



# National Sewer Baiting Protocol Best Practice & Guidance Document

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# 1 Background Information

In November 2000 Water UK and the Local Government Association issued a joint National Protocol for Co-operation on Rodent Control in sewers. The objective of the protocol was to facilitate improved co-operation between Water UK members and local authorities on the control of rats in sewers and surface infestations in a complimentary manner following the privatisation and the subsequent establishment of Water Companies.

During the intervening 12 years from the initial launch of the protocol in 2000 it was noted that implementation appeared to be patchy and in some areas it was alleged to have been ignored, feedback was received from numerous local authority pest liaison groups throughout the country to the National Pest Advisory Panel of the Chartered Institute of Environmental Health (NPAP). This feedback strongly advocated the need for refinements to the protocol and for the introduction of an operational guidance on sewer baiting treatments which included training and qualifications of pest control technicians; health & safety aspects; treatment methodology; all necessary for a safe and efficient treatment programme.

The revised protocol and guidance document addresses the identified deficiencies and ensures the continuity of treatments nationally, irrespective of whether treatments are undertaken in-house by Water UK members, by pest control contractors working on behalf of a Water Company or by the local authority themselves.

On the 1st October 2011, responsibility for the majority of 'private sewers' and lateral drains, (drains beyond the curtilage of a building), were transferred to (vested in) the Water and Sewerage Companies (WaSC.s).

This transfer places responsibility on the WaSC.s for the maintenance e.g. blockages, disrepair of the systems and the control of rat activity, of a greater length of the sewerage infrastructure than previously, and which had been confined to the public sewer network.

## 1.1 Reasons to control rats in sewers

Sewers and drainage systems generally are the ideal man-made habitats for rats. They offer a predator free environment, with temperature stability being warm in winter and cooler in the summer period and a fair abundance of food. All factors which contribute to a successful breeding regime without seasonal fluctuation and with the absence of predators.

Heavily infested sewers can act as a reservoir for rats particularly in urban areas and through defects in the fabric of the sewer, will support sub-surface and surface infestations. The WHO publication "Public Health Significance of Urban Pests" published in 2008 describes commensal or synanthropic rodents as presenting a risk to public health being associated with a number of zoonoses, including Leptospirosis, toxoplasmosis, salmonellosis, cryptosporidiosis and viruses and will physically transmit pathogens found in sewage to the surface harbourages which may also include domestic premises. In addition the rat's strong instinct to burrow and gnaw damages the sewer/ drainage infrastructure, particularly where defects already exist.

# 2

## Revised Protocol

The feedback received nationally from local authority pest liaison groups has been co-ordinated and incorporated into a revised protocol. The updated protocol is as follows:

### Revised National Protocol

1. Where a Water UK member commences a new sewer-baiting activity it should inform the relevant local authority in advance of the proposed sewer baiting schedule and of the outcome of the treatment programme.
2. Where a local authority commences a new surface baiting for significant rat activity it should inform the relevant Water UK member.
3. Where possible sewer baiting and surface baiting to combat rat infestation should be undertaken in a complementary manner by agreement between the Water UK member and the local authority and targeted to areas where rat activity is present and the treatment most cost effective. Water UK members should provide access by local authorities or contractors working on behalf of Water UK members, to their sewer mapping software to enable essential data relating to unique manhole reference numbers, direction of flow, to be obtained to facilitate effective treatments & the accurate recording of outcomes. Neighbouring local authorities need to communicate where sewers pass through boundaries.
4. Where a new contractor is engaged to carry out sewer baiting on behalf of the Water UK member it is imperative that the contractor liaises with the relevant local authorities to establish the locations of sites with persistent surface rat activity and to programme sewer baiting treatments accordingly.
5. Where LA.s are experiencing higher than normal surface infestations, with no obvious surface source they should notify the WaSC and agree test baiting or treatment of the sewers.
6. Seized manhole covers should be actioned with minimum of delay within a seven- day period and once released the local authority or contractor should be informed immediately to enable the manhole to be baited as part of the ongoing treatment programme.
7. Contractors engaged in sewer baiting on behalf of Water UK to provide sufficient resources to enable the treatment programmes previously notified to the local authority to complete within the agreed timeframe.
8. Water UK members and local authorities should share information regarding the success of baiting strategies, the baits and quantities used.
9. Local liaison groups should be established between Water UK members and local authorities to facilitate successful rodent control in sewers. Relevant contact details should be provided to facilitate liaison group meetings which should meet at least four times per year.
10. Within the bounds of commercial confidentiality, Water UK members and local authorities should share information on the costs of rodent control.
11. Water UK members and local authorities should jointly review on a regular basis their operation of this protocol with a view to improvement.
12. All sewer baiting programmes should be undertaken in accordance with the current National Sewer Baiting Best Practice guidance published by the Chartered Institute of Environmental Health.



