid sludge acceptance facilities in Athy, Carlow, Tullow and Osberstown.

7.5 Future upgrades

There are a total of 24 sludge hub and treatment centres in Ireland as detailed in Section 7.3. The majority of these are being operated by DBO contractors. Kilkenny County Council and Galway County Council undertake lime stabilisation at the wastewater treatment plants in Kilkenny and Tuam respectively. Other sites have lime stabilisation facilities owned and operated by contractors operating under an Irish Water Framework Contract. The location of existing and potential future Sludge Hub Centres is shown on Figure 7.2 overleaf with an outline of potential infrastructure upgrade in each local authority area detailed in Section 7.4. Any project and any associated works, individually or in combination with other plans or projects, shall be subject to Appropriate Assessment Screening to ensure there are no likely significant effects on the integrity (defined by the structure and function) of any Natura 2000 site(s) and that the requirements of Article 6(3) and 6(4) of the EU Habitats Directive are fully satisfied in accordance with the recommendations of the Strategic Environmental Assessment of the NWSMP.

There are a number of off-site facilities owned and operated by private contractors which provide lime stabilisation, anaerobic digestion & pasteurisation and composting. An audit of these facilities has indicated that the anaerobic digestion & pasteurisation and composting facilities are generally well controlled and operated. These operations offer good value for money and it is anticipated that use of these facilities will be continued. However, the audit identified a number of concerns over the operation of lime stabilisation facilities. Due to the number of these facilities
and the difficulty in monitoring the quality of the operations, it is recommended that any future lime stabilisation is restricted to Irish Water owned sites.

Figure 7.2 – Location of Current and Potential Future Sludge Hubs and Satellites
**Table 7.2 Summary of the Current Status and Proposed Upgrades**

<table>
<thead>
<tr>
<th>Local Authority</th>
<th>Sludge Satellites(s) / Hub(s)</th>
<th>Proposed Upgrades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carlow</td>
<td>Sludge import facilities at Carlow (Mortarstown WWTP), Tullow and Muinebheag. Temporary sludge treatment (lime stabilisation) at Carlow (Mortarstown WWTP)</td>
<td>Sludge import facilities at Tullow and Muinebheag to be upgraded</td>
</tr>
<tr>
<td>Cavan</td>
<td>Sludge import facilities with screening at Cavan; off site treatment and disposal</td>
<td>None</td>
</tr>
<tr>
<td>Clare</td>
<td>Off site treatment and disposal. Sludge import facilities at Scariff</td>
<td>Upgrade of existing Sludge Hub Centre at Limerick identified as an option for sludge from Clare. Sludge import facilities to be provided at Ennis and Lahinch</td>
</tr>
<tr>
<td>Cork City Council</td>
<td>Sludge treatment at Carrigrennan with no import facilities</td>
<td>Sludge Hub Centre proposed for Cork. Carrigrennan site identified as potential Sludge Hub Centre location.</td>
</tr>
<tr>
<td>Cork County Council</td>
<td>Separate sludge contracts for four regions with off site treatment. Liquid sludge import facilities at Blarney and Buttevant.</td>
<td>Sludge import facilities to be provided at Ballincollig, Bantry, Carrigtoohil, Clonakilty, Fermoy, Mallow, Midleton, Skibbereen.</td>
</tr>
<tr>
<td>Donegal County Council</td>
<td>Sludge hubs with thermal drying complete at Letterkenny and Donegal Town. Hubs include liquid and cake import facilities.</td>
<td>Sludge import facilities to be provided at Buncrana.</td>
</tr>
<tr>
<td>Dublin City Council</td>
<td>Sludge hub at Ringsend complete. Liquid sludge import facilities at Ringsend.</td>
<td>None</td>
</tr>
<tr>
<td>Dun Laoghaire Rathdown CC</td>
<td>Sludge treatment at Bray-Shanganagh with no import facilities.</td>
<td>None</td>
</tr>
<tr>
<td>Fingal County Council</td>
<td>No existing sludge hubs or satellites in Fingal.</td>
<td>Sludge hub planned as part of GDD WWTP.</td>
</tr>
<tr>
<td>Galway City Council</td>
<td>Sludge treatment with no sludge import facilities.</td>
<td>None</td>
</tr>
<tr>
<td>Galway County Council</td>
<td>Temporary sludge treatment (lime stabilisation) facilities at Tuam.</td>
<td>Sludge Hub Centre proposed for Galway/ Mayo. Tuam identified as potential Sludge Hub Centre location. Sludge import facilities proposed for Tuam, Ballinasloe and Moycullen.</td>
</tr>
<tr>
<td>County Council</td>
<td>Status and Description</td>
<td>Notes</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Kerry County Council</td>
<td>Off site treatment and disposal</td>
<td>Sludge Hub Centre proposed for Kerry. Tralee identified as potential Sludge Hub Centre location. Sludge import facilities to be provided at Tralee, Killarney, Dingle, Listowel, Castleisland and Kenmare.</td>
</tr>
<tr>
<td>Kildare County Council</td>
<td>Sludge Hub Centre at Osberstown not currently operational. Upgrade of sludge hub including liquid and cake sludge import facilities ongoing.</td>
<td>Sludge Hub Centre at Osberstown to be upgraded in 2016. Sludge import facilities to be provided at Athy.</td>
</tr>
<tr>
<td>Kilkenny County Council</td>
<td>Kilkenny City operating as sludge hub with temporary lime stabilisation.</td>
<td>Sludge Hub Centre proposed for south-east. Waterford City or Kilkenny City identified as potential Sludge Hub Centre locations. Sludge import facilities to be provided at Kilkenny City.</td>
</tr>
<tr>
<td>Laois County Council</td>
<td>Portlaoise sludge hub complete. Liquid and cake sludge import facilities at hub.</td>
<td>None</td>
</tr>
<tr>
<td>Leitrim County Council</td>
<td>Liquid sludge import facilities at Carrick-on-Shannon. Off site treatment and disposal</td>
<td>None</td>
</tr>
<tr>
<td>Limerick City Council</td>
<td>Limerick SHC complete. Liquid and cake sludge import facilities at hub.</td>
<td>Upgrade of existing Sludge Hub Centre required identified as an option for sludge from Clare.</td>
</tr>
<tr>
<td>Limerick County Council</td>
<td>Limerick SHC complete. Liquid and cake sludge import facilities at hub.</td>
<td>Sludge import facilities to be provided at Newcastle-West and Castletroy</td>
</tr>
<tr>
<td>Longford County Council</td>
<td>Temporary sludge treatment (lime stabilisation) provided at Longford</td>
<td>Sludge Hub Centre proposed for Longford</td>
</tr>
<tr>
<td>Louth County Council</td>
<td>Sludge Hub Centres complete in Dundalk and Drogheda. Liquid and cake sludge import facilities at Dundalk hub.</td>
<td>None</td>
</tr>
<tr>
<td>Mayo County Council</td>
<td>Off site treatment and disposal</td>
<td>Sludge Hub Centre proposed for Galway/ Mayo. Tuam identified as potential Sludge Hub Centre location. Sludge import facilities to be provided at Ballina, Castlebar, Westport and Achill.</td>
</tr>
<tr>
<td>Meath County Council</td>
<td>Temporary sludge treatment (lime stabilisation) provided at Navan.</td>
<td>Sludge Hub Centre proposed for Meath. Navan identified as potential Sludge Hub Centre location. Sludge import facilities to</td>
</tr>
<tr>
<td>County Council</td>
<td>Treatment and Disposal</td>
<td>Sludge Import Facilities</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Monaghan County Council</td>
<td>Off site treatment and disposal</td>
<td>Sludge import facilities to be provided at Monaghan and Carrickmacross.</td>
</tr>
<tr>
<td>Offaly County Council</td>
<td>Sludge Hub Centre complete at Tullamore. Liquid and cake sludge import facilities at hub.</td>
<td>Sludge import facilities to be provided at Birr, Ferbane and Clara.</td>
</tr>
<tr>
<td>Roscommon County Council</td>
<td>Off site treatment and disposal</td>
<td>Sludge import facilities to be upgraded at Castlerea and Monksland.</td>
</tr>
<tr>
<td>Sligo County Council</td>
<td>Sludge Hub Centre complete. No satellites proposed.</td>
<td>None</td>
</tr>
<tr>
<td>Tipperary CC</td>
<td>Thermal dryer at Clonmel for sludge from South Tipperary. Liquid and cake sludge import facilities at hub, liquid sludge acceptance facilities at Cahir, Carrick-on-Suir, Cashel, Fethard and Tipperary Town.</td>
<td>Sludge import facilities to be provided at Nenagh, Thurles, Roscrea, Cashel and Tipperary Town.</td>
</tr>
<tr>
<td>Waterford City Council</td>
<td>Sludge Hub Centre complete at Waterford City WWTO; no import facilities</td>
<td>Sludge Hub Centre proposed for south-east. Waterford City or Kilkenny City identified as potential Sludge Hub Centre locations.</td>
</tr>
<tr>
<td>Waterford County Council</td>
<td>Sludge Hub Centre complete at Dungarvan with import facilities</td>
<td>None</td>
</tr>
<tr>
<td>Westmeath County Council</td>
<td>Sludge Hub Centre complete at Mullingar. Liquid and cake sludge import facilities at hub.</td>
<td>None</td>
</tr>
<tr>
<td>Wexford County Council</td>
<td>Sludge Hub Centre complete at Wexford. Liquid and cake sludge import facilities at hub.</td>
<td>Sludge import facilities to be provided at Enniscorthy, New Ross and Gorey</td>
</tr>
<tr>
<td>Wicklow County Council</td>
<td>Sludge hub complete at Wicklow with import facilities for sludge cake only. Liquid sludge imports discharged to WWTP.</td>
<td>Sludge import facilities to be provided at Blessington</td>
</tr>
</tbody>
</table>
8 Sludge Outlet Options

8.1 Introduction
The main outlet for wastewater sludge in Ireland is agriculture. A review of sludge outlets currently in use in Europe shows that the most common outlet for wastewater sludge is agriculture (51% in 2012) with an additional 10% composted and also mainly used in agriculture. The main alternative to agricultural landspreading is incineration with 25% of wastewater sludge in Europe incinerated in 2012. Historically, landfilling was the main outlet. However, this is not considered to be economically or environmentally sustainable and is not considered further.

Other options are available, including use in energy crops, silviculture and land remediation. However, development of these outlets has been limited both in Ireland and internationally.

![Figure 8.1 – Wastewater Sludge Outlets in Europe (2012)](image)

Note: Data for 2012 used in Figure 8.1 as 2013 returns reported on EuroStat are incomplete.

8.2 Reuse in Agriculture
As detailed in Section 2, over 98% of wastewater sludge is currently disposed of to agriculture including sludge which is composted prior to agricultural re-use. The agricultural outlet for wastewater sludge is under pressure mainly due to perceptions of contamination risk. There has been a significant reduction in availability of agricultural outlets due to a tendency to exclude wastewater sludge from lands used for agricultural production under quality assurance schemes. This includes the schemes operated by An Bord Bia and the Irish Grain Assurance Scheme.

The use of wastewater sludge as a fertiliser in agriculture reduces the dependence on artificial (inorganic) fertilisers which are all imported and may contain high levels of heavy metals or other contaminants. The use of properly treated wastewater sludge, in accordance with a nutrient management plan can avoid any impact on receiving waters as the quantity of phosphorus is monitored and controlled to match the quantity required by the crop being grown. The use of digested sludge in particular has been shown to improve nitrogen uptake in plants. The organic content and slow release nature of wastewater sludge compared to artificial fertiliser has added benefits in improving the condition of soil and reducing the potential for run-off of nutrients. This underlies the benefits of using such sludge under controlled conditions.
The cost of ruling out the agricultural outlet for sludge was estimated in 2010 as €200 million over a 10 year period in a review of current sludge disposal commissioned by the EU\(^1\). Scottish water have estimated the cost of omitting the current agricultural outlet would be £50 million from 2015 to 2021. The risk of complete loss of the agricultural outlet can be mitigated by ensuring confidence in the sludge product by adopting appropriate control (e.g. HACCP) and monitoring measures. Treatment of all sludge to ensure pathogen removal and more stringent monitoring of sludge treatment and disposal practices is necessary to support the sustainable retention of the agricultural outlet.

There will be an additional cost, estimated as €2.5\(^9\) million per annum for the proposed higher level of treatment and additional monitoring. However, the additional cost if the agricultural outlet is no longer available is estimated as €200 million over a 10 year period as detailed above. Some of the additional cost for treatment and monitoring may be off-set by maximising energy recovery and reducing sludge volumes.

### 8.3 Agricultural Areas in Ireland

Agricultural land-use in Ireland, from 2010-2013, from CSO data, is detailed in Table 8.1 below. The type of land typically used for agricultural use of wastewater sludge is land used for fodder for animals with grassland also used. Pasture and horticultural crops are subject to legislative restrictions and as such are less suitable for use. Land used for dairy cattle in particular is not considered to be a viable option due to the concerns of the dairy industry, though the issues relate to perception rather than scientific issues. An average of 300,000 hectares of agricultural land is used for producing cereals. Approximately two-thirds of cereals are used for animal feed and are thus potentially suitable for fertilising using wastewater sludge. There are additional areas of potential use in hay and silage production and grazing for drystock. None of these outlets can reasonably be said to pose any risk to food quality.

<table>
<thead>
<tr>
<th>Agricultural Land-Use</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area farmed (AAU)</td>
<td>4568.9</td>
<td>4555.5</td>
<td>4532.7</td>
<td>4477.8</td>
</tr>
<tr>
<td>Pasture</td>
<td>2507.6</td>
<td>2459.3</td>
<td>2391</td>
<td>2337.7</td>
</tr>
<tr>
<td>Hay</td>
<td>193.8</td>
<td>213.2</td>
<td>203.5</td>
<td>218.4</td>
</tr>
<tr>
<td>Grass silage</td>
<td>1076.4</td>
<td>1070.2</td>
<td>1075</td>
<td>1071</td>
</tr>
<tr>
<td>Beans and peas</td>
<td>4.6</td>
<td>2.9</td>
<td>4.1</td>
<td>4.5</td>
</tr>
<tr>
<td>Oilseed rape</td>
<td>8</td>
<td>12.4</td>
<td>17.5</td>
<td>13.7</td>
</tr>
<tr>
<td>Arable silage</td>
<td>4.1</td>
<td>2.9</td>
<td>2.4</td>
<td>3.9</td>
</tr>
<tr>
<td>Maize silage</td>
<td>22.8</td>
<td>19</td>
<td>13.7</td>
<td>14.5</td>
</tr>
<tr>
<td>Fodder rape and kale</td>
<td>1.8</td>
<td>1.3</td>
<td>1.7</td>
<td>1.4</td>
</tr>
<tr>
<td>Potatoes</td>
<td>12.2</td>
<td>10.4</td>
<td>9</td>
<td>10.7</td>
</tr>
<tr>
<td>Turnips</td>
<td>1.2</td>
<td>1</td>
<td>1.1</td>
<td>0.9</td>
</tr>
<tr>
<td>Beet</td>
<td>9.6</td>
<td>8.2</td>
<td>7.8</td>
<td>10.1</td>
</tr>
<tr>
<td>Vegetables for sale</td>
<td>4.9</td>
<td>3.8</td>
<td>3.6</td>
<td>3.5</td>
</tr>
<tr>
<td>Fruit</td>
<td>1.2</td>
<td>0.8</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Nurseries, horticulture etc.</td>
<td>0.3</td>
<td>0.4</td>
<td>0.4</td>
<td>0.5</td>
</tr>
<tr>
<td>Other crops</td>
<td>9.4</td>
<td>4.9</td>
<td>4.5</td>
<td>4.7</td>
</tr>
</tbody>
</table>

\(^9\) Estimated 10,000 tonnes dry solids requiring additional treatment and/or monitoring at an average additional cost of €250 per tonne dry solids.
<table>
<thead>
<tr>
<th>Total cereals</th>
<th>273.9</th>
<th>297.4</th>
<th>315.4</th>
<th>307.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rough grazing in use</td>
<td>437.3</td>
<td>447.3</td>
<td>481.2</td>
<td>473.5</td>
</tr>
</tbody>
</table>

8.4 Suitability of Land for Reuse in Agriculture

In considering lands suitable for re-use of properly treated wastewater sludge a regional rather than county based approach is needed. Much of the central part of Ireland is limited by existing heavy metal content, mainly cadmium and nickel. In accordance with the Sewage Sludge Directive, as implemented by S.I. 148 of 1998 and amended by S.I. 267 of 2001, the levels of cadmium and nickel in soil must be less than 1mg/kg and 30 mg/kg respectively for use of sludge to be allowable. Based on these restrictions, the areas where use of wastewater sludge is not permitted are shown in red on Figure 8.2.

![Figure 8.2 – Spacial Distribution of Cadmium and Nickel](image)

There are large areas in the west and north-west of Ireland which are unsuitable for disposal of wastewater sludge, due to groundwater vulnerability and soil types. Groundwater is most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes. Use of wastewater sludge is not normally permitted in areas of extreme groundwater vulnerability, shown in red on Figure 8.3 overleaf.

8.5 Other Potential Restrictions

The agricultural use of wastewater sludge may be further restricted by the proximity of land to Natura 2000 sites and areas which may be impacted by flooding. This is assessed in more detail in the Strategic Environmental Assessment and Natura Impact Assessment of the NWSMP.
8.6 Overall Availability of Agricultural Land

The restrictions in agricultural use of wastewater sludge, due to groundwater vulnerability and cadmium and nickel levels, reduce the overall area of agricultural land, potentially available, from approximately 4.45 million hectares to 2.54 million hectares, i.e. 54% of agricultural land. These areas are shown on Figure 8.4. This area would be further reduced to approximately 108,000 hectares if only land used for animal fodder cereals was used.

The quantity of wastewater sludge produced in 2014 was 53,543 tonnes dry solids. Based on a phosphorus content of 1.7%, the application rate would be approximately 3.5 tonnes per hectare. Therefore the land requirement for agricultural re-use would be 15,300 hectares. It is expected that the quantity of sludge may increase to 75,150 tds per annum by 2020 if full compliance with wastewater discharge licencing is achieved. This would increase the land requirement to 21,500 hectares. The most sustainable, cost effective and beneficial outlet for wastewater sludge in Ireland, subject to appropriate treatment, is re-use on agricultural land, primarily land used for animal fodder production.
Figure 8.3 - National Groundwater Vulnerability Map from Geological Survey of Ireland
Figure 8.4 – Agricultural Areas Potentially Suitable for Use of Sludge
8.7 Reuse in Non-Agricultural Land

There are options for re-use of wastewater sludge in non-agricultural land. This includes use in energy crops, forestry and land remediation. There are limited ongoing options for both forestry and land remediation. It is recommended that this is reviewed on an ongoing basis to identify potential outlets. This includes liaising with Coillte and private forestry operations to identify any potential outlets.