# 3 Best Practice Guidance Document

## 3.1 Introduction

Sewers provide ideal conditions for rats, they have an even temperature being warm in winter and cool in summer, they (can) provide harbourage and an abundant supply of food, water with the absence of any predators

In the past, local authorities utilised proactive baiting to control the rat population living in sewers. Since privatisation, the water and sewerage companies have largely taken sewer baiting back under their control with an increasing tendency for only reactive baiting to be carried out.. The CIEH believes that pro-active (and targeted) sewer baiting is still a cost-effective and necessary method for the control of rats in sewers in many situations

The control of rats in sewers is a vitally important part of any integrated rodent control programme - sewer baiting should complement the control strategy for surface infestations and vice versa. Rats will move readily from one environment to another in search of food and a co-ordinated approach to control is therefore essential.

Many years' experience indicates that successful rat control in sewers can reduce the number of infestations on the surface. A comprehensive sewer baiting strategy is therefore essential if effective control of the rat population in the sewer network and reduce surface rat activity is to be achieved.

Minimisation of re invasion routes by ensuring proper repair and maintenance of the network infrastructure will assist in maintaining low population levels following a comprehensive sewer baiting programme. This is particularly relevant for the assets transferred in 2011 as information on the condition of these is likely to be limited, but there will inevitably be some disrepair and also are unlikely to have been subject to any rodent control (baiting activity). The WaSC.s in the lead up to the transfer may have liaised with the local authorities to identify any problem lengths of infrastructure. However if that has not been the case there should be liaison to ensure that the WaSC is aware of any problematic laterals and what were private sewers.

The role of local authorities is crucial to the development of effective sewer baiting, even though this may be carried out by the sewerage undertaker, or their contractor.

## 3.2 Qualifications & Training of Technicians

The pest control organisation engaged in carrying out sewer baiting operations should be able to provide evidence demonstrating that they can provide a service to the level required for baiting sewer and drainage systems.

- The pest control organisation should have staff qualified to the required level
- The pest control organisation should carry adequate insurance cover, such as Employers Liability Insurance, and Public and Products Liability Insurance
- The pest control company should be a member of a recognised Trade Association or body

### Training and Qualifications

In the UK, there is no statutory certification scheme governing the application of pesticides for public health use. However, it is a requirement under the Control of Pesticides Regulations 1986 and 1987 (as amended) (COPR) that:

1. *All employers must ensure that persons in their employment who may be required during the course of their employment to use pesticides are provided with such instruction, training and guidance as is necessary to enable those persons to comply with any requirements provided in and under these Regulations; and*
2. *No person in the course of his/her business or employment shall use a pesticide, or give an instruction to others on the use of a pesticide, unless that person (a) has received adequate instruction, training and guidance in the safe, efficient and humane use of pesticides; and (b) is competent for the duties for which that person is called upon to perform.*

All staff involved in the application of pesticides that are not under direct supervision, must therefore be adequately trained. The recognised industry entry-level qualification includes the BPCA/RSPH Level 2 Certificate in Pest Control, the RSPH Level 2 Award in Pest Management, the BPC Diploma Part 1, and the RSH Certificate in Pest Control and the NVQ in Pest Control.