8.7.1 Energy Crops

Wastewater sludge can be used as a fertiliser to increase yields of bioenergy crops that are harvested as sources of non-fossil fuel. There has been limited uptake of the Bioenergy Scheme managed by the Department of Agriculture, Food and the Marine which has been providing grant incentive for bioenergy crops since 2007. From 2007 to 2014, in the region of 3,400 hectares of energy crops were established under the Bioenergy Scheme as further detailed in Table 8.2. In the early years of the scheme, there was a strong preference for planting miscanthus and in recent years the preference has switched to willow. Due to the low uptake of the current schemes, the Department of Agriculture, Marine and Food are currently reviewing options for the future.10

Table 8.2 - Planting figures for the Bioenergy Scheme

<table>
<thead>
<tr>
<th>Year</th>
<th>Miscanthus</th>
<th>Willow</th>
<th>Total Area Planted</th>
<th>Total Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Hectares)</td>
<td>(Hectares)</td>
<td>(Hectares)</td>
<td>€m</td>
</tr>
<tr>
<td>2007</td>
<td>617</td>
<td>64</td>
<td>681</td>
<td>0.654</td>
</tr>
<tr>
<td>2008</td>
<td>775</td>
<td>128</td>
<td>903</td>
<td>1.077</td>
</tr>
<tr>
<td>2009</td>
<td>709</td>
<td>168</td>
<td>877</td>
<td>1.09</td>
</tr>
<tr>
<td>2010</td>
<td>159</td>
<td>185</td>
<td>344</td>
<td>0.594</td>
</tr>
<tr>
<td>2011</td>
<td>78</td>
<td>130</td>
<td>208</td>
<td>0.357</td>
</tr>
<tr>
<td>2012</td>
<td>64</td>
<td>99</td>
<td>163</td>
<td>0.258</td>
</tr>
<tr>
<td>2013</td>
<td>12</td>
<td>62</td>
<td>74</td>
<td>0.178</td>
</tr>
<tr>
<td>2014</td>
<td>0</td>
<td>103</td>
<td>103</td>
<td>0.087</td>
</tr>
<tr>
<td>Total</td>
<td>2414</td>
<td>939</td>
<td>3353</td>
<td>4.32</td>
</tr>
</tbody>
</table>

Teagasc has reported that there is a potentially larger market for up to 67,000 ha of energy crops to meet Ireland’s 2020 renewable energy targets. However, given the rate of uptake of the existing grant schemes, the actual area of land growing energy crops is not expected to increase substantially, unless additional incentives are provided.

While there are many advantages in the use of wastewater sludge in the fertilisation of energy crops, there are also some obstacles. The production of energy crops is not considered to be agriculture and as such the exclusions from licencing under the Waste Management Act which apply to agricultural use, do not apply and separate permissions are required under waste legislation to allow the sludge to be used. It is considered that recycling to energy crops is unlikely to become a significant sludge disposal route, unless existing legislative restrictions are amended. The production of energy crops may have impacts on the catchment hydrology with potential impacts on Natura 2000 sites. These potential impacts must be considered where the use of wastewater sludge is proposed.

10 Reference: Dáil Debates, 24th June 2015, Written Answer No. 149
8.8 Thermal Processes

The main alternative outlet for wastewater sludge is incineration. Other thermal processes, including gasification and pyrolysis, are currently being developed and are expected to be available on a commercial scale in the next 5-10 years. There are significant capital and operating costs associated with all thermal processes and as such it only likely to become a preferred option if reuse in agriculture or non-agricultural landuse are not available. As detailed in Section 8.2, the cost of removing the agricultural outlet for sludge has been estimated at €200 million over a 10 year period based on incineration as the alternative outlet.

Incineration of wastewater sludge may be carried out in commercial incinerators for general waste or in stand-alone wastewater sludge incinerators. There is substantial capital investment required for construction of a wastewater sludge incinerator and this is not currently being considered by Irish Water. There are a number of existing and proposed waste incinerators in Ireland which may offer an alternative outlet for wastewater sludge. The main disadvantages of incineration are the loss of the nutrient and organic value of the sludge, requirement for disposal of ash and the cost. There are, however, some advantages, including energy recovery and certainty of outlet. The environmental sustainability of incineration can be improved by recovery of phosphorus from the sludge stream prior to incineration.

8.9 Landfill

The use of landfill for disposal of wastewater sludge is effectively banned by the Landfill Directive due to the requirement to set limits on the acceptance of biodegradable organic waste. At present, the only sludge which is landfilled is from Shannon Town due to the potential presence of high heavy metal levels in this sludge. The quantity of wastewater sludge going to landfill in 2005 was 10,292 tonnes. This had reduced to 361 tonnes by 2014. Landfill is not considered to be a sustainable outlet for wastewater sludge and will only be considered as a short-term outlet where re-use options are not available.

8.10 Other Recovery Re-Use Options

The main recovery options for wastewater sludge are energy recovery and phosphorus recovery (as struvite) and use as a fertiliser where organic and nutrient content are of beneficial use. There has been research into recovery of other constituents including precious metals. However, these recovery options are not currently viable.
9 Options Assessment and Alternatives

9.1 General
The options in relation to wastewater sludge management relate mainly to treatment, transport and disposal. This was formerly assessed on a county by county basis. However, due to the large variation in the size and layout of each county, this is no longer considered appropriate. Similarly, assessing sludge management on a regional basis, i.e. east/midlands, north/west and southern is not considered appropriate, as there is currently significant movement of sludge between regions.

The main criteria in selection of options are as follows:

- Environmental impact – emissions to air, water and land, climate change impact and energy use
- Social impact – potential nuisance (e.g. odour, noise, traffic), public perception and food safety
- Financial impact – life cycle costs, energy cost and recovery, reliability of technology

These impacts cannot be considered in isolation as any option selected, for treatment, transport or disposal, must be economically, environmentally and socially acceptable. The sustainability of any option and the risks associated with it are a combination of all potential impacts. A graphical view of the impacts and connections is shown in Figure 9.1 below.

![Figure 9.1 – Options Assessment Criteria](image)

9.2 Options for Sludge Management
A range of options are available for sludge management which need to be considered to identify the optimum solution for each wastewater treatment plant site. A summary of options for sludge treatment and disposal is included in Table 9.1 below. Section 5 considers the types of treatment processes available and the advantages and disadvantages of each. Section 6 considers the transportation strategy and Section 8 considers the available outlets for wastewater sludge. The level of treatment, sludge outlets and the transportation strategy need to be considered in tandem in order to ensure the optimum solution is selected.
Table 9.1 – Summary of Options and Alternatives

<table>
<thead>
<tr>
<th>Options</th>
<th>Main Issues to be Considered</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Liquid Sludge</strong></td>
<td></td>
</tr>
<tr>
<td>• Transfer unthickened sludge to satellite</td>
<td>• Capital and operation cost of thickening / dewatering versus transport</td>
</tr>
<tr>
<td>• Thicken on site and transfer thickened sludge to satellite</td>
<td>• Distance to suitable satellite / hub for dewatering / treatment</td>
</tr>
<tr>
<td>• Thicken and dewater on site and transfer dewatered sludge cake to Sludge Hub Centre for treatment</td>
<td>• Access to site and traffic impacts</td>
</tr>
<tr>
<td>• Onsite sludge thickening, dewatering and treatment</td>
<td>• Suitability of site for on-site treatment</td>
</tr>
<tr>
<td>• Onsite sludge reed bed</td>
<td></td>
</tr>
<tr>
<td><strong>Sludge Cake</strong></td>
<td></td>
</tr>
<tr>
<td>• On-site dewatering and treatment</td>
<td>• Capital and operation cost of on-site treatment versus transport to Sludge Hub Centre / off-site treatment</td>
</tr>
<tr>
<td>• Transfer sludge cake to designated Sludge Hub Centre for treatment</td>
<td>• Distance to suitable Sludge Hub Centre</td>
</tr>
<tr>
<td>• Transfer sludge cake to off-site private sludge treatment facility</td>
<td>• Distance to suitable private sludge treatment facility</td>
</tr>
<tr>
<td><strong>Sludge Treatment</strong></td>
<td></td>
</tr>
<tr>
<td>• No treatment</td>
<td>• Final outlet for sludge</td>
</tr>
<tr>
<td>• Mesophilic Anaerobic Digestion</td>
<td>• Capital and operation cost of treatment</td>
</tr>
<tr>
<td>• Mesophilic Anaerobic Digestion with pre- or post-pasteurisation</td>
<td>• Value of energy recovery</td>
</tr>
<tr>
<td>• Thermophilic Anaerobic Digestion</td>
<td>• Environmental sustainability</td>
</tr>
<tr>
<td>• Thermophilic Aerobic Digestion</td>
<td></td>
</tr>
<tr>
<td>• Composting</td>
<td></td>
</tr>
<tr>
<td>• Alkaline Stabilisation</td>
<td></td>
</tr>
<tr>
<td>• Thermal Drying</td>
<td></td>
</tr>
<tr>
<td>• Thermal treatment with or without energy recovery</td>
<td></td>
</tr>
<tr>
<td><strong>Sludge Outlet</strong></td>
<td></td>
</tr>
<tr>
<td>• Re-use on agricultural land / non-agricultural crops</td>
<td>• Capital and operation cost of re-use on land versus thermal treatment</td>
</tr>
<tr>
<td>• Use in land remediation</td>
<td>• Distance to suitable land bank for reuse / remediation</td>
</tr>
<tr>
<td>• Thermal treatment with or without energy recovery</td>
<td>• Environmental sustainability</td>
</tr>
</tbody>
</table>

There is a large variation in type of treatment, sludge infrastructure and population densities in areas being served by wastewater treatment plants operated by Irish Water. As such, the particular requirements for each plant must be assessed individually, taking into account the environmental, social and financial impacts, prior to carrying out any capital upgrades or operational changes.

### 9.3 Existing Infrastructure

#### 9.3.1 Sludge Hub Centres and Sludge Treatment Centres

The development of sludge management infrastructure and activities over the last 15 years has been outlined in Section 7. The construction of sludge treatment infrastructure at a large number of locations has implications for the future management of sludge. There are thirteen sites where thermal drying has been put in place, seven of which also have anaerobic digestion. Three sludge treatment sites have anaerobic digestion and pasteurisation.
## 9.3.2 Satellite Dewatering Centres

There are currently over 100 wastewater treatment plants reported as taking sludge imports. However, only 16 of these sites, including fourteen of the existing Sludge Hub Centres, have complete facilities to operate as effective satellite dewatering sites. It is considered that where a wastewater treatment plant accepts more than 8,000m$^3$/year of liquid sludge that a separate sludge acceptance facility is justified. It is expected that an additional 40 to 50 sites will continue to accept sludge as further detailed in Section 7.4. The receipt of sludge at these sites requires balancing with controlled discharge to the inlet works of the site.

## 9.4 Liquid Sludge Options

The first level of sludge treatment relates to volume reduction, i.e. thickening and/or dewatering. Further details are included in Section 6.3. In order to ensure sludge transport costs are minimised without impacting on the wastewater treatment process or the final sludge treatment process, the volume of sludge storage and method of thickening selected are significant. An economic balance is needed between volume reduction and transport costs.

In general for WWTP’s over 5,000 PE dewatering is economically justified and in many cases it is justified for WWTP’s over 3,000 PE. There are 177 No. WWTP’s reported as having sludge dewatering installed. In general, existing wastewater treatment plants with a current PE over 3,000 have dewatering in place. There are a number of WWTP’s with a PE of less than 2,000 with dewatering. It may be more cost effective to transfer liquid sludge from these WWTP’s than to continue to dewater sludge.

The following requirements need to be assessed when considering the sludge storage, thickening and dewatering requirements:

- Site location relative to satellite and hub centres
- Site access
- Sludge production rates in treatment process
- Storage capacity within treatment process
- Minimum storage requirements in line with Section 6.4
- Emission limit values and current level of compliance
- Potential nuisance (odour, noise, traffic)
- Current staffing arrangement

An assessment of shortfalls in existing sludge infrastructure was undertaken in 2015 using workshops with the Local Authorities in relation to 411 wastewater treatment plants. Based on these workshops, 78 WWTP’s were identified as requiring upgrades in sludge storage, thickening /or dewatering plant. Based on the information from the workshops, it has been estimated that a further 112 WWTP’s also require upgrading of existing sludge infrastructure. The cost of upgrading the WWTP’s identified as having shortfalls has been assessed. Implementation of these upgrades will be undertaken on a phased basis with priority given to WWTP’s causing non-compliance in effluent standards due to shortfalls in sludge infrastructure and WWTP’s with disproportionately high cost for sludge treatment, transport or dewatering due to inadequate facilities on the site.

## 9.5 Site Selection for New Infrastructure

The selection of sites for new infrastructure has been considered in the Strategic Environmental Assessment. The specific requirements in relation to satellite dewatering centres and Sludge Hub Centres are considered in Section 9.6 and 9.7 respectively. In general the location of new or upgraded sludge facilities must consider the following:
• Avoid, as far as possible, siting sludge infrastructure (including expansion to WWTP, sludge hub or sludge satellite) or related infrastructure in areas protected for landscape and visual amenity, geological heritage and/or cultural heritage value. Where this is unavoidable, an impact assessment should be carried out by a suitably qualified practitioner and appropriate mitigation and/or alternatives must be provided.

• Avoid siting sludge infrastructure or related infrastructure in proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Statutory Nature Reserves, Refuges for Fauna and Annex I Habitats occurring outside European designated sites.

• In order to protect habitats which, by virtue of their linear and continuous structure (e.g. rivers and their banks) or their contribution as stepping stones (e.g. ponds or small woods), are essential for the migration, dispersal and genetic exchange of wild species, these features will be protected as far as possible from loss or disruption through good site layout and design.

• To protect river habitats and water quality, ensure that no sludge facility, including clearance and storage of materials, takes place within a minimum distance of 15 m measured from each bank of any river, stream or watercourse.

• Ensure Sustainable Drainage System (SuDS) is applied to any sludge facility and that site-specific solutions to surface water drainage systems are developed, which meet the requirements of the Water Framework Directive and associated River Basin Management Plans.

• Avoid development of sludge infrastructure in flood risk areas. Reference should be made to the Planning System and Flood Risk Management for Planning Authorities (DECLG/OPW 2009) and the National Flood Hazard Mapping (OPW) while referring to the relevant Flood Risk Management Plan (FRMP).

• Ensure riparian buffer zones (minimum of 15 m) are created between all watercourses and any sludge facilities to mitigate flood risk. The extent of these buffer zones shall be determined in consultation with a qualified ecologist and following a Flood Risk Assessment. Any hard landscaping proposals shall be located outside of these buffer zones.

• To protect river habitats and water quality (including physical habitat and hydrological processes/regimes), ensure that no sludge facilities, including clearance and storage of sludge materials, takes place within a minimum distance of 15 m measured from each bank of any river, stream or watercourse.

• Avoid geologically unsuitable areas including karst where practicable, and areas susceptible to subsidence or landslides. Due consideration should be given to the primary water source of the area and the degree of surface water/groundwater interaction.

• Impact from a transport perspective will be assessed including road access, network, safety and traffic patterns to and from the proposed sludge facility in accordance with road design guidelines and/or relevant LA guidelines in relation to roads.

• Existing WWTP sites and brownfield sites should be considered for any expansions for sludge facilities. Opportunities to integrate sludge treatment with sites that produce sludge needs to be considered ensuring maximum efficiency of sludge processing.

• Ensure strict protocols are applied to prevent the spread of Invasive Alien Species.

Irish Water will carry out Appropriate Assessment Screening on proposed projects and any associated works, individually or in combination with other plans or projects, to ensure there are no likely significant effects on the integrity (defined by the structure and function) of any Natura 2000 site(s) and that the requirements of Article 6(3) and 6(4) of the EU Habitats Directive are fully satisfied. In projects where the only potential impact is on the final effluent discharges, Appropriate Assessment Screening is undertaken by the EPA as part of the wastewater discharge licensing process. Irish Water will also ensure that in carrying out activities associated with management of wastewater sludge we are in compliance with our obligations as a the public water authority under the Birds and Natural Habitats Regulations 2011-2015.
9.6 Selection of Satellite Dewatering Centres

Existing and potential future suitable satellite dewatering sites have been identified Section 7.4. It is proposed to use spare dewatering capacity and under-utilised infrastructure where possible. The number of sites to be used as satellites will require review and updating as loads to existing wastewater treatment plants vary. In particular, if the quantity of septic tank sludge imports increase, the number of satellite dewatering sites may need to be increased.

The following requirements need to be assessed when considering a WWTP as a satellite:-

- Site location
- Site access
- Spare capacity or space (WWTP and sludge)
- Emission limit values and current level of compliance
- Potential nuisance (odour, noise, traffic)
- Current staffing arrangement

9.7 Selection of Sludge Hub Centres

Sludge Hub Centres provide final treatment of sludge prior to disposal. In general, these sites also act as satellite dewatering centres. The sludge management plans prepared for each Local Authority identified suitable locations within the local authority area for development of a Sludge Hub Centre. Fifteen Sludge Hub Centres have been developed to date with an additional five temporary sludge hubs and four sludge treatment sites with no imports. As detailed above and in Section 7.3, an additional 2 – 3 sludge hubs are recommended, in addition to upgrade of existing sludge hubs where necessary, in order to cater for all wastewater sludge generated. It is not considered that additional sludge hubs will be required to cater for sludge from septic tanks. However, it is recommended that the capacity of sludge hubs take into account potential future imports of septic tank sludge.

The location of Sludge Hub Centres will be generally in line with the recommendations of the previous sludge management plans prepared for the individual Local Authorities, with new sludge hubs proposed at Fingal North Dublin WWTP and Tralee. Sites used as temporary sludge hubs in Tuam, Longford and Navan should be upgraded to permanent sludge hubs with sites currently excluded from taking imports at Waterford City and Cork City reviewed to assess whether these sites can be considered as Sludge Hub Centres, including identification and assessment of possible alternative sites.

9.8 Selection of Treatment Options to Produce Biosolids

The treatment processes identified in the Code of Good Practice for Use of Biosolids in Agriculture are detailed in Section 5. These treatment processes have all been demonstrated to achieve 99.9999% (or 6 log) reduction in indicator pathogens and are therefore acceptable. New processes which are proven to achieve the same levels of reductions may also be considered by Irish Water in the future. Only processes with this capability are permissible.

Studies of biosolids treatment options have indicated that advanced anaerobic digestion provides the most economically feasible option and the lowest carbon footprint for sludge treatment. There are greenhouse gases produced by anaerobic digestion with carbon dioxide produced when the methane is used for energy recovery. However, the energy produced off-sets the impact of producing greenhouse gases. There is a further potential impact if the methane produced is allowed to leak. Anaerobic digestion installations should be inspected to ensure that all methane is captured. Advanced anaerobic digestion has been shown to be the most economic option, irrespective of the final outlet, and recent upgrades of existing wastewater treatment plants have been undertaken in numerous locations in the EU using this approach where the final outlet is either to land or incineration.
The most commonly used method of sludge treatment at present is thermal drying. As detailed in Section 9.3, there are thirteen sites where thermal drying has been put in place. The capital and operating cost of thermal drying is high relative to other sludge treatment options. However, due to the uncertainty associated with the agricultural outlet, where operational thermal drying plants are in place, it is recommended that these processes be retained for the short to medium term. Where an upgrade is proposed for a Sludge Hub Centre, the options for sludge treatment should be reassessed and consideration given to advanced digestion only. A review of all sites with thermal drying is also recommended to assess whether anaerobic digestion is feasible to either replace or supplement the existing thermal drying plant. Options for co-digestion with organic waste shall also be considered in order to improve the energy recovery and economic feasibility of anaerobic digestion facilities will also be considered at Sludge Hub Centres and off-site facilities.

The most commonly used method of sludge treatment, after thermal drying, is lime stabilisation. While this is an accepted method of sludge treatment, the audit of sludge management activities has identified a significant variation in the adequacy of the treatment being provided, particularly at off-site installations. The main issues identified were inadequate dosing of lime and inadequate monitoring of temperature and pH during treatment. Due to the difficulties in controlling off-site activities, it is proposed that off-site treatment of sludge by lime stabilisation is phased out as soon as alternatives can be developed.

Off site anaerobic digestion and composting facilities have also been assessed as part of the sludge management audit and the facilities inspected are considered to provide a high level of treatment and quality control.

There are fourteen wastewater treatment plants in Ireland with anaerobic digestion currently in operation, including the Drogheda WWTP, shown on Figure 9.2. Nine of these sites use the biogas produced for electricity production and the biogas is used for sludge thermal drying in a further two sites. Over 50% of sludge was anaerobically digested in 2014. However, further treatment is needed in order to provide an acceptable biosolids product for re-use. The proportion of sludge anaerobically digested is expected to increase to approximately 65% when upgrades, currently underway, are completed. It is recommended that the number of sites with anaerobic digestion is increased to nineteen sites, with the biogas produced used for energy recovery in all cases.

It is recommended that new Sludge Hub Centres should include the provision of advanced anaerobic digestion where this is assessed as the most economically and environmentally sustainable option. Due to the size of the proposed new North Dublin WWTP, consideration should be given to the inclusion of thermal drying to reduce the sludge volume. This may be provided for in phasing of the wastewater treatment plant development based on economic assessment.
9.9 Selection of Outlets

The main outlet for treated wastewater sludge is currently agriculture. As detailed in Section 8, this is considered to provide a sustainable solution provided the sludge is treated appropriately with the required quality control. Extensive research has been undertaken both in Ireland and internationally on the use of wastewater sludge in agriculture. These studies have shown that, subject to suitable quality controls, wastewater sludge is safe to use in agriculture and has considerable economic, environmental and security of outlet benefits.

However, it is considered desirable to promote alternative outlets in order to provide flexibility. Further research into alternative reuse outlets will be undertaken to assess options. This will include a financial evaluation and consideration of wider environmental impacts including biodiversity, water, soils, human health and food safety. Irish Water will incorporate alternative outlets into its Standard Operating Procedures for sludge management, as appropriate once any such outlet is developed. The main alternative outlet in Europe is incineration. Other outlets such as use as a fuel in industry have been researched in Ireland previously with no reliable outlet identified to date. However, this is still considered as a viable option in the future as companies strive to meet renewable energy targets.

9.10 Potential Impacts and Mitigation Measures

There are potential impacts on receptors in relation to sludge management activities. These impacts require detailed assessment for any proposed projects. However, the potential impacts and mitigation measures, which are assessed in the SEA report, are as follows:-

- Biodiversity, Flora and Fauna
- Population and Human Health
- Food Production and Safety
- Soils, Geology and Hydrogeology
- Water
- Air Quality and Climatic Factors
All of these impacts will need to be considered in advance of any upgrade works at any individual site. The potential impact on any Natura 2000 site will need to be considered for any project by undertaking an Appropriate Assessment. In projects where the only potential impact is on the final effluent discharges, Appropriate Assessment screening is undertaken by the EPA as part of the wastewater discharge licensing process. In each case, mitigation measures proposed must be complied with. If the appropriate assessment identifies potentially significant impact which cannot be mitigated, the project will not proceed.

Furthermore, in recognition of wider issues relevant to protection of biodiversity in Ireland, that do not fall under the remit of the Habitats Directive, e.g. ecological networks, disturbance of habitats and species etc. Irish Water undertake that in carrying out activities associated with management of wastewater sludge from Irish Water operated WWTP, Irish Water will ensure that they are in compliance with their obligations as a the public water authority under the Birds and Natural Habitats Regulations 2011-2016.

9.11 Risk Assessment of Current Sludge Outlet

The current outlet for wastewater sludge in Ireland is almost exclusively agriculture. The NWSMP has identified agriculture as the preferred outlet going forward. However, a policy based on a single disposal of option is very susceptible to policy, regulatory and/or perception changes.

<table>
<thead>
<tr>
<th>Risk</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stakeholder perception leading to loss of agricultural outlet</td>
<td>• Stakeholder consultation – NWSMP/SEA and one-to-one</td>
</tr>
<tr>
<td></td>
<td>• Quality assurance procedures</td>
</tr>
<tr>
<td>Public perception – due to real or perceived issues</td>
<td>• Public consultation</td>
</tr>
<tr>
<td></td>
<td>• Quality assurance procedures</td>
</tr>
<tr>
<td>High cost if incineration only option for disposal</td>
<td>• Consultation with incinerator operators to assess options and costs</td>
</tr>
<tr>
<td>Environmental liabilities – potential pollution of soil and receiving waters</td>
<td>• Quality assurance and auditing of contractors</td>
</tr>
<tr>
<td>Potential short-term need for export of sludge if agriculture not available</td>
<td>• Ongoing consultation with stakeholders to reduce potential</td>
</tr>
</tbody>
</table>

It is recommended that secondary options are investigated further in order to reduce current dependence on agricultural disposal. This will be achieved in the short to medium term through solids reduction as a result of advanced anaerobic digestion, where viable.

Another risk to the disposal outlet is the expected increase in dairy cattle following the end of milk quotas in 2015. The Irish agricultural sector has set a target of 50% increase in output by 2020. This will lead to a substantial increase in animal slurry and industrial sludge from the dairy industry. Land used for dairy is not considered a suitable future outlet for wastewater sludge taking a realistic view of industry perceptions. Any additional sludge from agriculture or agricultural industries is likely to put pressure on the current outlets of wastewater sludge to agriculture.

9.12 Risk Assessment of Landspreading

The potential risks associated with landspreading include, but are not limited to the following:-

- Risk to availability of agricultural outlet
- Risk of different agricultural produce
• Risk to Natura 2000 sites
• Persistent organic pollutants, pathogens and metals content in sludge
• Pharmaceuticals and personal care products content in sludge
• Industrial discharges to WWTP’s impacting sludge quality
• Illegal discharges to WWTP’s impacting sludge quality
• Leachate acceptance at WWTP’s impacting sludge quality

9.12.1 Risk to Agricultural Produce

The use of wastewater sludge in agriculture for food production and must take into account food safety with regard to microbiological and chemical risk to human health. Microbiological risk is addressed in treatment with chemical risk by careful monitoring of the product in addition to source control of industrial discharges. There is also a risk that adverse perception of Irish agricultural produce, where wastewater sludge is used, may impact the agricultural sector financially. The agri-food and drink sector is a significant part of the economy in Ireland, accounting for 7.2% of Ireland’s economy-wide gross value added (GVA), 12.3% of Ireland’s exports and 8.8% of total employment (DAFM 2014). Further details on the baseline for the agri-food and drink sector are included in Section 5.2.3, Food Production and Safety.

The Strategic Environmental Assessment considers these risks in further detail. The mitigation measures currently in place and the additional monitoring, reporting and quality control procedures proposed by Irish Water will further mitigate against risk to agriculture. There are restrictions in place in relation to use of wastewater sludge in production of fruit and vegetable crops with use of wastewater sludge not allowed for 10 months prior to harvesting or during the growing period. Grassland may not have wastewater sludge applied for three weeks prior to grazing or harvesting. There are particular concerns in the agricultural industry in relation to the use of wastewater sludge in dairy production. Irish Water acknowledges this concern and proposes to voluntarily restrict use of wastewater sludge on lands to be used for dairy for future contracts. Other crops such as crops for animal feed are considered more suitable, low risk and less likely to cause public concern.

9.12.2 Risk to Natura 2000 sites

Special Areas of Conservation (SAC) are designated under the EU Habitats Directive (92/43/EEC) and Special Protection Areas are designated under the Birds Directive (2009/147/EC). There are 423 cSAC sites, 1 proposed cSAC and 165 SPA sites in Ireland. Further details on these sites can be found in the Natura Impact Statement for the NWSMP. The risks to Natura 2000 sites have been assessed in detail in the SEA and Appropriate Assessment for the NWSMP. The environmental reports on these assessments include mitigation measures and details of further assessments required in relation to site specific issues. It is noted in the Natura Impact Statement that the NWSMP is a national plan and as such the assessment is focussed at a national strategic level. As such, it will be necessary to assess risks to particular Natura 2000 sites on a case by case basis in relation to particular sludge management activities.

9.12.3 Persistent organic pollutants, pathogens and metals content in sludge

The pathogen content and metal levels in treated sludge are monitored regularly in accordance with the Code of Good Practice for Use of Biosolids in Agriculture. As Irish Water requires full treatment of all sludge, the levels of pathogens in treated sludge have been measured at consistently low values. Due to low levels of industrial discharges in Ireland, the metals levels in wastewater sludge are consistently low. There have been significant decreases in metal levels in sludge in Europe since measurements commenced in the 1980’s. This is largely due to source control on industrial discharges and reductions in heavy industry. Irish Water has commenced a programme of more extensive licencing of trade discharges with tighter emission controls.

Monitoring of persistent organic pollutants is undertaken based on the requirements of the Code of Good Practice for Use of Biosolids in Agriculture. There has been extensive international
monitoring and research in this area in recent years. To date, there are no limits or recommendations for levels of organic pollutants for sludge used in agriculture. It is proposed that research and recommendations in this area are reviewed regularly, with additional analysis undertaken if necessary, to mitigate against any risk to soils or health due to the presence of organic pollutants.

9.12.4 Pharmaceuticals and personal care products content in sludge

Monitoring of pharmaceuticals and personal care products content in sludge is not normally undertaken in Ireland. There has been extensive international monitoring and research in this area in recent years.

![Graph of typical concentrations of selected 'emerging' contaminants in wastewater sludge (mg/kg dm)](image_url)

To date, there are no limits or recommendations for levels of emerging contaminants for sludge used in agriculture. It is proposed that research and recommendations in this area are reviewed regularly to mitigate against any risk to soils or health due to the presence of contaminants.

Clarke and Smith\(^\text{11}\) in their review of international research in relation to organic contaminants, note that most risk assessments demonstrate that use of biosolids does not place human health at risk from the organic contaminants studied. They recommend that this is reviewed on an ongoing basis to ensure the long-term sustainability and security of the beneficial agricultural route for biosolids management.

9.12.5 Industrial discharges to WWTP’s impacting sludge quality

Industrial discharges from a wastewater catchment are generally to the sewer network but may also be discharged via tanker. All industries require either a Section 16 or an IPPC Licence to discharge to the sewer network. Irish Water is currently reviewing all Section 16 and IPPC Licences. As part of this review, limits will be set on all relevant parameters taking into account the potential impact on wastewater sludge. Ongoing monitoring and controls are required, at both the WWTP and the industrial discharge point, to mitigate against any risk to the wastewater sludge produced.

9.12.6 Leachate acceptance at WWTP’s impacting sludge quality

Landfill leachate is frequently discharged to wastewater treatment plants for treatment. This is either directly to the WWTP via tanker or to the sewer network. It is a requirement of the Wastewater Discharge Licence for any WWTP accepting leachate, that the toxicity of the leachate is assessed and the quantity is controlled. In order to ensure that the WWTP and sludge are not impacted, Irish Water has limited the leachate quantity to a maximum of 5% of the hydraulic load to any plant. In addition to this, the leachate must be analysed to assess nutrient and metal content. Ongoing monitoring and controls are required to mitigate against any risk to the wastewater sludge produced.

9.12.7 Illegal or non-compliant discharges to WWTP’s impacting sludge quality

There is the potential for illegal or non-compliant discharges to a WWTP from a number of sources. Non-compliant discharges are non-domestic discharges, i.e. industrial, commercial or leachate, which are not in compliance with the limits set. Illegal discharges are where discharges are made to the sewer network with no licence in place. There are a number of measures in place to mitigate against the potential impacts of these types of discharges. This includes monitoring at source of significant industrial discharges, monitoring of the influent to and effluent from the wastewater treatment plant, process monitoring and visual inspections. Irish Water is committed to establishing a properly resourced unit tasked with controlling discharges to the networks.
10 Quality Assurance, Monitoring and Reporting

10.1 Introduction
There are a number of statutory requirements for monitoring and reporting of sludge management activities. However, in order to ensure the risks and perception issues are addressed, it is recommended that an independently audited quality assurance system is in place for sludge management activities. It is proposed that, that an annual audit of sludge management activities is undertaken on behalf of Irish Water pending a fully developed quality control scheme. Separate Standard Operating Procedures and control procedures are being developed by Irish Water to ensure that the whole process from source control of pollutants, through sludge treatment and reuse is controlled and monitored. Full monitoring and reporting is required for each step of the process to ensure a quality assured biosolids product.

On-site management of sludge activities has the potential to impact the final effluent discharges from the wastewater treatment plant. This may be due to operational issues or inadequacies in infrastructure. It is proposed that Irish Water Standard Operating Procedures will address the requirements for sludge management at individual WWTP’s. The requirements for upgrading existing infrastructure, to ensure there is no impact on final effluent quality, are considered in Section 6 and 7. New infrastructure will be developed in line with Standard Specifications currently being developed by Irish Water.

10.2 Background Data Collection
There has been a requirement for Local Authorities to keep a register of all sludge since 1996 (Waste Management Act) with additional specific requirements in S.I. No. 148/1998 - Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 1998. These regulations require that the following information is included in the sludge register:-

a) the quantities of sludge produced and the quantities supplied for use in agriculture in their functional area,
b) the composition and properties of the sludge having regard to the parameters referred to in Part II of the Schedule (i.e. cadmium, copper, nickel, lead, zinc and mercury)
c) the treatment which the sludge has undergone having regard to the types of treatment referred to in article 2,
d) the name and address of each recipient of the sludge and the location of each site
where the sludge is to be used.

Data collected in sludge registers, in addition to site data with regard to existing infrastructure
and quantities of sludge removed has been used to inform the assessment of sludge infrastructure requirements. Ongoing data collection is proposed to confirm capacity requirements as solutions are developed.

10.3 Source Control
Irish Water is applying source control principles to commercial and industrial discharges to the sewer network. A review of existing discharge licences and conditions is ongoing. Through source control, standardised conditions are applied to discharge licences based on the nature of the discharger’s activity, the capacity of the receiving network and the capability of the wastewater treatment plant to remove pollutants. In the case of industries licenced to discharge by the EPA, a memorandum of understanding (MoU) or similar should be established between Irish Water and the EPA to agree protocols for exchange of information and assistance in addressing earlier intervention in removing substances which compromise the WWTP. End-of-pipe treatment is often not the appropriate location to remove specific pollutants (e.g., metals, persistent organic pollutants, pharmaceutical products, etc); in such cases, treatment at source is economic to all involved. Ensuring specific pollutants are managed at source also ensures the quality of wastewater sludge.

- Industrial discharges
- Commercial discharges
- Leachate
- Water treatment plant sludge
- Septic tank sludge

10.4 Audit of Current Wastewater Sludge Management
An independent audit of wastewater sludge management was undertaken in 2015 in order to assess the current levels of compliance, identify any issues and make recommendations for improvements. The audit included an assessment of sludge treatment facilities, both on Irish Water WWTP’s and off-site treatment facilities, audit of off-site sludge storage facilities and an audit of sludge re-use activities.

The audit of sludge treatment facilities has indicated that the anaerobic digestion & pasteurisation and composting facilities, operated on or off site, are generally well controlled and operated. These operations offer good value for money and it is anticipated that they will be used on an ongoing basis. However, the audit identified a number of concerns over the operation of lime stabilisation facilities.

The issues identified in the lime stabilisation facilities were as follows:-

- Inadequate quantity of lime dosed
- Frequency of pH and temperature monitoring
- Recording systems for pH and temperature monitoring
- Frequency of pathogen monitoring

Due to the number of these facilities and the difficulty in monitoring the quality of the operations, it is proposed that future lime stabilisation is restricted to Irish Water owned sites. It is also proposed that more detailed minimum requirements are set for the use of lime stabilisation in the future with the use of off-site lime eliminated as soon as possible.
The CEN Standard CEN/TR 15809 Characterization of sludges – Hygienic aspects – Treatments recommends a minimum lime dose of 0.3kg CaO per kg dry sludge to ensure full treatment. The monitoring and recording systems for pH, temperature and pathogens were inadequate at a number of sites. Where inadequate monitoring of the sludge treatment process has been identified, the relevant contractor must detail how this situation will be rectified.

The audit of sludge storage facilities identified some concerns with facilities lacking the relevant permissions, structural integrity certificates and/or safety signage in place. Where issues have been identified, the relevant contractor must detail how this situation will be rectified.

The audit of the reuse of sludge included a review of nutrient management plans produced and an on-site assessment of the implementation of the nutrient management plan. There were some issues identified in the control of landspreading with uncertainty in relation to the quantity of sludge spread. In general, nutrient management plans were not updated following any changes to quantities spread or crop types. Currently there are limited checks by Local Authorities to check that the plans are followed.

It is proposed to develop an independently assessed quality assurance scheme in relation to sludge management. It is recommended that until this scheme is in place, an annual audit of sludge management activities is undertaken on behalf of Irish Water.

10.5 Asset Register

Data on sludge treatment infrastructure was provided in 2013 by Local Authorities for approximately 700 existing wastewater treatment plants. Data was also collected on sludge volume and % dry solids. A project to audit all Irish Water infrastructure at water and wastewater treatment facilities has commenced. This project includes sites surveys of all wastewater assets, including sludge treatment with full details of all assets detailed in an asset register. The project will take a period of 2-3 years and will be used to inform infrastructure needs. The data which will be gathered in relation to sludge management will include the following:

- Identify any access issues to site
- Identify any space available on site for upgrade/expansion
- Identity space in sludge dewatering buildings for upgrade/expansion
- Type, number and volume of liquid sludge storage tanks
- Type of sludge thickening
- Type and capacity of sludge dewatering
- Number and size of existing sludge skips
- Detail any other on-site sludge storage
- Type and capacity liquid sludge acceptance facilities
- Type and capacity of sludge cake acceptance facilities
- Details of any other sludge treatment processes (e.g., anaerobic digestion, thermal drying etc.)
- Details of ancillary sludge transfer equipment, instrumentation etc.