In addition to the basic BPCA/RSPH Level 2 Award in Pest Control qualification, additional training and qualifications must be obtained. Sewer baiting is a highly specialised operation therefore technicians must have received basic health and safety training and additional training and qualifications in the areas indicated in bold (red headings).



- New Roads & Street Works Act 1991 Chapter 8 - Safety at Street Works & Road Works Code of Practice for working on highways, including awareness of traffic flow, erection of signage and barriers, together with vehicle specification and markings
- Health & Safety at Work Act 1974 - Risk Assessments, Safe Working Practices
- Management of Health and Safety at Work Regulations 1999 – with respects to manual handling and the lifting of manhole covers etc.
- Personal Protective Equipment Regulations 1992 (as amended) – provision of safety footwear, coveralls, gloves, visor/goggles, hi-visibility jacket, toxic gas analysers etc.
- Confined Spaces Regulations 1997 – An awareness of the hazards associated with working near confined spaces
- Control of Substances Hazardous to Health Regulations 2002 (as amended) – Awareness of hazard & risks, systemic and dynamic risk assessments
- Control of Pesticides Regulations 1986 (as amended) – in relation to the safe use of pesticides etc.

### 3.3 Legislation

A summary of the principal legislation applying to sewer baiting operations both on highways or in domestic/commercial situations is detailed below :-

#### 3.3.1 New Roads & Street Works Act 1991

It is a legal requirement to comply with the Road Traffic Act 1988 and the New Roads & Street Works Act 1991 Chapter 8; these Acts impose a requirement for the sewer baiting contractor to conduct themselves safely on the highway at all times.

The Code of Practice “Safety at Street Works and Road Works” (known as the “red book”) gives detailed information and requirements regarding the use of warning cones, “men at work” signage, direction arrows, barriers etc that must be deployed during sewer baiting operations. All technicians engaged in highway sewer baiting operations must have received specific training and obtained certification before engaging in such work.

#### 3.3.2 Health & Safety Act 1974

This Act is the principal piece of legislation for securing the health, safety and welfare of persons at work and for protecting others against risks to health or safety in connection with the activities of persons at work. It places a duty on employers to ensure; so far as is reasonably practicable, the health, safety and welfare at work of all his/her employees. Numerous regulations and codes of practice have subsequently been made under this legislation relating to both specific general work activities. Detailed guidance is available from the HSE website at [www.hse.gov.uk](http://www.hse.gov.uk)

#### 3.3.3 Management of Health and Safety at Work Regulations 1999

These regulations generally make it more explicit what employers are required to do to manage health and safety under the Health and Safety at Work Act and apply to every work activity.

The main requirement on employers is to carry out a risk assessment. Employers with five or more employees need to record the significant findings of the risk assessment. Detailed guidance can found in the HSE publication “Management of Health and Safety at Work Regulations 1999 Code of Practice & Guidance” and leaflet “Five Steps to Risk Assessment”

#### 3.3.4 Manual Handling Operations Regulations 1992 (as amended)

These regulations place a duty on the employer to avoid Manual Handling as far as reasonably practicable if there is a possibility of injury. If this cannot be done then they must reduce the risk of injury as far as reasonably practicable.

Sewer baiting by necessity require the lifting of manhole covers prior to baiting, this task requires an assessment being carried out to minimise the risk of musculoskeletal injuries, and may indicate for example the use of mechanical manhole lifting systems. Training in safe lifting techniques (kinetic) is therefore required. Detailed guidance is available in the HSE publication “Manual Handling Assessment Charts” INDG 383

### 3.3.5 Personal Protective Equipment Regulations 1992

Employers have basic duties concerning the provision and use of personal protective equipment (PPE) at work.