10.6 Reporting Sludge Data

There is a requirement under S.I. No. 148/1998 - Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 1998 as amended by S.I. 267 of 2001 for the Local Authority to establish and maintain a register, known as the ‘sludge register’ to record information relating to use of wastewater sludge in agriculture including the following:

(a) the quantities of sludge produced and the quantities supplied for use in agriculture in their functional area,
Irish Water is required to report annual sludge data to the EPA. This report includes quantities of sludge produced, types of treatment and final disposal locations.

A template for reporting of data for sludge contracts has been developed to collate a more accurate database of sludge produced at the existing wastewater treatment plants. Contractors providing sludge management services for Irish Water, under framework contracts, have been completing these spreadsheets since mid-2014. New reporting templates for Design Build Operate contracts have been developed and are being introduced on a phased basis nationally. These new reporting templates will improve the accuracy of data collected in relation to sludge.

**10.7 Monitoring and Reporting of Sludge Data**

Monitoring and reporting of sludge data is undertaken at wastewater treatment plants and at the final disposal location. The final disposal, including statutory monitoring of all sludge and soil, is current undertaken by contractors acting on behalf of Irish Water. These contractors provide sludge data directly to Local Authorities for inclusion in the Sludge Register. In addition, all contractors report directly to Irish Water. Data reported to Irish Water includes all sludge treatment, transport, disposal and final disposal locations including all statutory analysis data and additional data where required in particular contracts.

Irish Water is currently developing systems to allow online reporting of all sludge data by contractors. This will include all data required for the local authority sludge registers. In parallel, a national database of data reported in Annual Environmental Reports for all licenced wastewater treatment plants has also been developed. The development of online reporting systems including geographical data in relation to sludge disposal sites and central recording of all sludge and soil analysis is considered an essential element of the quality assurance procedures for wastewater sludge management. The online reporting system will be used to check landspreading areas for environmental sensitivity. The data from Annual Environmental Reports prepared by each of the Local Authorities will be used to cross-check reporting submissions by contractors.

**10.8 Monitoring of Impacts of Sludge Disposal**

In accordance with S.I. 267 of 2001, all sludge disposal to agriculture must be carried out in accordance with a Nutrient Management Plan. Particular limits on nutrient addition are set by S.I. No. 31/2014 - European Union (Good Agricultural Practice for Protection of Waters) Regulations 2014. The purpose of these Regulations was to give further effect to several EU Directives, including Directives in relation to protection of waters against pollution from agricultural sources (‘the Nitrates Directive’), dangerous substances in water, waste management, protection of groundwater, public participation in policy development and water policy (the Water Framework Directive). This legislation, in combination with specific requirements of the Code of Good Practice for Use of Biosolids in Agriculture provide for protection of surface waters, groundwaters and drinking water abstractions. Irish Water intend to liaise with the Department of the Environment, Community and Local Government in relation to a review of the Code of Good Practice for the Use of Biosolids in Agriculture to take into account current legislation. It is proposed that any updated COGP would be incorporated into Standard Operating Procedures for Irish Water and would include recommendations for assessment of environmental sensitivity of lands to be used for landspreading. The Standard Operating
Procedures will also include a template for Nutrient Management Plans and a requirement to consider environmental impacts and the potential to impact on the European Sites in both the Nutrient Management Plan and the Standard Operating Procedures. Contractors appointed to carry out sludge management on behalf of Irish Water will be required to comply with Irish Water’s Standard Operating Procedures.

Ongoing research in relation to the composition of treated wastewater sludge has identified the presence of persistent organic pollutants, pharmaceuticals and personal care products which needs to be considered. It is proposed that standards for monitoring of wastewater sludge in the EU and international research will be reviewed on an ongoing basis to determine if additional monitoring of sludge or soil samples is required.

10.9 Quality Assurance

It is proposed that future sludge treatment and disposal contracts for Irish Water will be required to comply with a quality assurance scheme currently being developed by Irish Water. Compliance with the Code of Good Practice for Use of Biosolids in Agriculture is currently a requirement of Irish Water contractors. In order to ensure that all sludge treatment and disposal complies with this, annual auditing of contractors activities is proposed. The timing of the audit shall be planned to allow auditing of landspreading activities during spreading.

In order to ensure that there is consistency and traceability in reporting of sludge re-use, it is proposed that GIS systems will be used to record the destination of all sludge disposed of. This will also facilitate reviewing the suitability of lands considered sensitive for the purposes of land spreading. Teagasc have recently developed an online nutrient management planning system which must be used by farmers participating in the Glas scheme. There is a potential synergy with Teagasc in nutrient management planning for wastewater sludge and reporting of the location and quantity of sludge on a field basis. Irish Water intends to engage further with Teagasc to assess the potential of availing of this synergy.
11 Review Research and Opportunities

11.1 Introduction

Ongoing research is being carried out internationally into options for re-use of wastewater sludge. Emerging and innovative technologies may provide new cost-efficient and effective solutions to wastewater sludge management. Research in relation to new technologies for wastewater sludge is typically concentrated on larger scale installations and may not be transferable to smaller scale installations, which are representative of Ireland. However, research into technologies that provide sustainable outlets with low-energy consumption, energy recovery and recovery of nutrients may nevertheless provide future options for wastewater sludge management in Ireland.

11.2 Irish Water Research and Innovation Policy

Irish Water has developed a Research and Innovation Policy. The Research and Innovation Policy in Irish Water sets out the following objectives:

- Supporting a key business objective of customer service
- Complying with EU WFD standards and efficiencies in both capital investment and operating costs
- Addressing current and emerging issues across Irish Water networks
- Delivering benefits in efficiency, customer service and water or environmental quality in Irish Water’s business plan
- Identifying ways to work with CER to ensure that innovative solutions can be deployed in a timely manner
- Identifying innovation needs based on both bottom-up issues and top-down strategic drivers

The Research and Innovation Policy will be delivered through collaboration with: (1) academic institutions (DCU, UCD, NUIG, CIT, DIT, UL, NUIA, etc.), (2) research bodies (Environment Protection Agency (EPA), Enterprise Ireland (EI), Science Foundation Ireland (SFI), The Greenway, (3) other organisations (TBC - WRc plc, UK, UKWIR, Aqua Publica Europea), (4) participating in EU Networks/Action Groups, EU Horizon 2020 and INTERREG funding programmes to pursue research and innovation opportunities and (5) engage with other water utilities (Scottish and Northern Ireland (NI) Water) to develop research and innovative technologies, processes or systems for local application.

The Research and Innovation Policy will provide a focus for reviewing, trialling and testing innovation within Irish Water assets in the following areas: (1) energy reduction and recovery, (2) treatment processes to achieve compliance, (3) nutrient recovery and re-use, (4) infrastructure rehabilitation or upgrade, (5) monitoring and automation and (6) climate change adaptation or infrastructure resilience.

11.3 Relevance of Innovation and Research Policy to Wastewater Sludge

There is significant potential for wastewater sludge to provide energy reduction and recovery and reduce the overall carbon footprint of Irish Water. The potential for nutrient recovery from wastewater sludge is currently limited. However, research in this area may make this more viable in the future.

11.4 Research in Wastewater Sludge Management

Due to the high cost of wastewater sludge management, there is ongoing research internationally in relation to wastewater sludge. Due to the energy and phosphorus content, sludge is viewed as a resource rather than as a waste product. The main areas of research in relation to wastewater sludge relate to the following:-
• Sludge reduction in wastewater treatment processes
• Sludge volume reduction
• Sludge quantity reduction
• Energy recovery
• Nutrient recovery
• Precious metal and heavy metal recovery

In many cases, new technologies are only suitable for very large wastewater treatment plants and have limited potential use in Ireland. However, via the Innovation Section of Irish Water, technologies which have been developed to commercial scale will be considered for use on Irish Water sites.
12 Financial Evaluation

12.1 General

The overall cost of sludge treatment is estimated as follows:

- Sludge transport
- Sludge treatment (thickening and dewatering)
- Sludge treatment (stabilisation)
- Sludge disposal

The estimated cost for sludge transport ranges from €8.00 to €25.00 per tonne, depending on the required travel distance and type of sludge. Based on transportation utilising satellite dewatering centres and full compliance, the annual sludge transport cost is estimated as €10 to €15 million per annum.

Sludge dewatering has a relatively high operation cost due to the labour, power, chemical and capital maintenance requirements. This is disproportionately high at smaller sites, due to high fixed costs, with the cost range estimated as <€2 to €25 per PE. The total national cost annual operating is estimated as €10 to €15 million.

The cost for sludge treatment and disposal costs varies depending mainly on sludge quantity and type of treatment. The estimated cost for sludge treatment and disposal is estimated as €400 per tonne dry solids produced, i.e. upstream of anaerobic digestion. The total estimated annual cost is €28 million per annum based on the 2014 sludge production. This is expected to increase to €35 to €38 million with full compliance with all wastewater discharge licences.

12.2 Cost of Proposed Improvements

12.2.1 Capital Costs

There are currently a limited number of liquid sludge reception facilities to enable the development of satellite dewatering centres. In order to reduce sludge transport costs, it is recommended that additional sites are developed as sludge Satellite Sites. The cost for a full liquid sludge acceptance facility ranges from approximately €400,000 to €1,500,000 depending on the volume of sludge proposed to be imported and any requirement for improvement to access roads, turning areas and upgrades to existing dewatering equipment. The cost saving for transport of sludge to a satellite dewatering site versus transport directly to the proposed hub has been estimated. The cost savings range from <€10,000 to over €100,000. Where the proposed volume of imports of sludge are less than 7,000 to 8,000 m³/annum, it considered more cost effective to discharge sludge to a balancing tank, which will enable controlled discharge to the inlet works. The design of the balancing tank should allow for a future sludge screen and diversion of discharge directly to the sludge process, where feasible. The cost for provision of a balancing tank discharging to the inlet works is estimated to be €50,000 to €80,000.

The development of twenty new satellite dewatering centres is recommended with an additional 2 to 3 to be developed as part of recommended new Sludge Hub Centres. The cost for this is estimated to be €12,000,000. A further 40 sites should be provided with balancing tanks to allow controlled discharge of sludge. The cost for this is estimated to be €2,400,000. A detailed site assessment will be required in each case to assess suitability and a detailed cost estimate. The provision of balancing tanks for sludge acceptance will also allow for the acceptance of sludge from septic tanks.

The capital cost for the proposed Sludge Hub Centre infrastructure is estimated as €85 million. There are potential cost savings of €2.5m per annum in electricity generation with a further potential cost saving of €2.0m per annum for disposal. The cost for the Sludge Hub Centre
proposed for the new North Dublin WWTP is not included as this is considered in the overall cost for that project.

12.2.2 Operation and Maintenance Costs

There are operation and maintenance costs associated with operation of the sludge acceptance facilities and supervision of deliveries. Over 100 wastewater treatment plants reported acceptance of imports of sludge in 2014. The diversion of this to certain specified WWTP’s will reduce the overall level of supervision required. It is not certain what impact the current uncontrolled acceptance of sludge has on either operational costs or compliance. If sludge is accepted to a balancing tank this will reduce the risks to wastewater treatment plant compliance and reduce the potential impact on the WWTP equipment.

There is potential cost savings of up to €1.5 million per annum if the proposed infrastructure is provided compared to the cost of transfer directly to the proposed Sludge Hub Centre. There is a potential to provide economic collection and treatment of DWWTS sludge where these are managed under a scheduled collection system, with potential synergies with the collection of sludge from smaller WWTP’s under the control of Irish Water. However, the DWWTS sludge is not the responsibility of Irish Water and changes to current legislation and enforcement are likely to be required to support any change in the current practice of irregular desludging of DWWTS’s.
13 Conclusions and Recommendations

Wastewater sludge is currently being produced at over 1,000 wastewater treatment plants under the control of Irish Water. The total quantity of wastewater sludge generated in 2014, as reported to the EPA, was 53,543 tonnes dry solids (tds). Over 98% of this was re-used in agriculture. The sludge produced includes primary, biological, chemical and septic tank sludge which undergo further treatment prior to re-use in agriculture.

The quantity of wastewater sludge produced is expected to increase over the next 25 years as new and upgraded wastewater treatment plants are completed. The predicted sludge quantity in 2040 is 96,442 tds/annum. Additional wastewater sludge is produced in individual Domestic Wastewater Treatment Systems (DWWTS’s), mainly septic tanks, some of which is currently accepted at Irish Water wastewater treatment plants. It is expected that the amount of DWWTS sludge accepted by Irish Water will increase over the duration of the NWSMP.

The design and operation of the sludge infrastructure can have a significant impact on the operation of the wastewater treatment plant main treatment process. Inadequate sludge management, in terms of either plant design or operation including frequency of desludging, can potentially lead to breaches of emission limit values, odours and high operating cost. A desludging schedule is proposed for all WWTP sites taking into account the treatment process, sludge production and site location as part of new standard operating procedures (SOP).

The lifecycle cost for transport versus further on-site thickening, dewatering and/or treatment prior to final disposal has been reviewed to establish economically viable transport distances. This initial assessment of the recommended maximum transport distances varies with size of plant, distance to satellite centre and type of treatment process.

There is the potential to reduce the volume of sludge for transport by 20 to 25% by optimising sludge thickening at smaller wastewater treatment plants. There are a large number of sites with existing sludge storage tanks, where sludge thickening could be optimised by automating the decant process.

There are currently over one hundred WWTP sites reporting acceptance of imports of liquid sludge. However, only sixteen of these sites, including fourteen of the existing Sludge Hub Centres, are equipped to operate as effective satellite dewatering sites. The development of twenty new satellite dewatering centres is proposed to optimise sludge transport costs. A further forty sites should be provided with balancing tanks to enable controlled discharge of sludge.

An audit of sludge management activities has identified issues with the quality of lime stabilisation activities. The main issues identified were inadequate dosing of lime and inadequate monitoring of temperature and pH during treatment. It is proposed that off-site treatment of sludge by lime stabilisation will be phased out in the short-term and a minimum lime dose is specified in the meantime.

Studies of biosolids treatment options have indicated that advanced anaerobic digestion provides the most economically feasible option and the lowest carbon footprint for sludge treatment. It is proposed that the number of sites with anaerobic digestion will increase, with the biogas produced used for energy recovery in all cases. Options for co-digestion with organic waste shall also be considered.

There are twenty sites currently acting as Sludge Hub Centres to provide final treatment of sludge prior to disposal. Fifteen Sludge Hub Centres were developed in line with county sludge management plan recommendations, with an additional five temporary sludge hubs and four sludge treatment sites with no imports. An additional 2 – 3 sludge hubs are proposed, in addition
to upgrade of existing sludge hubs, including temporary sludge hubs, where necessary, in order to cater for all wastewater sludge generated.

Thirteen of the existing Sludge Hub Centres include thermal drying treatment. A review of all sites with thermal drying is planned to assess whether anaerobic digestion is feasible on a cost basis to either replace or supplement the existing thermal drying plant. New Sludge Hub Centres will include the provision of advanced anaerobic digestion where this has been assessed as the most economically and environmentally sustainable option.

The current outlet for wastewater sludge in Ireland is almost exclusively agriculture. The NWSMP identifies agriculture as the preferred outlet in the future as far as possible. However, a policy based on a single re-use or disposal option is very susceptible to policy, regulatory and/or perception changes. Alternative options will be investigated on an ongoing basis in order to reduce our current dependence on agricultural disposal, in view of the risk of constraints on this outlet.

There are risks associated with the landspreading of wastewater sludge, with particular concerns in recent years in relation to the risks associated with persistent organic pollutants. There has been extensive international monitoring and research in this area. To date, there are no limits or recommendations for levels of organic pollutants for sludge used in agriculture. Standards for monitoring of wastewater sludge in the EU and international research will be reviewed on an ongoing basis to determine if additional monitoring of sludge or soil samples is required to mitigate against any potential impacts.

There are a number of statutory requirements in relation to monitoring and reporting of sludge management activities. However, in order to ensure that the risks and perception issues are addressed, it is proposed that an independently audited quality assurance scheme is in place for sludge management activities. Pending this scheme, an annual audit of sludge management activities will be undertaken on behalf of Irish Water. Separate control procedures are being developed to ensure the end to end process from source control of pollutants, through sludge treatment and reuse are effectively controlled and monitored.
Appendices
Appendix 1

Stage 1 Public Consultation Report
National Wastewater Sludge Management Plan Consultation 1 Report
TABLE OF CONTENTS

SUMMARY ................................................................................................................................... 1

1 PROJECT BACKGROUND ........................................................................................................... 2
  1.1 INTRODUCTION ..................................................................................................................... 2
  1.2 CONSULTATION PROCESS .................................................................................................. 5
    1.2.1 Advertising and Public Relations ....................................................................................... 5
    1.2.2 Project Webpage ............................................................................................................... 5
    1.2.3 National Elected Representatives ..................................................................................... 6
    1.2.4 Statutory Bodies .............................................................................................................. 6
    1.2.5 Interested Bodies ............................................................................................................. 7

2 FEEDBACK FROM CONSULTATION 1 .......................................................................................... 8
  2.1 TERMS OF REFERENCE – QUESTION 1 .................................................................................. 8
  2.2 TERMS OF REFERENCE – QUESTION 2 .................................................................................. 10
  2.3 TERMS OF REFERENCE – QUESTION 3 .................................................................................. 12
  2.4 TERMS OF REFERENCE – QUESTION 4 .................................................................................. 14
  2.5 TERMS OF REFERENCE – QUESTION 5 .................................................................................. 15
  2.6 TERMS OF REFERENCE – QUESTION 6 .................................................................................. 15
  2.7 IMPACT OF SLUDGE SPREADING IN RELATION TO FOOD PRODUCTION ............................... 16
  2.8 PUBLIC CONSULTATION AND PUBLIC PARTICIPATION ............................................................ 19
  2.9 SPECIFIC TREATMENT FACILITIES ..................................................................................... 20
  2.10 DOMESTIC WASTEWATER TREATMENT SYSTEM SLUDGE .................................................... 20
  2.11 TRANSPORT COSTS ........................................................................................................... 20
  2.12 NATIONAL WASTEWATER MANAGEMENT PLAN AND OTHER PLANS .............................. 21

3 NEXT STAGES OF PROJECT DEVELOPMENT .............................................................................. 22
  3.1 WHAT HAPPENS NEXT .......................................................................................................... 22

APPENDICES

Appendix A Advertising of NWSMP Consultation 1
Appendix B Media Coverage
Appendix C Briefing Note to Interested Bodies
Appendix D Press Release
SUMMARY

Irish Water is preparing a long-term National Wastewater Sludge Management Plan (referred to as the NWSMP) that will outline its 25-year strategy for managing the distribution and recycling of wastewater sludge to ensure high standards nationwide.

Irish Water launched Consultation 1, a non-statutory public consultation to inform the development of the Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA), the environmental reports that will accompany the Draft NWSMP. Consultation 1 ran for six weeks from Tuesday 12th May to Wednesday 24th June 2015.

Section 1 of this report sets out the activities undertaken to ensure widespread awareness of Consultation 1. Section 2 of the report sets out the feedback raised by stakeholders during the consultation process.
1 PROJECT BACKGROUND

1.1 INTRODUCTION

Irish Water was incorporated in January 2014 under the Water Services (No. 2) Act of 2013. Irish Water has been established as a single utility providing water and wastewater services nationally. Irish Water now has the responsibility for the provision of water and wastewater services in Ireland from 31 local authorities. This includes the management of approximately 856 water treatment plants and approximately 1,000 wastewater treatment plants.

Irish Water is currently preparing a National Wastewater Sludge Management Plan (referred to as the NWSMP throughout this document), which will set out Irish Water’s high level strategies for wastewater sludge management over a 25 year horizon. A separate report will be undertaken for sludge from water treatment plants. The NWSMP will take into account current legislation and guidance documents in relation to the treatment and utilisation of wastewater sludge in addition to potential environmental impacts and sustainability of proposals. The recommendations of the NWSMP will be used to inform future capital and operational activities in relation to sludge management.

The NWSMP will allow for the optimisation of sludge management procedures nationally to ensure efficiency and ongoing improvement, which will be to the benefit of the customer. This is in keeping with the objectives of Irish Water’s Water Services Strategic Plan (WSSP), which is a separate strategy document available at http://www.water.ie/about-us/project-and-plans/future-plans/.

The SEA Directive requires that certain Plans and Programmes, prepared by statutory bodies, which are likely to have a significant impact on the environment, be subject to the SEA process. Screening of the proposed NWSMP was undertaken by Irish Water in 2014 and a decision was taken to undertake SEA. A copy of the SEA Screening Statement is available on www.water.ie/wastewater-sludge-management/.

The SEA Scoping Report for the NWSMP was published on Tuesday, 12th May 2015.

The SEA Scoping Report looks to establish the range of environmental issues and level of detail of information to be included in the environmental reports. It considers Human Beings and Population, Soils, Water, Noise, Air, Odour, Climate, Transport and Energy. Irish Water will refer to the SEA and AA environmental reports when preparing the Draft NWSMP.

Consultation 1 was a non-statutory public consultation that provided all interested individuals and organisations with an opportunity to feed into the SEA Scoping Report for the NWSMP.

As part of Consultation 1, Irish Water sought feedback from the public, statutory consultees and interested bodies on the SEA Scoping Report and any additional information, not currently contained in the Scoping Report, that should be considered for the SEA, or any other comments or suggestions that should be considered.
The terms of reference for this round of consultation are shown below:

**Consultation 1: Terms of Reference**

- Based on the plans, policies and programmes outlined in Chapter 4 of the SEA Scoping Report, are there any other key relevant international, national or regional plans, policies or programmes that should be considered in the SEA Environmental Report?

- Are there any other significant information sources that should be considered?

- Do you agree with the list of potential significant effects that have been identified in Chapter 5 of the SEA Scoping Report? Should any be added or removed?

- Are there any other existing environmental issues which should be considered?

- Do you have any comments regarding the draft SEA Objectives outlined in Chapter 7 of the SEA Scoping Report?

- Do you have any suggestions in relation to the overall approach to alternatives?

- How would you like to be contacted as the project progresses?

Consultation 1 ran for six weeks from Tuesday, 12th May to Wednesday, 24th June 2015.

All of the communications activities undertaken as part of this first public consultation have been summarised in Section 1 of this report. The feedback provided is summarised in Section 2.

Feedback from this consultation will be reviewed and considered by the project team and relevant feedback will be incorporated by the project team into the SEA and AA environmental reports.

Irish Water will refer to the SEA and AA environmental reports when preparing the Draft NWSMP.

It is anticipated that the Draft NWSMP will be available in spring 2016, when there will be opportunity for the public and interested bodies to provide feedback on the Draft NWSMP and associated SEA and AA environmental reports as outlined in Figure 1.1 the Project Roadmap during a period of focused consultation, Consultation 2. During Consultation 2, the Draft NWSMP and its associated environmental reports (SEA and AA) will be available online here [www.water.ie/wastewater-sludge-management/](http://www.water.ie/wastewater-sludge-management/) and at local authority planning counters around the country.
Figure 1.1: Project Road Map

NWSMP Project Roadmap

2014

Screening
- Study of the proposed NWSMP undertaken resulting in decision to undertake SEA - completed

2015

2015 May - June

Scoping for Environmental Report
- Study the scope and level of detail of information to be included in the Environmental Report
- Consult with Statutory Consultees
- Non statutory Public Consultation - 6 weeks; opportunity to submit feedback on what should be included in Environmental Report

2015 July - March 2016

Prepare Draft NWSMP, including SEA Environmental Report and Appropriate Assessment
- Outline alternatives, assess the strategic aims and objectives contained within the NWSMP; provide mitigation measures where required; assess potential in-combination effects with other plans and programmes with regard to findings of Appropriate Assessment
- Review and consider consultation feedback and incorporate relevant feedback into Draft NWSMP Plan

2016

2016 January

Consultation 1 Report
- Publish First Consultation Feedback Report

2016 Spring

Statutory Public Consultation - 8 weeks
- Opportunity to review and submit feedback on Draft NWSMP and SEA Environmental Report and Appropriate Assessment
- Public information leaflet
- Review and consider consultation feedback

2016 Summer

Finalise NWSMP
- Update and publish final NWSMP
- Prepare SEA Statement - outline how environmental considerations have been integrated and how consultation influenced the final NWSMP
- Publish Second Consultation Feedback Report
- Public information leaflet
1.2 CONSULTATION PROCESS

A range of communications tools were employed for Consultation 1 in order to raise levels of awareness of the project and to facilitate participation in the consultation process.

Key components of the consultation process included:

- Advertising
- Public relations
- A dedicated project webpage hosted on the Irish Water website;
- Mailouts and briefings to:
  - National Elected Representatives;
  - Local and Regional Authorities;
  - National and Regional Media;
  - Interested Bodies.

This section of the report provides further details on each of the above consultation components.

1.2.1 Advertising and Public Relations

Awareness of the consultation was achieved through a combination of advertising and public relations.

1.2.1.1 Advertising

An advert was placed in the national newspaper the Irish Independent on 12th May 2015. A copy of this advert is included in Appendix A.

1.2.1.2 Public Relations

Public relations activities included issuing news releases to national and local media organisations and posting them online on the Irish Water website.

Copies of the national and local news coverage along with a list of media outlets that were issued press releases are contained in Appendix B. The press release issued to media is contained in Appendix D.

1.2.2 Project Webpage

All relevant project information, including an electronic version of the SEA Scoping Report is available online.

A dedicated page for the NWSMP was established on the Irish Water website and information on the project was made live on the website at the consultation launch on Tuesday 12th May 2015.
The URL for the project website is www.water.ie/wastewater-sludge-management.

In addition to the project website, members of the public were invited to submit feedback and queries to the project team:

**By Email:**  
[water.ie](http://water.ie)

**Or by Post:**  
National Wastewater Sludge Management Plan, Irish Water,  
P.O. Box 860, South City Delivery Office, Cork

### 1.2.3 National Elected Representatives

In recognition of the mandate given to national elected representatives and the critical role they play in representing the public and the public interest, Ministers, Senators, TDs and MEPs were identified as priority stakeholders.

Letters and emails were issued by Irish Water to all Ministers, TDs, Senators, MEPs, and Councillors.

All City and County Councils in the study area were contacted and informed of the commencement of Consultation 1.

### 1.2.4 Statutory Bodies

Statutory consultation on the NWSMP commenced on the 12th May 2015 when a Scoping Report and letter were sent to the five statutory consultees for SEA in Ireland, namely:

- Environmental Protection Agency (EPA);
- Department of Arts, Heritage and the Gaeltacht (DAHG);
- Department of Communications, Energy and Natural Resources (DCENR);
- Department of the Environment, Community and Local Government; and
- Department of Agriculture, Food and the Marine.

In addition, statutory consultation was also undertaken with the NIEA (Northern Ireland Environment Agency) in the context of transboundary impacts.

A workshop was held on July 7th 2015 to discuss the NWSMP and the scope and level of detail of the environmental assessment of the plan. Representatives from the EPA and DCENR (represented by Inland Fisheries Ireland) attended the meeting with apologies from NIEA, DAHG, DAFM and DECLG. The workshop included a presentation on the purpose and outline content of the NWSMP and a further presentation on the SEA and AA, including identification of key issues.

Feedback from the statutory bodies has been included in Section 2.
1.2.5 Interested Bodies

Stakeholder groups and community leaders from the following sectors were identified:

- Agriculture;
- Environment;
- Elected Representatives;
- Community Organisations;
- Business Organisations;
- Statutory/Strategic Stakeholders.

Contact information for these groups was obtained from publicly available sources including websites and telephone directories. A briefing note on the consultation on the SEA for the NWSMP, including the terms of reference of the consultation and a link to the SEA Scoping Report was issued digitally to the groups identified. The information sent is included in Appendix C.
2 FEEDBACK FROM CONSULTATION 1

There were 40 responses to Consultation 1. The following section is a compilation of the issues raised under the relevant question asked in the Consultation 1 terms of reference. Everything included in the section below is taken directly from stakeholder feedback. Many submissions reiterated similar themes; therefore some of the issues raised are quoted directly from submissions, while others are a summary of issues raised by a number of submissions.

2.1 TERMS OF REFERENCE – QUESTION 1

Based on the plans, policies and programmes outlined in Chapter 4 of the SEA Scoping Report, are there any other key relevant international, national or regional plans, policies or programmes that should be considered in the SEA Environmental Report?

Stakeholders and interested bodies noted that quality assurance schemes and the consequences that arise from the schemes for restricted use of sludge in agriculture should be included. These schemes include but are not limited to:

- Bord Bia Origin Green Initiative;
- Sustainable Dairy Assurance Scheme (SDAS)
- Beef & Lamb Quality Assurance Scheme
- Irish Grain Assurance Scheme

Stakeholders noted that the lists of plans, policies & programmes as listed in Section 4.2 of the SEA Scoping Report - Interaction With Other Plans and Programmes - do not appear to include any documents on alternative energy or climate change, which would be relevant to consideration of energy generation from digestion of sludge.

A submission on behalf of the Connacht-Ulster, Eastern Midlands and Southern Waste Regions proposed that the following policies, plans and programmes should be included in the SEA Environmental Report:

- The regional waste management plans;
- River Basin Management Plans;
- Water Services Investment Programme;
- Water Framework Monitoring Programmes;
- A Blueprint to Safeguard Europe’s Water Resources/*COM/2012/0673 final;
- The EU Flood Action Programme: Flood risk management – Flood prevention, protection and mitigation/*COM/2004/0472/final; and
- Strive Report; STRIVE 123 – Management Options for the collection, treatment and disposal of Sludge derived from Domestic Wastewater Treatment Systems.

The submission also noted that additional information should be included in the Environmental Report to highlight how the NWSMP measures align with Water Framework Directive (WFD) requirements as well as documenting the reasons for where any environmental criteria are
proposed to be scoped out. The submission further pointed out that consideration should be given to the problems identified in previous sludge management plans for generating alternatives.

The EPA noted that it would be useful to categorise the various plans and programmes, legislation according to environmental aspect / topic i.e. water, waste, biodiversity etc. and that it would be also useful to consider including references to other key relevant plans, programmes & legislation including:

- International Conventions e.g. OSPAR (Convention for the Protection of the Marine Environment of the North-East Atlantic), RAMSAR (Convention on Wetlands).
- EU Directives/Regulations e.g. Waste Framework (2008/98/EC), Environmental Liabilities, Shellfish Water, Freshwater Fish Bathing Water, Drinking Water, Integrated Pollution Prevention and Control (IPPC), etc.
- National Legislation/ Policy / Guidance e.g. the relevant aspects of the Environmental Protection Agency Act 1992 as amended, Water Services Act, SEA Regulations, EIA Regulations, etc.
- In the regional context, the Draft NWSMP should also include a reference and consider the relevant aspects from: Regional Waste Management Plans, relevant Shellfish Waters - Pollution Reduction Programmes and associated Characterisation Report, relevant River Basin Management Plans, relevant CFRAMS (Catchment Flood Risk Assessment and Management).

The EPA further noted that the biennial reporting requirements of the Waste Statistics Regulation S.I. No. 2150 of 2002 on sludge (and other wastes) generated and treated by wastewater treatment activities should be reflected in the Draft NWSMP.

In relation to Section 4.3 - SEA Guidance, the EPA provided a reference to the SEA related guidance and information available on the Agency’s website in addition to recent guidance on the Developing and Assessing of Alternatives.

The EPA noted that with reference to Table 6-1-Baseline data sources, (page 19/20), an EPA database (municipal solid waste) is referenced as a potential data source, however the Agency does not maintain a municipal solid waste database and that wastewater treatment sludge is not classed, by the EPA, as municipal waste. It was suggested that this should be reflected in Table 6.1 and any associated text.

The EPA stated that SEA Regulations were signed into Irish law on 3rd May 2011, amending the original SEA Regulations, and should be referenced and integrated into the Draft NWSMP and SEA process as appropriate:

- The DoEHLG Circular (PSSP 6/2011) ‘Further Transposition of the EU Directive 2001/42/EC on Strategic Environmental Assessment (SEA)’ which should also be referred to and integrated into the Draft NWSMP.
- The DoEHLG Circular (Circular PL 9 of 2013) ‘Article 8 (Decision Making) of EU Directive 2001/42/EC on Strategic Environmental Assessment (SEA) as amended’ should be taken into account during the preparation of the Draft NWSMP and in undertaking the SEA process.
The Department of Arts, Heritage and the Gaeltacht (DAHG) advised that the screening for Appropriate Assessment, and Appropriate Assessment as may be required, are to be undertaken pursuant to SI 477 of 2011, European Communities (Birds and Natural Habitats Regulations), 2011 and that the statements and conclusions in relation to Appropriate Assessment screening be clarified, in line with the relevant legislative requirements.

Cré noted that the Danish policy for the management of domestic wastewater sludge should be reviewed in the Draft NWSMP.

The Irish Business and Employers Confederation (IBEC) stated that the SEA Scoping Report should consider the requirement for industry standards governing the production, treatment and recovery of sludge, bio-solids and other substances, akin to the industry standards recently implemented by the compost and anaerobic digestion industries in collaboration with the NSAI (National Standards Authority of Ireland).

In IBEC’s submission they stated that the Scoping Report does not go far enough in setting out how the Draft NWSMP will address inconsistencies and other issues with the existing rules (e.g. legislation, guidance, and codes-of practice) on sludge. IBEC suggested that Irish Water properly legally analyse these instruments on foot of policy formulation such that they may be amended, consolidated, revise or replaced as necessary to the provision of better rules for sludge management and that this legal analysis should address how the applicable instruments regulate the auditing, control and traceability of sludge throughout the production, treatment and recovery chain, and the elimination of conflicts of application or interpretation between the various instruments as well as between the instruments and relevant case-law, particularly with respect to end-of waste criteria.

### 2.2 TERMS OF REFERENCE – QUESTION 2

**Are there any other significant information sources that should be considered?**

Cré proposed that measures which provide the best food safety should be a key factor for all considerations in developing the Draft NWSMP and suggested the following reports as sources of other information:

- Food Safety Implications of Land-spreading Agricultural, Municipal and Industrial Organic Materials on Agricultural Land used for Food Production in Ireland (Food Safety Authority of Ireland, 2008);

The EPA and DCENR noted that there are significant gaps in information on sludge disposal.

The DAHG suggested that the following data and information sources should be considered:

- The NPWS website for sources of data, information and publications, including GIS datasets;
- Site-specific conservation objectives, and associated backing documents and GIS datasets in the case of some European sites;
- Due regard to developments in the interpretation and application directives and legislation arising from jurisprudence of the Court of Justice of the European Union, and of the Irish Courts, particularly in regard to Article 6 of the Habitats Directive.

There was feedback that the following information should have been included in the Scoping Document:

- Tonnage, source and the chemical composition including heavy metals, that are present in wastewater sludge;
- Endocrine Disrupting Chemicals (EDCs), Emerging Contaminants (ECs); and Prions should also have been considered.

Feedback in this regard included that there is documentation that the maximum concentration of heavy metals in soils exceeded the maximum permitted values on land in agricultural use where wastewater sludge was spread and referenced the EPA Bi annual ‘Waste Water Reviews’ 2000 –2001 and 2002-2003. The EPA Urban Waste Water Discharges Report 2002- 2003, was also referenced stating that the EPA reports show that the maximum-recorded levels of heavy metals on agricultural land where wastewater sludge was spread was of being up to 12 times the maximum level of heavy metal recorded in the wastewater sludge in 2003. Feedback included a view that the Scoping Report should state the proposed mitigating measures for the lands where the maximum concentration of heavy metals in soils exceeds the permitted levels, where Ringsend sludge was reused in agriculture.