*PPE is defined in the Regulations as 'all equipment (including clothing affording protection against the weather) which is intended to be worn or held by a person at work and which protects them against one or more risks to their health or safety', e.g. safety helmets, gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses.*

*The Regulations require that all PPE is properly assessed before use to ensure suitability, is maintained and stored properly, is provided with instructions on its safe use and is used correctly by employees.*

*All PPE used in sewer baiting operation, must comply with the requirements of these regulations. Detailed guidance is available in the HSE publication "A Short Guide to the Personal Protective Equipment Regulations 1992" Leaflet INDG174 (rev1)*

### 3.3.6 The Workplace (Health, Safety and Welfare) Regulations 1992

These Regulations cover a wide range of basic health, safety and welfare issues of employees and cover issues such as the storage of PPE, issue of first aid kits, vaccinations, washing facilities on board the vehicle etc.

Detailed guidance is available in the HSE publication "Workplace Health, Safety and Welfare, a guide for managers. Leaflet INDG244

### 3.3.7 Control of Substances Hazardous to Health Regulations 2002 (as amended)

These Regulations require that all substances which may cause ill health to employees are risk assessed and that appropriate control measures are employed to minimise the risks.

This is a major piece of legislation where the substance, the task and exposure of employees and "non targets" to the substance during the work activity is controlled by how the substance is presented, how the work activity is managed, and the control equipment used. An essential requirement under this legislation is that employees receive the necessary training.



Detailed guidance is available for the HSE website and in the publication "Five Steps to risk assessment" Leaflet INDG163.

"Working with Sewage and Working with Sewage – The Health Hazards publications are also available from HSE.

### 3.3.8 Confined Spaces Regulations 1997

This legislation requires that a "suitable & sufficient" risk assessment is carried out for the purposes of deciding what measures are necessary for safety. All hazards associated with the task, the working environment, suitability of individuals to carry out the task, the tools and materials, together with arrangement for emergency rescue, should be risk assessed and documented and appropriate measures taken to minimise the risks. (Guidance on working in confined spaces is published by HSE in the leaflet INDG258).

No person is permitted to enter a manhole unless they have been fully trained in working in confined spaces specific to sewer entry and are suitably equipped to do so. This specialist training is usually a 2 or 3-day course, which covers areas such as safe entry; detection of gases; use of gas detectors; the use of man entry hoist, self rescuers and tripods, etc. The need for entry in to sewers is –not permitted as most baiting can be carried out from the surface.

### 3.3.9 Control of Pesticides Regulations 1986 (as amended)

These regulations control the sale, storage & use of pesticides in the UK and in particular require that:

*"Any person who uses a pesticide shall take all reasonable precautions to protect the health of human beings, creatures and plants, to safeguard the environment and in particular to avoid pollution of water."*

*"No person shall use a pesticide in the course of business unless he has received adequate instruction and guidance in the safe, efficient and humane use of pesticides and is competent for the duties which he is called upon to perform."*

### 3.4 Health & Safety

Before any consideration is given to actually baiting the manholes, the question of health & safety must be addressed. Legislation requires that suitable and sufficient risk assessments must first be carried out.

It is important to highlight at this point that all sewer-baiting can be carried out from the surface. It is not necessary to enter any manhole for the specific reason of baiting and most sewers that require baiting will not be walk-able.

Baiting however should not be limited by the location of access. For example, if manholes are located in the highway then the baiting team should be of a size that can ensure safe working and those manholes should not be neglected because the team cannot work safely on the highway as that will undermine the effectiveness of treatment. A team comprising a minimum of two technicians is therefore recommended

### 3.4.1 Personal Hygiene

The wide range of zoonotic diseases with which rats can be infected together with the rodenticide and sewage contamination make it imperative that those involved in sewer baiting have the highest standards of personal hygiene and the training they receive should emphasise this.