It was requested that the following Base Line Information be included in the Environmental reports:

Information on the amount of wastewater sludge produced in the country:
Table 2.1 Quantity of Wastewater Sludge Produced 2012

<table>
<thead>
<tr>
<th>Regional Waste Authority</th>
<th>Figures for year</th>
<th>Quantity of Wastewater Sludge Produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern and Midland Region</td>
<td>2012</td>
<td>227,998 tons</td>
</tr>
<tr>
<td>Southern Region</td>
<td>2012</td>
<td>144,525 tons</td>
</tr>
<tr>
<td>Connacht Ulster Region</td>
<td>2012</td>
<td>99,794 tons</td>
</tr>
<tr>
<td>National Total</td>
<td>2012</td>
<td>472,317 tons</td>
</tr>
</tbody>
</table>

Information on the amount of Landfill Leachate received by wastewater treatment plants in 2012:
Table 2.2 Quantity of Landfill Leachate received in wastewater treatment plants 2012

<table>
<thead>
<tr>
<th>Regional Waste Authority</th>
<th>Figures for year</th>
<th>Quantity of Landfill Leachate Received*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern and Midland Region Waste Authority</td>
<td>2012</td>
<td>236,396 tons</td>
</tr>
<tr>
<td>Southern Region</td>
<td>2012</td>
<td>154,409 tons</td>
</tr>
<tr>
<td>Connacht Ulster Region</td>
<td>2012</td>
<td>177,824 tons</td>
</tr>
<tr>
<td>National Total</td>
<td>2012</td>
<td>472,317 tons</td>
</tr>
</tbody>
</table>

*These figures do not include Landfill Leachate discharged to sewers either with or without authorisation. All three Regional Waste Authorities indicated that all Landfill Leachate is sent to wastewater treatment plants controlled by Irish Water and outlined the need for detailed chemical analysis of the landfill leachate being received by the wastewater treatment plants.
2.3 TERMS OF REFERENCE – QUESTION 3

**Do you agree with the list of potential significant effects that have been identified in Chapter 5 of the SEA Scoping Report? Should any be added or removed?**

The Confederation of Waste-to-Energy Plants (CEWEP) Ireland suggested that reference to the effect on food quality is considered as a parameter within the SEA issues of Human Health and Soil and Land Use in Table 5-1 and that a more extensive list of potential soil (and hence food supply chain) contaminants as a result of landspreading be included in this table, including but not limited to: heavy metals, Persistent Organic Pollutants (POPs), Environmental Persistent Pharmaceutical Pollutants (EPPP) and personal care products (e.g. antibiotics, endocrine disrupting hormones). It was also noted that the impact on fertiliser use - if landspreading of wastewater sludge was limited or discontinued - should be considered under Material Assets.

Other stakeholders also proposed that the effects of human health (pathogens, heavy metals etc. resulting from landspreading of sludge should be included in Table 5-1, noting that this could be via food crops or directly from contact with sludge.

The EPA noted that water related aspects and implications of the NWSMP need to be further considered, in the context of determining potential for conflict with the achievement of the Water Framework Directive (WFD) objectives. The Draft NWSMP should identify and select appropriate mitigation measures where required and should be designed to ensure compliance with the WFD. The Draft NWSMP should also include suitably scaled maps identifying the relevant WFD related Protected Areas and should consider the potential effects on Groundwater Source Protection Areas.

The EPA further noted that the Draft NWSMP should take into account the relevant aspects of the recently published Significant Water Management Issues in Ireland (SWMI) Report (DECLG, 2015 and the Water Quality in Ireland 2010-2012 Report (EPA, 2015), as appropriate in undertaking the SEA.

With respect to Flood Risk, the EPA recommended that a section and relevant maps be included that describes the potential risk of flooding to existing infrastructure, noting that the ongoing and future development/operation/upgrade of supporting wastewater treatment infrastructure should be consistent with the Flood Risk Management Guidelines (DEHLG, 2009) and take into account the relevant aspects of the various national CFRAMS programme in order to ensure that existing and future wastewater treatment plant (WWTP) related infrastructure is protected from the risk of flooding, which is particularly relevant in the context of potential impacts on population/ human health/water quality and biodiversity (including fisheries).

Stakeholder feedback noted that Chapter 5 should make reference to the fertiliser and soil organic matter benefits from the use of biosolids as a fertiliser and soil improver; Ireland currently imports our fertiliser from unsustainable sources, so locally produced and sustainable fertilisers should be viewed positively. There was reference to the quality of Ireland’s WWTP sludge and a suggestion that it should be compared against some areas of mainland Europe.

The ICMSA stated that they believe that the special and unique environmental issues in relation to food production should be dealt with separately in Table 5.1.
The Department of Arts, Heritage and the Gaeltacht (DAHG) recommended that the Environmental Report in the SEA should include an Archaeological Impact Assessment of the potential impact that works carried out under the NWSMP may have on known or potential archaeological sites including the underwater cultural heritage.

The DAHG suggested that the following environmental effects should be considered and that a review of peer-reviewed literature should be undertaken to gain a fuller understanding of how these impacts may affect species and habitats, e.g. on vegetation and structure and functioning of ecosystems and through the trophic levels. An example includes “Nitrogen deposition and Natura 2000: Science and Practice in Determining Environmental Impacts” by Hicks et al 2011:

- The implications of acidification and deposition for nature conservation.
- The potential for habitat loss (from new sludge infrastructure).
- Habitat deterioration from spreading and subsequent changes to chemical composition (phosphate, copper) of surface run-off and environmental receptors, etc.
- Disturbance to Annexed species (including birds).

The DAHG also proposed that the scope of the SEA for Biodiversity, Flora and Fauna should include:

- All nature conservation sites, including European sites, sites protected under national legislation, National Parks and Nature Reserves etc.;
- Species of wild flora and fauna, including rare and protected species and their habitats; Annex IV (Habits Directive) species of flora and fauna, and their key habitats (i.e. breeding sites and resting places), which are strictly protected wherever they occur, whether inside or outside sites, (including data on rare and protected species from NPWS, the National Biodiversity Data Centre, BirdWatch Ireland, etc.);
- Other species of flora and fauna and their key habitats which are protected under the Wildlife Acts, 1976-2000, wherever they occur;
- ‘Protected species and natural habitats’ as defined in the Environmental Liability Directive (2004/35/EC) and European Communities (Environmental Liability) Regulations, 2008, including:
  - Birds Directive – Annex I species and other regularly occurring migratory species, and their habitats (wherever they occur).
- Stepping stones and ecological corridors including nature conservation sites (other than European sites), habitat areas and species’ locations covered by the wider obligations of the Habitats Directive.
- All watercourses, surface water bodies and associated wetlands, including floodplains and flood risk areas.

The DAHG noted that while it is inferred that species protected under European and national legislation are included within “flora and fauna” that this would benefit from elaboration.

The DAHG stated that if disposal of sludge at sea, or incineration is being considered that this will expand the potential implications for nature conservation that will need to be considered and assessed in both the SEA and NIS (Natura Impact Statement) (e.g. potential implications of heavy metal loading from incineration on fauna).
Inland Fisheries Ireland (IFI) as part of DCENR suggested that, in determining the likely significant effects of the NWSMP, some key issues from a fisheries perspective for consideration in the SEA should include:

- Water quality;
- Fish spawning and nursery areas;
- Ecosystem structure and functioning;
- Sport and commercial fishing and angling;
- Amenity and recreational areas.

The IFI further suggested that consideration should be given to watercourses outside formal European designation which may hold species that are designated under the European Habitats Directive i.e. salmon and lamprey (sea, river and brook), which are listed as Annex II Species.

The Geological Survey of Ireland (GSI) as part of DCENR recommended that geology is included together with Soils under the heading Soil & Geology, that the Soils & Geology section of the SEA should provide information about the description of the bedrock and lithologies (types of strata), quaternary geology, landslide hazard and geological heritage should be included and potential impacts recognised and that the use of maps is recommended where appropriate. The GSI provided links to their online resources with relevant datasets that should be considered in the Baseline Data Sources and Extent of Assessment.

The Northern Ireland Environment Agency (NIEA) noted that to ensure that there are no adverse environmental impacts on Northern Ireland, that adequate mitigation and monitoring measures are highlighted in the Environmental Report and built into the NWSMP. They further suggested the inclusion of a clear statement in the SEA Environmental Report indicating whether or not the implementation of the NWSMP, in combination with any identified measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment, is likely to have a significant effect on Northern Ireland. The NIEA also provided links to their information sources that should highlight the current state of the environment in Northern Ireland at a regional level for inclusion in the baseline assessment.

Cré suggested that the Draft NWSMP and associated environmental reports should acknowledge the potential environmental impact of sludge from plants of a population equivalent of less than 5,000.

2.4 TERMS OF REFERENCE – QUESTION 4

*Are there any other existing environmental issues which should be considered?*

The ICMSA stated that the SEA should specifically address in detail the issue of the use of sludge on farms and the environmental impact of same as well as the impact of the general management of sludge on the food sector in Ireland and measures to prevent or mitigate any perceived risks.

Stakeholder feedback proposed that there should be a quantitative assessment of the environmental impact of the options. It was suggested that consideration should be given to using a waste management lifecycle assessment tool such as the Danish Easewaste or the UK Wrate tool;
such tools measure the impact with regard to greenhouse gas emissions, impact on soil, impact on air and water

Carlow County Council noted that in their experience of the supervision of Nutrient Management Plans and landspreading that there have been no environmental incidents in disposing of the treated sludge.

Clare County Council noted that issues to be considered with respect to Sludge outlets should include:

- Size of land banks required;
- Buffer zones;
- Neighbouring land uses;
- Vulnerability of groundwater and surface water.

2.5 TERMS OF REFERENCE – QUESTION 5

Do you have any Comments regarding the draft SEA objectives outlined in Chapter 7 of the SEA SCOPING REPORT?

The DAHG stated that the Environmental Report is required to contain environmental protection objectives. The environmental protection objectives for Biodiversity, Flora & Fauna should integrate with the objectives and obligations of other directives such as the Habitats Directive, the Birds Directive, the Water Framework Directive and the Floods Directive, the Wildlife Acts 1976-2000 and the National Biodiversity Plan. They further noted that under the Biodiversity, Flora & Fauna SEA Indicators, it is unclear what kind of “margaritifera plans” are being referred to. Under the Soil SEA Indicators, clarification on what is meant by “management” of peatlands is required.

The Geological Survey of Ireland (GSI) as part of DCENR recommended that the Environmental Component – Soil & Geology of the SEA Objective is modified to “Avoid conflicts with, and contribute toward, where possible, the appropriate management of soils and geology”.

The Northern Ireland Environment Agency (NIEA) recommended that Air & Climatic Factors should include a strategic environmental objective target to ‘Minimise emissions to air from sewage sludge treatment / spreading’, and ‘Minimise effects on sensitive habitats from contact/deposition of air pollutants (specifically ammonia) from sewage sludge treatment/spreading activities.’

The EPA noted that the Draft NWSMP should incorporate an additional objective to establish a register of Urban WWTPs, and an associated national reporting system for recording information on the generation and treatment of wastewater sludge (and other waste arising from the activity). These objectives and associated data are relevant for national waste reporting purposes.

2.6 TERMS OF REFERENCE – QUESTION 6

Do you have any suggestions to the overall approach to alternatives?
Stakeholders stated that consideration of alternatives should go beyond the confines of Table 7.1, to look at any emerging new technologies and innovative ways of treating and/or disposing of sludge.

Stakeholder said incineration should be given greater consideration as an alternative as the vast majority of the Irish food processing industry is now or is expected to be committed to the various quality assurance schemes, placing pressure on the available land bank.

CEWEP Ireland supports the proposed alternatives to landspreading including incineration with energy recovery, but would rule out incineration without energy recovery as this is seen to be an unsustainable approach which does not adhere to best available techniques. They noted that mono-incineration with phosphorous recovery from the ash should also be considered in the context of the phosphorous material cycle and that additional alternatives, including but not limited to; anaerobic digestion and composting could also be considered. They further noted that the different capabilities of each alternative should be recognised in terms of treating or removing contaminants from the nutrient cycle.

Bord na Móna (BNM) proposed that the final NWSMP should highlight the potential advantages / disadvantages of each treatment option, e.g. land-filling, composting, incineration, pyrolysis, gasification and anaerobic digestion. BNM noted that while it is understood that Ireland as a nation is fully compliant with EU sludge policy, it is nevertheless felt that we should support further deployment treatment options such as anaerobic digestion, pyrolysis or gasification as a sludge management and renewable energy solutions. This ethos is in line with Article 14 of the Urban Waste Water Treatment Directive (UWWTD) which states that "Sludge arising from waste water treatment shall be re-used whenever appropriate. Disposal routes shall minimise the adverse effects on the environment." BNM also noted that of the 3 treatment options (pyrolysis/gasification/anaerobic digestion) highlighted above it is anaerobic digestion which has the potential for maximum energy recovery.

Cré suggested considering the Danish model of composting of sludge produced by an on-site mobile desludging of septic tanks, which could be done by the private sector and be very cost effective. No extra infrastructure would be needed at wastewater treatment plants to handle this material.

One stakeholder noted that they have been supplying a broad bacteria consortium with very good results in sludge yield reduction and queried whether this alternative was being considered in the Draft NWSMP.

Another stakeholder proposed the use of modified slatted units as a start point for the launching of anaerobic digestion in Ireland.

There was a proposal from a stakeholder that rather than incinerating that dried sludge cakes be used as land-build/land fill for low lying fields subject to waterway flooding.

### 2.7 IMPACT OF SLUDGE SPREADING IN RELATION TO FOOD PRODUCTION

A stakeholder concern raised was that the impact on food producing lands by sludge spreading had not been considered, given the importance of the agri-food sector nationally. Stakeholders noted that sludge spreading on agricultural crops is forbidden under Irish quality assurance schemes, with
some noting that the application of municipal sludge to any agricultural land is forbidden under law in a number of European countries.

Bord Bia and the Department of Agriculture both highlighted a critical criterion set out in Bord Bia’s quality assurance standards that the use of raw or treated sewage/wastewater sludges are prohibited from being used on Bord Bia certified farms. It was noted that while the merit the use of wastewater treated sludge as a fertiliser was understood, that the sentiment among the processors and their customers in relation to the use of municipal sludge on agricultural land is strongly negative, particularly given the positioning of the Irish food sector at the high quality end of the market. The Irish Dairy Industries Association (IDIA) stated that Irish dairy processors will simply not accept products manufactured with milk from lands on which municipal sludge has been spread. The IDIA stated that the only effective manner to prevent serious reputational and commercial damage to the Irish agri-food industry is a complete ban on the spreading of municipal sludge on the Irish farm land.

Stakeholder feedback was provided noting that there is considerable concern from farmers, processors and exporters of Irish Food Products that Quality Assurance guidelines are not being adhered to in the production of food products for sale both at home and abroad and that this could have a negative impact on trust in the source of the food production if breaches were to be identified. It was noted that other countries are not clear what Ireland’s position is with respect to allowing food production on land that has been used for wastewater sludge spreading.

Particular reference was made in the submission by the Department of Agriculture, Food and Marine (DAFM) to the current legislation and guidance document in relation to the treatment and utilisation of wastewater sludge, in addition to food safety concerns as highlighted in ‘The Food Safety Authority (FSAI) Scientific Committee report (2008), as well as environmental impacts and sustainability issues. The DAFM noted its support for recommendations in the FSAI report and also noted the 11 recommendations in the FSAI report which relate to the minimum safe standards required when land-spreading organic agricultural and municipal and industrial materials on agricultural land for food production.

The DAFM also noted the sewage sludge is considered a fertiliser under the definitions of the Nitrates Regulations and as such must be taken into account when considering the maximum amounts of available nitrogen and phosphorus that may be applied to meet the requirements to promote crop growth and that the total nitrogen and total phosphorus content per ton shall be declared by the supplier in accordance with the Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 1998 to 2001 and any subsequent amendments thereto.

Both the EPA and DCENR noted the limitations on outlets for landspreading including cadmium and nickel levels, groundwater vulnerability and water quality impacts.

BNM stated that considering the potential adverse health effects arising from applying untreated sewage sludge to land, all sewage sludge should be applied using appropriate application technologies (trailing shoe/direct injection) and in accordance with Nutrient Management Planning (NMP).

It was noted in stakeholder feedback that there is no Environmental Report on the issue of Heavy Metals on Agricultural Soils, nor is there any reference to the lack of compliance of any local, national and international environmental laws, acts, regulations, licences etc. It was also stated that
there is no legislation covering the use of wastewater sludge on agricultural land in Ireland, only a code of conduct. This compares to the Netherlands where the use of wastewater sludge on agricultural land is banned by legislation. The Dutch chemical analysis and control of wastewater sludge is sufficiently detailed to allow them to identify the source of wastewater sludge from the legal and illegal chemical composition of the sewage sludge. All wastewater sludge in the Netherlands is dried and incinerated. This policy is to protect the quality and reputation of Dutch agricultural produce. When it comes to food safety, perceptions matter more than facts. The current standards in Ireland address neither. The stakeholder asked if Irish Water will research, collect, correlate and publish up to date international findings on the risks associated with wastewater sludge spreading.

The EPA noted the Draft NWSMP should include a commitment that sludge is only applied to agricultural land where it is both environmentally and agronomically safe and appropriate to do so. It should also be ensured that it is applied at levels which ensure that the nutrients can be effectively used for plant growth or assimilated into the soil.

While agriculture may be considered the main outlet for sludge, the EPA noted that the national landbank available to recover the sludge will be under significant pressure in the future for many reasons, including:

- Food Harvest 2020 (and Agri-Food 2025), that will increase the dairy herd and reduce the tillage area which is the most suitable crop type for this material;
- Consumer sentiment, where some food producers are discouraging the use of wastewater sludge on agricultural land due to the negative perceptions of spreading wastewater sludge.

The EPA suggested that the Draft NWSMP should consider including a commitment to establish a system for improved tracking of sludge spreading, in order to minimise the risk of overspreading and increasing the risk of runoff and leaching suggesting consideration of a central GIS based landspreading database to ensure that the available lands are not overspread.

The EPA further suggested that the Draft NWSMP should include a commitment to ensure that sludge applied to agricultural lands complies with the Sewage Sludge in Agriculture Regulations (S.I. No. 267 of 2001) and that an appropriate regime is put in place for the testing of sludge and landbanks to demonstrate compliance. They proposed that a commitment should also be included to undertake risk assessments for any significant industrial effluent/pharmaceutical effluent discharging to a municipal wastewater treatment plant, to assess its potential impact on the sludge and on its proposed disposal/recovery options.

One stakeholder noted that the majority of imported grain to feed our national herd (livestock such as cattle, sheep or pigs) in Ireland comes from countries where landspreading of biosolids is common practice and is now business as usual and that the scientific and real tangible sustainability benefits of utilising this national resource (i.e. 300,000 tons sludge cake equivalent) as a fertiliser and soil improver does not get the recognition it deserve. This stakeholder cautioned that policy should be based on scientific and not emotive arguments.

Cré recommended the ‘Code of Good Practice for the Use of Biosolids in Agriculture’ should be made into legislation and that a number of exemptions and provisions in the current Regulations should be removed as they conflict with the Code of Good Practice and give rise to food safety concerns. Cré recommended the following legislative changes:
The Code of Good Practice states that untreated wastewater sludge should not be landspread or injected into soil. Regulations that allow this practice should be changed to prevent untreated sludge being landspread or injected into the soil.

The Regulations that allow for the use of residual sludge from septic tanks on grassland and the use of untreated sludge (worked/injected into ground) in agriculture should be changed to prevent residual sludge from septic tanks being landspread untreated as this is a matter of concern as it may introduce pathogens into the food chain.

The Regulations should be changed to remove the exemption that the sludge register does not have to contain details of sludge from plants of less than 5,000 p.e. (population equivalent) as this represents a breakdown in the traceability and monitoring necessary for the safe use of sludge in agriculture and is a matter of concern.

### 2.8 PUBLIC CONSULTATION AND PUBLIC PARTICIPATION

Feedback noted that to comply with the Aarhus Convention and the Public Participation Directive 2003/35/EC, there is a requirement to have meaningful public consultation through the holding of public meetings, workshops and discussions to comply with the SEA directive, in other words the SEA process must be adhered to in both the spirit and the letter of the Directive. It was felt that the published SEA Scoping Report does not make provision for public participation at the earliest stage as there has not been an opportunity to have meaningful consultation and discussions at the earliest possible stage, and it was felt that stakeholders were left with the much-reduced opportunity of outlining concerns in writing.

There was also stakeholder feedback stating that there is a lack of consultation on specific plans for Sludge Storage/Treatment Facilities.

The EPA recommended that consultation with the National Waste Collection Permit Office (NWCPO) be carried out as they would be able to advise on aspects such as the operators authorised to collect wastewater sludge and they also gather annual return information from collectors on the collections and transfers of wastewater sludge. The EPA further recommended consultation with the lead authorities for the three waste management plan regions.

The EPA also advised that under the SEA Regulations (S.I. No. 435 of 2004), as amended by S.I. No. 200 of 2011, notice should also be given to the following:

- The Minister for the Environment, Community & Local Government;
- Minister for Agriculture, Marine and Food, and the Minister for Communications Energy and Natural Resources, where it appears to the planning authority that the plan or programme, or modification of the plan or programme, might have significant effects on fisheries or the marine environment;
- Where it appears to the competent authority that the plan or programme, or amendment to a plan or programme, might have significant effects in relation to the architectural heritage or to nature conservation, the Minister for Arts, Heritage and Gaeltacht Affairs.
2.9 SPECIFIC TREATMENT FACILITIES

Stakeholders asked that all aspects of specific existing or proposed treatment facilities be examined including:

- Thornhill Sewage Sludge Storage facility.
- The Proposed Sludge Storage/Treatment facility located in Corclough East, Belmullet, Co. Mayo.

Stakeholders had the following specific questions on the development of facilities:

- Will an EIS be done for each project?
- How will Irish Water control contamination to wildlife from discharge from Proposed Sludge Storage/Treatment facilities?
- How does Irish Water propose to protect safe uncontaminated shellfish for human consumption from discharge from Proposed Sludge Storage/Treatment facilities?
- How does Irish Water propose to control water quality affected from discharge from Proposed Sludge Storage/Treatment facilities?
- How will Irish Water control the noise level during construction and operation phases on Waste Storage/Treatment Plants?
- How will Irish Water deal with the issue of visual impact of these plants both from a landscape perspective and intrusion with respect to being lit up at night for security purposes?
- How will Irish Water deal with the issue of odour and air quality from these plants?
- How will Irish Water deal with the issue that these plants would attract rodents and pests?

2.10 DOMESTIC WASTEWATER TREATMENT SYSTEM SLudge

The EPA expressed concern about the current status of inadequate infrastructure and capacity for onward disposal of sludge from Domestic Wastewater Treatment Systems (DWWTS). The EPA sees the management of sludge arising from DWWTS as being a national priority that should be reflected in the Draft NWSMP. The EPA further noted the findings of their report that there is a volume deficit for receipt of 50% of evacuated DWWTS sludge generated annually and that there is a lack of sludge screening facilities at WWTPs resulting in discharge from sludge tankers to the inlet of the process, resulting in the shock loading of the WWTPs, disruption of the biological process, higher energy costs and a reduction in the quality of the final effluent discharged to receiving waters.

2.11 TRANSPORT COSTS

BNM suggested that the finalised NWSMP should give careful consideration to the location of future agglomerations or centralisation of WWTPs bearing in mind the transportation distances which would be considered by potential investors to the anaerobic digestion marketplace.

Feedback was received regarding transport costs being a significant factor in sludge treatment and disposal and while regional hubs might have a number of advantages due to the scale of operations the transport costs may negate these.
2.12 NATIONAL WASTEWATER MANAGEMENT PLAN AND OTHER PLANS

While the Department of Arts, Heritage and the Gaeltacht (DAHG) acknowledged that the relevant recommendations arising from the SEA and AA of the Water Services Strategic Plan will be reviewed and incorporated into the SEA and AA of the Draft NWSMP, they further suggested that such recommendations may need to be incorporated into the Draft NWSMP itself (and other Tier 2 Implementation Plans), particularly if it is mitigation on which the higher-level plan relies for any conclusion that it will not adversely affect the integrity of European sites.

The EPA noted that there would be merit in clarifying the extent to which the focus of the Draft NWSMP and the associated SEA will include relevant aspects of alternative management options considered for all forms of non-hazardous sludge currently arising and predicted to arise over the lifetime of the plan.

The EPA suggested that the Draft NWSMP should clarify which population figures will be taken into account in estimating future sludge generation quantities. They further suggested that the Draft NWSMP and the SEA should consider the location and capacity aspects of the necessary sludge management infrastructure and that the capacity to treat domestic wastewater sludge should also be factored into predicted sludge volumes and be linked to predicted population growth as described in the Regional Planning Guidelines and relevant Core Strategies. The Regional Spatial & Economic Strategies (likely to be prepared in the lifetime of the NWSMP), should also be taken into account, as appropriate, upon their adoption.

The EPA suggested that the Draft NWSMP should consider the systems, processes, monitoring and records required to ensure that the volumes of sludge to be removed from wastewater treatment plants (for offsite disposal, reuse or recovery) are accurately recorded and reported on. These should be clearly described in the Draft NWSMP. They proposed that a commitment should also be included in the Draft NWSMP to ensure the appropriate annual wastewater return information is provided to the EPA in a timely manner.

The EPA noted that the Draft NWSMP should take into account that the current sludge volumes removed from wastewater treatment plants may not accurately reflect the potential/predicted volumes that should be removed, as some plants do not de-sludge at the required frequency.

The EPA suggested that current sludge management practices operating at WWTPs should be described in the Draft NWSMP, highlighting any additional measures/processes required to ensure compliance with the Urban Waste Water Treatment Directive and EPA Waste Water Discharge (Authorisation) Regulations. They proposed that the Draft NWSMP and associated SEA should take into account the potential increase in wastewater sludge production likely from ongoing and planned sludge handling improvements at several WWTPs. They suggested that a commitment to review/assess the current status of sludge handling facilities at WWTPs should also be included in the Draft NWSMP as appropriate sludge handling facilities are required at WWTPs to ensure performance of these plants is not adversely affected. The Agency noted that in particular there is a deficit of appropriate sludge handling facilities/infrastructure in the west of Ireland and that this needs to be addressed in the Draft NWSMP.
3 NEXT STAGES OF PROJECT DEVELOPMENT

3.1 WHAT HAPPENS NEXT

The feedback received from Consultation 1 will be reviewed by the project team, and issues raised will inform the development of the scope and detail of the SEA Environmental Report and Draft NWSMP, with relevant feedback being incorporated into the Strategic Environmental Assessment and Appropriate Assessment.

Statutory Consultation on the Draft NWSMP and associated Environmental Reports will be carried out in spring 2016. This will represent a further opportunity for the public and interested stakeholders to have their say.
APPENDIX A

ADVERTISING OF NWSMP CONSULTATION 1
The MSC Splendida towers over the Poolbeg chimneys as it enters Dublin Port. Below, crew members, Joanne O'Callahan, Tristan Zeebrock, Davide Pernovski and Iwona Perosic from Serbia get ready for more lessons. Bottom, Performer Paddy Line and Legs great tourist Alexandra Synytska from Ukraine on the quayside. Photos: Damien Eagles/Courier

Magic for retailers as Disney liner to sail into city with 2,700 on board

Sam Griffin

DUBLIN is in line for a major tourism windfall after the city was added as a stop-off destination for a massive transatlantic cruise liner operated by a Walt Disney company subsidiary.

"Mickey Mouse and a host of other characters will descend on the capital on May 28 next year when the Disney Magic liner, part of the Disney Cruise Line fleet of luxury ships, makes port here.

Dublin Port has also been added to a second Disney travel package, which will see the Disney magic liner stop in June.

The ship can accommodate 2,700 passengers and 990 staff and performers, who will be hired for around 12 hours.

Disney Cruise Line recommends a number of potential attractions for passengers to visit, including the Guinness Storehouse, Trinity College and the Book of Kells, and Christ Church.

Dublin Town, the business representative body, said passengers on such cruise ships typically spend an average more than €100 per person during stop-overs.

"It's very welcome to Dublin, which has been added as a destination. We do see a big boost when such cruise ships stop here. Shops will also often hire additional staff as well as hire additional staff as well," CEO Richard Guiney said.

The 'Magic' Einer is 944.4 (300m) long with 11 decks, and boasts numerous swimming pools, bars, restaurants and clubs. The May stopover is part of the 14-night Eastbound Transatlantic Cruise, which starts in Port Canaveral in Florida and ends in Dover in England.

A stay in a standard inside stateroom for two adults and two children is available from €5,696.52 and includes dining, entertainment and character experience.

The June visit is part of a 13-night Disney Magic cruise around Ireland and Britain.

Dublin Port is planning a major redeveloped area of the Alexandra Basin in the north port area.

Public consultation on the Strategic Environmental Assessment (SEA) Scoping Report for the Draft National Wastewater Sludge Management Plan

This starts today Tuesday 12th May for a period of six weeks, until Wednesday 24th June 2015.

Irish Water is preparing a long-term National Wastewater Sludge Management Plan (NWSPP) that will outline its 25-year strategy for managing the distribution and recycling of wastewater sludge to ensure high standards nationwide.

Public consultation, to inform the development of the Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA), the environmental reports that will accompany the Draft NWSPP, is now underway.

Irish Water is seeking feedback on the contents of the SEA Scoping Report, any additional information that should be considered for the SEA and any other comments or suggestions that should be considered from the public and interested bodies with respect to the development of the SEA.

Public consultation will be undertaken for six weeks from Tuesday 12th May to Wednesday 24th June 2015 during which time the SEA Scoping Report can be viewed at www.water.ie/wastewater-sludge-management

Further details on the scope of this consultation are included in the SEA Scoping Report which can be viewed at www.water.ie/wastewater-sludge-management

Comments and feedback should be sent to Irish Water by 5pm on Wednesday 24th June 2015:

By Email: nwspmp@water.ie

Or by Post: National Wastewater Sludge Management Plan, Irish Water, P.O. Box 860, South City Delivery Office, Cork

Submissions will be reviewed and relevant feedback incorporated into the environmental reports. Irish Water will refer to the environmental reports when preparing the Draft National Wastewater Sludge Management Plan.

There will be a further consultation opportunity at this stage.

—End—
APPENDIX B

MEDIA COVERAGE AND MEDIA LIST
MEDIA COVERAGE:

1. Irish Independent – 13.05.2015
2. Irish Independent – 13.05.2015
3. Waterford Today – 13.05.2015
**Irish Water** may use sludge to power incinerators

**Paul Melia**

Irish Water could use sludge produced by wastewater treatment plants as fuel to power incinerators and produce electricity.

The company said one potential source of disposal was transforming it into ‘cakes’ and using it as so-called ‘refuse derived fuel’.

But Head of Asset Management Jerry Grant said the most effective method of disposal was to spread it on land as fertiliser.

Irish Water operates 1,000 wastewater treatment plants, and produces 220,000 tonnes of sludge a year, of which 25,000 tonnes is dried into cakes.

Most of the remaining 195,000 tonnes is spread on land as a fertiliser after being treated to remove dangerous pathogens, or biological agents which can cause illness.

The sludge is also tested for metals and other toxins, and the land where it is to be spread is also assessed.

“**The best way to disposing of sludge is as a fertiliser in soil,”** said Mr Grant, but added: “**It’s important for us to have other options as well.**

“This is the first time we would have produced a national plan and in doing that, in consulting on it, it will open up to sensitivities around using sludge for food production.

“We are conscious that certain aspects of sensitivity around use in dairy or beef production. Bord Bia don’t want to see it used on production of milk. The food sector is taking a view on this, and we’re very conscious we have to have sustainable options.”

The company is producing a National Wastewater Sludge Management Plan for the next 25 years which is currently out for public consultation.

Submissions on the plan can be made at nwsamp@water.ie by June 24 next.
Irish Water may use sludge to power incinerators

Paul Melia Twitter

Published 13/05/2015 | 02:30

Irish Water could use sludge produced by wastewater treatment plants as fuel to power incinerators and produce electricity.

The company said one potential source of disposal was transforming it into ‘cakes’ and using it as so-called ‘refuse derived fuel’.

But Head of Asset Management Jerry Grant said the most effective method of disposal was to spread it on land as fertiliser.

Irish Water operates 1,000 wastewater treatment plants, and produces 220,000 tonnes of sludge a year, of which 25,000 tonnes is dried into cakes.

Most of the remaining 195,000 tonnes is spread on land as a fertiliser after being treated to remove dangerous pathogens, or biological agents which can cause illness.

The sludge is also tested for metals and other toxins, and the land where it is to be spread is also assessed.

“The best way to disposing of sludge is as a fertiliser in soil,” said Mr Grant, but added: “It’s important for us to have other options as well.”

“This is the first time we would have produced a national plan and in doing that, in consulting on it, it will open up to sensitivities around using sludge for food production.

“We are conscious that certain aspects of sensitivity around use in dairy or beef production. Bord Bia don’t want to see it used on production of milk. The food sector is taking a view on this, and we’re very conscious we have to have sustainable options.”

The company is producing a National Wastewater Sludge Management Plan for the next 25 years which is currently out for public consultation.

Submissions on the plan can be made at nwsmp@water.ie by June 24 next.

Irish Independent

Follow @Independent-ie

Promoted Articles
Irish Water prepares National Wastewater Sludge Management Plan (NWSMP)

Irish Water is preparing a long-term National Wastewater Sludge Management Plan (NWSMP) that will outline its 25-year strategy for managing the distribution and recycling of wastewater sludge to ensure high standards nationwide. Public consultation, to inform the development of the Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA), the environmental reports that will accompany the NWSMP, is now underway.

Public Consultation

Public consultation will be undertaken for six weeks from Tuesday 12th May to Wednesday 24th June 2015 during which time the SEA Scoping Report can be viewed at http://www.water.ie/wastewater-sludge-management and comments and feedback sent to Irish Water by 5pm on Wednesday 24th June 2015, as follows:-

Email: nwsmp@water.ie
Post: National Wastewater Sludge Management Plan, Irish Water, P.O. Box 860, South City Delivery Office, Cork.

Irish Water is seeking any additional information, not currently contained in the Scoping Report, that should be considered for the SEA, and any other comments or suggestions that should be considered from the public and interested bodies. Further details on the scope of this consultation are included in the SEA Scoping Report which can be viewed at http://www.water.ie/wastewater-sludge-management.

Commenting on the NWSMP, Mr. Jerry Grant, Head of Asset Management with Irish Water said, "We are currently working on this draft strategy with a view to publishing a full 25 year strategy by autumn 2015. The plan will take into account current legislation and best practice in relation to the treatment and utilisation of wastewater sludge, leading to efficiencies in the process, which will be to the benefit of our customers."

Traditionally, the majority of Ireland’s wastewater sludge is re-used as a fertiliser and soil conditioner, and also used to generate renewable energy. A very small percentage of Ireland’s sludge currently goes to landfill. Irish Water aims to retain and develop these traditional outlets with full regard for food safety and the environment, through quality management and communication at all stages of the process.

Up to recently, it was the responsibility of local authorities to deal with wastewater sludge management. This is the first time that wastewater sludge will be dealt with at national level and Irish Water is seeking feedback from statutory bodies and the public on shaping the future of wastewater sludge management.

The NWSMP will assess the following issues in relation to sludge management:

- Current and predicted future sludge quantities;
- Statutory requirements and best practice for the utilisation of sludge;
- Potential for sludge reduction and increased energy recovery;
- Options and alternatives for sludge management;
- Availability of sludge outlets and risks to current outlets.

All submissions made on the SEA Scoping Report will be reviewed and relevant feedback incorporated into the environmental reports. Irish Water will refer to the environmental reports when preparing the Draft National Wastewater Sludge Management Plan. Submissions from individuals will be reported anonymously; feedback from organisations will be attributed to them and stakeholders will be advised of this in correspondence inviting them to participate in the consultations.

Later this year, when the Draft NWSMP is prepared it will go on display for a 6-week statutory public consultation, before being reviewed and finalised in the winter.
perhaps an indication that a general election is in the offing when even though it is the summer and the Dail is in recess much of the media and the Irish political class is still behaving as if the Dail is still up and running and working as if it’s business as usual. It is unusual, to say the least, that there have already been a large number of polls questioning the Irish public over what their forthcoming polling preferences will be if a general election is to be c...
Cheap fertilizer – does municipal sludge count?

T here are few subjects that grab mine and other farmers’ attention as quickly as fertiliser prices. Prices have stayed up despite the halving of energy prices and the fall in general commodity prices. I look forward to the forthcoming IFA conference on this area necessary for, I wonder if we should not stand back and reassess. It is quite clear – that its use is forbidden under the various quality assurance schemes. So for cattle farmers producing beef and participating in the Bord Bia quality assurance scheme, as practically every beef producer is, its use is forbidden.

Likewise, all the milk purchasers as far as I know have an absolute ban on their suppliers using sewage sludge on their farms. The same applies to those producing malting barley for dominant Diageo supplier Boortmalt. Even in my own farming case, where I am growing gluten-free oats for Glanbia’s US customers, I am forbidden to use it.

Recently, on a trip to Brussels for the Forum for the Future of Agriculture Conference, I was talking to a Dutch agricultural scientist. He assured me that in the Netherlands there was a legislative ban on using sewage sludge on land used for agricultural production. To be honest, I did not fully believe him and checked with the Dutch government and got a comprehensive written reply confirming that my informant was correct. Sewage sludge cannot be used on land in The Netherlands – end of story. The reasoning is straightforward. While heavy metals and other contaminants can be extracted by plants such as willows, there are potential features to sewage sludge that make it unsuitable for use on land producing food. The Dutch insist on sewage sludge being dried and incinerated.

We have not been as stringent as that here but given the similarities in the range of export markets we cater for, I wonder if we should not stand back and reassess. I was glad to see Moy Park, the amazingly successful Northern Ireland poultry producer, making the manoeuvre from contract growers available on a wider basis than up to now.

This year most of the inputs for maize are down in price, but the banning of Atrazine a few years ago really complicated the weed control programme with a need for a pre-emerge at sowing under plastic and then a band spraying between the rows before the plants broke through the plastic. This year we are trying a new herbicide at sowing that is meant to do everything, so we will see how it goes.

Farming where I do, outside the direct Dublin metropolitan area but close enough to be affected by infrastructural developments servicing the capital, I again have a public body carrying out work. Last year, it was the County Council putting in a new water main.

This year, we have the ESB on site. I have two lines of pylons going across the place and there always seems to be something needed. This year it’s a major line that needs strengthening, with some pylons actually needing replacing. I am always conscious of the enormous legal powers the ESB has, so it’s a question of hammering out a modus vivendi that makes life tolerable for everybody.