It is essential to provide adequate facilities for personal hygiene on the vehicle. This can be in the form of a specialised vehicle wash hand basin with running hot water, soap, nailbrush and paper towels. Alternatively, a waterless antiseptic gel or an aerosol waterless mousse, which can be wiped off with paper towels, could be provided.

### 3.4.2 Personal Protective Equipment

It is essential that good quality protective clothing is supplied to all staff engaged in sewer-baiting and the following items are recommended:

- Safety shoes
- One-piece overall
- High visibility jackets or waistcoats
- Good quality gloves (NBR-coated are the best and are hard-wearing)
- Visors or goggles for face/eye protection when manual force is required with hammers and chisels to loosen manhole covers from their frames (visors are preferred, as they protect the whole face)
- Waterproof suits for wet weather protection (you don't have to stop working in the rain)
- First aid box adequately equipped

### 3.4.3 Vaccinations

Personnel engaged in sewer baiting activities should have received vaccinations against polio, tetanus and hepatitis prior to engaging operationally in sewer baiting activities and be subject to regular pro-active health monitoring. It is recommended that all staff carry a warning card for Weil's disease, Leptospirosis due to the increased risk of contracting the infection whilst working in such an environment; and to provide the medical profession with essential information should the occasion arise.

## 3.5 Equipment

### 3.5.1 Recommended equipment

There is a range of lifting equipment to remove manhole covers from their frames available and staff will work more effectively if the correct equipment is supplied. Specially adapted screwdrivers called "gougers", which are designed with hardened cranked ends to keep their shape, are used for the clearing of debris in keyholes in manhole covers.

Sledgehammers, lump hammers, cold chisels, prising bars and wrecking bars are all necessary equipment to actually lift manhole covers. One other very useful item of equipment is an industrial magnet to reclaim items of equipment accidentally dropped down the manhole.

Standard T keys can be used but with a word of caution. If staff use them incorrectly they risk causing personal injury such as back strain. The manhole cover must be completely loose in its frame before any lifting is attempted using T keys. Both manual, hydraulic and electromagnetic lifting equipment is available, which can make lifting manhole covers easier and safer.

The manual equipment usually relies on a principle of leverage using the operator's body weight to supply downward pressure to lift the manhole cover. Once the cover has cleared the frame, the operator has to hold the weight of the cover (approximately 134kgs or 2cwt) and then pivot the equipment to one side and lower the cover onto the road surface.

The hydraulic manhole lifter is useful, as it eliminates the physical aspect of lifting manhole covers.

One model, which has a proven history including reliability, is the LOJAK hydraulic manhole lifter. The machine is portable, easy to operate and when assembled only weighs 28kg. Nonetheless it is capable of lifting a capacity of 1,500kg (1.5 tonnes) without injury to the back and/or shoulders. A wide variety of keys are available to fit all types of manhole covers.

A good quality torch is essential, preferably quartz halogen for additional brightness.

*Personnel engaged in sewer baiting activities should have received vaccinations against polio, tetanus and hepatitis prior to engaging operationally in sewer baiting activities and be subject to regular pro-active health monitoring.*





### 3.6 Vehicle Specification

#### 3.6.1 Signage & Lighting

The vehicle should comply with the requirements of the Traffic Signs Manual Chapter 8 (part 05) They should be a conspicuous colour e.g. white or yellow and it must have yellow warning beacons with 360° visibility fitted to the roof, preferably at both the front and rear. The rear of the vehicle should have chevron markings comprising alternate strips of fluorescent orange-red retro reflective material and fluorescent yellow non-retro reflective material, of not less than 150 mm width each, inclined at 45-60° to the horizontal and pointing upwards, or a solid block of fluorescent orange-red retro reflective material.

The vehicle hazard warning lights and roof beacons should be switched on at all times when work is in progress. (The vehicle should be placed facing oncoming traffic, roof beacons and hazard lights flashing, with the working area to rear of the vehicle).

To comply with COSHH warning signs indicating the presence of pesticides (black exclamation mark on a yellow triangular background) together with bio hazard signage should be affixed in a prominent position at the rear of the vehicle.



#### 3.6.2 Recommendations for internal design specification

A vehicle comprising rear cargo doors and nearside sliding door to allow safe access from the pavement area is desirable. The drivers cab should be sealed from the internal cargo compartment of the vehicle to prevent potential risks from airborne contamination from both biological agents and pesticide residues.

The internal walls of the cargo area should be lined with an impervious material and be capable of being effectively cleaned. Mechanical roof ventilation should be fitted to cargo area to minimise the build up of fume/vapours. To avoid potential contamination, PPE should not be stored in the cargo area; instead suitable facilities should be provided in the drivers cab and for the storage of pesticide safety data sheets and any electronic data recording equipment.

Sealed storage area should be provided to store all equipment necessary for sewer bating operations; however, rodenticides must be stored separately in a bundled sealed compartment. Facilities for the recovery and onward disposal of accidentally spilt rodenticide should be available in the vehicle.

A second supplementary locking system should be provided to the rear cargo doors and the window apertures to the rear doors reinforced internally with steel mesh to prevent any unauthorised access. Solid metal doors without glazed window apertures would be an acceptable alternative.

#### 3.6.3 Washing facilities

The vehicle should be fitted with on board hand washing facilities comprising a sink supplied with hot water at a suitable temperature together with soap towels and nailbrush

### 3.7 Planning

Thorough planning is essential to ensure effective targeting of resources and correct application of baiting technique. It is recommended that areas for baiting should be agreed at least six monthly at a joint meeting between the local authority and the water company, and when the outcome of the previous six month's activity can be assessed. Where appropriate the sewer-baiting contractor should also be included.

The areas to be baited and frequency of baiting should be identified by using historical data including results of previous treatments, details of surface infestations, along with relevant information from the water and sewerage company such as repairs and renewals of the sewerage system and previous test-baiting results.

It is essential to have up-to-date drainage maps showing public sewers, manholes, catchment areas and direction of flow. Manholes chosen for baiting should ideally be in discreet catchment areas to aim for the maximum reduction of the rat population in that catchment area and minimum opportunity for immigration from adjoining systems. Baiting should commence furthest from the sewer outfall and move towards the outfall or junction.

A survey of the area is also important when planning the strategy. It may be that there will be rat populations between manholes and consideration of rat movements is important. For example if food premises drain into the sewer between manholes, bringing substantial quantities of food waste into the sewer, then the home range may be quite restricted and movement limited.

This limitation on the effectiveness of manhole baiting has to be recognised, and these rats will have to be dealt with in other ways, such as by changing the environment by reducing the amount of food waste discharged to sewer, and ensuring good repair of drains and sewers with control over potential points of rat entry and exit.

Increasing financial constraints which have been experienced in recent years have placed considerable pressure on sewer baiting funding making it imperative to develop and implement the most cost effective and efficient sewer baiting programmes with reduced budgets. In response to this less than ideal financial climate and where access to historical

records of rat activity associated with manholes in the planned programme area are available it is not considered necessary to carry out test baiting prior to treatment.

Resources saved by not carrying out test baiting can be redirected to develop a more comprehensive treatment programme.

In planning a sewer baiting programme where there are no previous historical records relating to levels of infestation available or where a new contractor has been engaged by a Water UK member it may be necessary to arrange to test bait the system to establish the level of current rat activity. Between 10% to 15% of the manholes on the system should be selected for test baiting. These should include manholes which have shown to have rat activity on a previous occasion together with manholes known to be associated with surface rat infestation in the designated area.

All "stuck" manhole covers identified during the course of the baiting programme should be referred for releasing if necessary by a third party contractor. Once the cover is released the chamber should be baited immediately.