I am glad to see that the company has invested in metal trackways, similar to the ones used at the Ploughing, so the vehicles are kept to these as they cross the fields. But inevitably there is some damage to crops and land.

Koch Advanced Nitrogen®, fertiliser

THE MOST EFFICIENT NITROGEN FERTILISER

- Contains 70% more Nitrogen than CAN
- Removes the concerns of volatilisation losses
- Yield performance comparable to CAN
- Reduces the cost of your Nitrogen inputs
- Saves on transport and spreading time
Sewage sludge needs clarity

There has been a continuing ambivalence about the use of sewage sludge as a fertiliser in Irish agriculture. It is forbidden under all the quality assurance schemes, including the Bord Bia scheme and the grain quality assurance scheme. In some schemes, you must give a written guarantee that sludge has not been used on your farm within the last five years. But there is a view that the oversight of how sludge is used is less than complete.

Responsibility for this whole area now rests with Irish Water and, while the organisation has come in for substantial criticism in the way it was set up, there is no doubt that a competent national water and waste body is badly needed.

Last week I went through Irish Water’s thoughts on the treatment of sewage sludge with them.

As we mentioned before, the Netherlands bans the use of sewage sludge in agriculture completely, as does Switzerland. Other countries such as Germany, Belgium and Austria have regional bans, while a ban on its use on grassland is widespread. But Denmark, the UK and France use it routinely as a fertiliser on crops.

It is to be used on land, the ideal is that it is as a fertiliser on energy crops. In other words, it is removed from the food chain.

In Ireland, Irish Water’s policy is to maintain land spreading as an option but obviously to have a quality assured pathogen-free product with strict monitoring and reporting mechanisms in a unified national online reporting system (which is being developed).

As in most areas of life, there are pros and cons on both sides of the argument. Irish Water points out that only about 15,000 hectares (45,000 acres) are needed to be available for land spreading – less than one-quarter of 1% of the 4.5m hectares (11m acres) of agricultural land in the country. Irish Water has detailed soil and parent material maps of the country which pinpoint the southeast as being most suitable for sludge spreading on land.

One of its clear policies on cost and fertiliser recovery grounds is to maintain the land spreading outlet and it is in discussions with Bord Bia on whether an absolute ban on quality assured farms is justified.

Irish Water points out that Ireland imports 70% of its feed grain and there are no controls in place as to whether this grain is produced with the aid of sludge or not.

Ultimately, it is a choice for Government. The Environmental Protection Agency and Food Safety Authority have broadly kept out of the discussions, at least publicly. But what do farmers want? There is no doubt there is a capacity to influence legislation towards the Dutch and Swiss models of a total ban, or to have a strict monitoring and quality control policy, as in France and Britain.

What has not been decided is where the clear national interest lies instead of just muddling through. At least Irish Water has laid out its objectives and policies. We are due the same clarity from other stakeholders.

If it is to be used on land, the ideal is that it is as a fertiliser on energy crops.
<table>
<thead>
<tr>
<th>Trade Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer Choice</td>
</tr>
<tr>
<td>Council Review</td>
</tr>
<tr>
<td>Decision Ireland</td>
</tr>
<tr>
<td>Department of the Environment</td>
</tr>
<tr>
<td>Energy &amp; Environment Management</td>
</tr>
<tr>
<td>Engineers' Journal</td>
</tr>
<tr>
<td>Enterprise</td>
</tr>
<tr>
<td>Enviro Solutions</td>
</tr>
<tr>
<td>Eolas (Science &amp; Technology magazine)</td>
</tr>
<tr>
<td>Farm Week</td>
</tr>
<tr>
<td>Farming Life</td>
</tr>
<tr>
<td>Irish Farmers' Monthly</td>
</tr>
<tr>
<td>Irish Farmers' Journal</td>
</tr>
<tr>
<td>Irish Farmers' Journal</td>
</tr>
<tr>
<td>Irish Franchise Magazine</td>
</tr>
<tr>
<td>Lifestyle Green</td>
</tr>
<tr>
<td>Environmental Management Ireland</td>
</tr>
<tr>
<td>Organic Matters</td>
</tr>
<tr>
<td>Peatland News</td>
</tr>
<tr>
<td>Public Affairs Ireland</td>
</tr>
<tr>
<td>Public Sector Times</td>
</tr>
<tr>
<td>Public Sector Times</td>
</tr>
<tr>
<td>Project Management</td>
</tr>
<tr>
<td>The Irish Field</td>
</tr>
<tr>
<td>Today's Farm</td>
</tr>
<tr>
<td>TRResearch (Science magazine)</td>
</tr>
<tr>
<td>Science Spin</td>
</tr>
<tr>
<td>Science Spin</td>
</tr>
<tr>
<td>Sustainable Ireland</td>
</tr>
<tr>
<td>WWT Magazine (UK wastewater magazine)</td>
</tr>
<tr>
<td>Marine Times</td>
</tr>
<tr>
<td>Irish Food</td>
</tr>
</tbody>
</table>
12 May 2015

Non-statutory public consultation on strategic environmental assessment (SEA) Scoping for the National Wastewater Sludge Management Plan (NWSMP) from 12 May to 24 June 2015

Dear,

Irish Water, as the competent authority for the management of sludge from wastewater treatment plants under its remit, is undertaking Environmental Assessment (EA) scoping of the National Wastewater Sludge Management Plan (referred to as the NWSMP) and invites you to participate in non-statutory consultation now underway.

The NWSMP will set out Irish Water’s high level strategies for wastewater sludge management over a 25 year period. A separate plan will be developed for sludge from water treatment plants.

In accordance with the European Communities Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment, as incorporated into Irish law through S.I. No. 435/2004 and 436/2004 (as amended), consideration has been given to potential environmental effects associated with implementation of the plan. Irish Water has undertaken screening for SEA and concluded that the SEA process would provide an appropriate mechanism to ensure environmental considerations are incorporated into the plan. RPS has been appointed by Irish Water to carry out the SEA and also an Appropriate Assessment (AA) on the NWSMP.

In accordance with Article 11 of S.I. No. 435, the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004 and 2011:

1. RPS on behalf of the competent authority (in this case Irish Water) will prepare an Environmental Report on the likely significant environmental effects of implementing the NWSMP; and
2. The Environmental Report will include information that may reasonably be required, taking into account:

   - Current knowledge and methods of assessment;
   - The contents and level of detail in the NWSMP;
   - The stage of the NWSMP in the decision making process; and
• The extent to which certain matters are more appropriately assessed at different levels in the decision making process in order to avoid duplication of environmental assessment.

We are seeking to establish the range of environmental issues and the level of detail to be included in the Environmental Report. You can view the SEA Scoping Report at www.water.ie/wastewater-sludge-management and we have included the Terms of Reference as detailed below to guide you in making any submission.

Submissions or observations in relation to the scope and level of detail of the information to be included in the environmental report may be made on or before **5pm on Wednesday 24 June 2015** as follows:-

**Email:** nwsmp@water.ie

**Post to:** National Wastewater Sludge Management Plan,

Irish Water,
P.O. Box 860,
South City Delivery Office,
Cork

Submissions will be reviewed and relevant feedback incorporated into the environmental reports. Irish Water will refer to the environmental reports when preparing the Draft NWSMP.

Consultation Reports will be prepared on the feedback received as part of each of the focused consultation periods and will be published on the website at www.water.ie/wastewater-sludge-management. Submissions from individuals will be reported anonymously, while feedback from organisations will be attributed to them.

Yours sincerely,

[Signature]

Fiona Lane

Wastewater and Sludge Strategy Specialist

**TERMS OF REFERENCE FOR NON-STATUTORY CONSULTATION ON SEA SCOPING REPORT**

Irish Water is undertaking a Strategic Environmental Assessment (SEA) to inform the development of a National Wastewater Sludge Management Plan.

The purpose is to ensure that the environmental consequences of plans and programmes are assessed both during their preparation and prior to adoption. The SEA process also gives interested parties an opportunity to comment on the environmental impacts of the proposed plan or programme and to be kept informed during the decision making process.
An SEA Scoping Report has been prepared and is available at [www.water.ie/wastewater-sludge-management](http://www.water.ie/wastewater-sludge-management). The SEA Scoping Report looks to establish the range of issues and level of detail of information to be included in the SEA and considers the following:

- Human beings and population
- Soils
- Water
- Noise
- Air
- Odour
- Climate
- Transport
- Energy.

- Based on the plans, policies and programmes outlined Chapter 4 of the SEA Scoping Report, are there any other key relevant international, national or regional plans, policies or programmes that should be considered in the SEA Environmental Report?
- Are there any other significant information sources that should be considered?
- Do you agree with the list of potential significant effects that have been identified in Chapter 5 of the SEA Scoping Report? Should any be added or removed?
- Are there any other existing environmental issues which should be considered?
- Do you have any comments regarding the draft SEA Objectives outlined in Chapter 7 of the SEA Scoping Report?
- Do you have any suggestions in relation to the overall approach to alternatives?
- How would you like to be contacted as the project progresses?

Submissions will not be individually responded to, but will feed into the Consultation Reports, which will be published on the Irish Water website.

Submissions will be reviewed and relevant feedback incorporated into the environmental reports. Irish Water will refer to the environmental reports when preparing the Draft National Wastewater Sludge Management Plan.

Submissions from individuals will be reported anonymously, while feedback from organisations will be attributed to them.
Irish Water prepares National Wastewater Sludge Management Plan (NWSMP)

Tuesday May 12th, 2015 - Irish Water is preparing a long-term National Wastewater Sludge Management Plan (NWSMP) that will outline its 25-year strategy for managing the distribution and recycling of wastewater sludge to ensure high standards nationwide. Public consultation, to inform the development of the Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA), the environmental reports that will accompany the NWSMP, is now underway.

Public Consultation

Public consultation will be undertaken for six weeks from Tuesday 12th May to Wednesday 24th June 2015 during which time the SEA Scoping Report can be viewed at www.water.ie/wastewater-sludge-management and comments and feedback sent to Irish Water by 5pm on Wednesday 24th June 2015, as follows:-

Email: nwsm@water.ie
Post: National Wastewater Sludge Management Plan, Irish Water, P.O. Box 860, South City Delivery Office, Cork.

Irish Water is seeking any additional information, not currently contained in the Scoping Report, that should be considered for the SEA, and any other comments or suggestions that should be considered from the public and interested bodies. Further details on the scope of this consultation are included in the SEA Scoping Report which can be viewed at www.water.ie/wastewater-sludge-management.

Commenting on the NWSMP, Mr. Jerry Grant, Head of Asset Management with Irish Water said, “We are currently working on this draft strategy with a view to publishing a full 25 year strategy by autumn 2015. The plan will take into account current legislation and best practice in relation to the treatment and utilisation of wastewater sludge, leading to efficiencies in the process, which will be to the benefit of our customers.”

Traditionally, the majority of Ireland’s wastewater sludge is re-used as a fertiliser and soil conditioner, and also used to generate renewable energy. A very small percentage of Ireland’s sludge currently goes to landfill. Irish Water aims to retain and develop these traditional outlets with full regard for food safety and the environment, through quality management and communication at all stages of the process.

Up to recently, it was the responsibility of local authorities to deal with wastewater sludge management. This is the first time that wastewater sludge will be dealt with at national level and Irish Water is seeking feedback from statutory bodies and the public on shaping the future of wastewater sludge management.

The NWSMP will assess the following issues in relation to sludge management:

- Current and predicted future sludge quantities;
- Statutory requirements and best practice for the utilisation of sludge;
- Potential for sludge reduction and increased energy recovery;
- Options and alternatives for sludge management;
- Availability of sludge outlets and risks to current outlets.

All submissions made on the SEA Scoping Report will be reviewed and relevant feedback incorporated into the environmental reports. Irish Water will refer to the environmental reports when preparing the Draft National Wastewater Sludge Management Plan. Submissions from individuals will be reported anonymously; feedback from organisations will be attributed to them and stakeholders will be advised of this in correspondence inviting them to participate in the consultations.

Later this year, when the Draft NWSMP is prepared it will go on display for a 6-week statutory public consultation, before being reviewed and finalised in the winter.

ENDS
Appendix 2

Glossary and Abbreviations
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>Appropriate Assessment</td>
</tr>
<tr>
<td>Alkaline Stabilisation</td>
<td>Also known as lime stabilisation. The treatment of sludge by the addition of an alkaline product, usually lime, to raise the pH of the sludge to ensure predetermined quality targets are met.</td>
</tr>
<tr>
<td>Anaerobic digestion</td>
<td>Biological sludge treatment process during which microorganisms break down biodegradable material in the absence of oxygen producing a stable sludge product and biogas, which is combusted to generate heat and electricity. (See also MAD and TAD)</td>
</tr>
<tr>
<td>Ash</td>
<td>The inert residues from sludge processing</td>
</tr>
<tr>
<td>Biosolids</td>
<td>Wastewater sludge which has been treated to an approved standard using treatment processes such as composting, advanced digestion, thermal drying or lime stabilisation and is suitable for use in agriculture</td>
</tr>
<tr>
<td>Composting</td>
<td>The mixing of Nitrogen rich (sludge) and Carbon rich (wood chippings, straw, etc.) to ensure that predetermined quality targets are met.</td>
</tr>
<tr>
<td>DAFM</td>
<td>Department of Agriculture Food and the Marine</td>
</tr>
<tr>
<td>Dewatering</td>
<td>Means the conversion of liquid sludge to sludge cake. Cake is normally defined as being thick enough to be lifted using a shovel. Dry solids content typically ranges from 15% to 25% dry solids</td>
</tr>
<tr>
<td>DBO</td>
<td>Design Build Operate. This is a type of contract where a private contractor is appointed to design and construct a wastewater treatment plant and then operate the plant for a fixed period of time up to twenty years.</td>
</tr>
<tr>
<td>DoECLG</td>
<td>Department of Environment, Community and Local Government (formerly DEHLG - Department of Environment Heritage and Local Government)</td>
</tr>
<tr>
<td>DS</td>
<td>Dry Solids Content. The weight of dry solids per unit weight of sludge expressed as a %.</td>
</tr>
<tr>
<td>DWWTS</td>
<td>Domestic Wastewater Treatment System</td>
</tr>
<tr>
<td>EC / EU</td>
<td>European Community / European Union</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
</tr>
<tr>
<td>EWC</td>
<td>European Waste Catalogue</td>
</tr>
<tr>
<td>Final effluent</td>
<td>Liquid discharge from a wastewater treatment plant to a receiving water, e.g. river or the sea, following treatment at a WWTP.</td>
</tr>
<tr>
<td>Gasification</td>
<td>Gasification is the breakdown of hydrocarbons into a syngas by carefully controlling the amount of oxygen present.</td>
</tr>
<tr>
<td>ha</td>
<td>Hectare</td>
</tr>
<tr>
<td>HACCP</td>
<td>Hazard Analysis Critical Control Point – HACCP methodology which is widely used in food safety management involves the identification and close monitoring of Critical Control Points throughout the treatment process to ensure the required quality standard is met.</td>
</tr>
<tr>
<td>Heavy metal</td>
<td>A term used to describe metals with a high atomic mass, some of which can be harmful to ecological and human health.</td>
</tr>
<tr>
<td>IW</td>
<td>Irish Water</td>
</tr>
<tr>
<td>LA</td>
<td>Local Authority</td>
</tr>
<tr>
<td>Lime stabilisation</td>
<td>Also known as alkaline stabilisation</td>
</tr>
<tr>
<td>MAD</td>
<td>Mesophillic anaerobic digestion; MAD is digestion undertaken at the temperature range 35°C ±3°C. This is the most commonly used type digestion in Ireland for wastewater sludge.</td>
</tr>
<tr>
<td>NWSM</td>
<td>National Wastewater Sludge Management Plan</td>
</tr>
<tr>
<td>p.e.</td>
<td>Population Equivalent; 1 p.e. is the organic load from a wastewater treatment plant.</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>PTE</td>
<td>Potentially Toxic Element</td>
</tr>
<tr>
<td>Pyrolysis</td>
<td>The thermal degradation of waste in the absence of air. Sludge is heated to a high temperature in an oxygen-free atmosphere to produce fuel and a char product. May be used as a pre-treatment step to gasification.</td>
</tr>
<tr>
<td>SEA</td>
<td>Strategic Environmental Assessment</td>
</tr>
<tr>
<td>Sewage sludge</td>
<td>Also known as wastewater sludge. The term ‘sewage sludge’ is normally used in legislation.</td>
</tr>
<tr>
<td>S.I.</td>
<td>Statutory Instrument</td>
</tr>
<tr>
<td>Sludge Cake</td>
<td>Sludge which has been dewatered to the extent that it can be handled as a solid; dry solids content typically ranges from 15% to 25% dry solids</td>
</tr>
<tr>
<td>Sludge management</td>
<td>Sludge management refers to all activities from production of wastewater sludge at a treatment plant and sludge treatment through to storage, reuse and disposal of same</td>
</tr>
<tr>
<td>Sludge satellite centre</td>
<td>Sludge satellite centres act as ‘intermediate centres’ at which liquid sludge is dewatered, i.e. water is eliminated from sludge using mechanical dewatering to reduce sludge volume to reduce the number of traffic movements and cost of sludge transportation. Sludge satellite centres are typically located at medium to large wastewater treatment plants.</td>
</tr>
<tr>
<td>Sludge Hub Centre (SHC)</td>
<td>A SHC is a centralised regional sludge treatment facility which provides for treatment of wastewater sludge to produce biosolids. Sludge Hub Centres accept imported sludge from the surrounding region for treatment. Sludge Hub Centres are typically located at large wastewater treatment plants.</td>
</tr>
<tr>
<td>Sludge treatment centre (STC)</td>
<td>A STC is a sludge treatment facility, located at a WWTP, which provides for treatment of wastewater sludge to produce biosolids with no importation of sludge from other WWTP’s.</td>
</tr>
<tr>
<td>tDS</td>
<td>Tonnes Dry Solid. This is the preferred unit of measurement for sludge and excludes the weight of water in the sludge.</td>
</tr>
<tr>
<td>TAD</td>
<td>Thermophillic anaerobic digestion; TAD is digestion undertaken at the temperature range 50 - 55°C.</td>
</tr>
<tr>
<td>Wastewater</td>
<td>Domestic and industrial effluents collected by the sewerage system. Also known as sewage.</td>
</tr>
<tr>
<td>Wastewater sludge</td>
<td>Organic by-product of the biological treatment of wastewater comprising a mixture of organic solids and water. Also known as sewage sludge</td>
</tr>
<tr>
<td>WSSP</td>
<td>Water Services Strategic Plan</td>
</tr>
<tr>
<td>WWTP</td>
<td>Wastewater treatment plant</td>
</tr>
</tbody>
</table>