The relationship between sewer and surface infestations has been difficult to establish. Where reliable attempts have been made to trace surface infestations there is strong evidence that where significant populations of rats live in the sewers, more than 50% of surface infestations can be traced directly to sewer and drainage defects. Local authority service requests for surface rat infestations for a given period plotted on a GIS and overlaid on sewer maps is an extremely effective tool in planning sewer baiting programmes. The less urban an area becomes the less likelihood there is that such high levels of infestation from the sewers would exist.

Where there is a sewer baiting programme it is important that all surface infestations are also treated to prevent migration back into the sewers and all possible sites for harbourage including redundant lengths of drain or sewer are dealt with.

As part of this comprehensive approach any disrepair to the sewerage infrastructure should be dealt with, in this way population recovery in the sewers will be slow.

*It is essential to have up-to-date drainage maps showing public sewers, manholes, catchment areas and direction of flow*

### 3.71 Strategy - Mapping rat distribution

Identification of catchments requires up-to-date information on sewers and the sewerage undertaker should have that information on maps. However, information on some older public sewers may not always be complete. The same is true for private sewers, which may become apparent only when there is a major problem such as flooding or collapse.

The subject of access to manholes can raise several difficulties, i.e. following resurfacing of roads, tar macadam can partially or completely cover the manhole to be raised. This can involve a considerable amount of additional work for the sewer-baiting team. Parked vehicles also present problems in gaining access to manhole covers, either because cars are parked over manhole covers or streets that contain long rows of parked cars have limited access for other vehicles, including the sewer-baiting vehicle.

In large towns and cities the task of organising routine sewer treatments can often be time-consuming. Greater progress can be achieved if the sewer baiting programme can be subdivided into smaller sub areas. This may be more labour intensive for the individuals planning the programme initially but will be more beneficial in the long term. In town centres where traffic congestion is high with access to manholes made difficult due to parked vehicles etc. consideration should be to programming these areas for treatment at less busy periods e.g. early morning or on Sundays.

In areas where re-housing schemes are in progress it is a good idea to attempt to disinfect the sewers of the district concerned before the local inhabitants are moved out. Otherwise the rats that are looking for fresh harborage may travel great distances - presumably because other rat colonies that they may meet during their search show hostility to them. Also, where also sewers are under construction or have been opened up for repair, it is wise to see that they are temporarily sealed-off.



Baiting strategies should also include storm water overflows. Experience has shown that rat populations tend to be present on the banks of water courses close to the storm water outlets. To minimise the potential for reinvasion into the sewer network, sewer baiting should be undertaken within the storm water overflow. The banks of the watercourse should be surveyed and surface rat activity controlled with rodenticide cleared for use in the external environment.

When surveying water courses especially rivers which may be fast-flowing it is essential that a suitable risk assessment is carried out. The baiting team should comprise a minimum of 2 technicians suitably equipped with waders etc and wearing a safety harness tethered to the "anchor man" on the bank of the watercourse.

Care should always be taken to ensure the rat activity evident on the banking is *Rattus norvegicus* the Norway rat and not mistaken for signs of activity by water voles *Arvicola terrestris* which is a protected species.

## 3.8 Treatment

### 3.8.1 Rodenticides

The selection of an effective rodenticide active ingredient and bait formulation is a key component governing the overall success of the treatment and cost efficiency of the baiting programme.

Sewer bait is available in a number of formulations ranging from loose grain, bagged bait, pellets and blocks. Of the four formulations loose grain bait is the more palatable to rats and therefore should be considered as the preferred option. (Quy *et al*, 2003)

Second generation anticoagulants are to be preferred over the older first generation anticoagulants because they are more toxic to Norway rats and this allows pulsed baiting to be carried out in the sewer system. Of the second generation compounds the more toxic single feed rodenticides, containing e.g. brodifacoum, flocoumafen and difethialone are to be preferred over older less toxic compounds such as difenacoum and bromadiolone. The use of these more toxic anticoagulants in a sewer treatment programme allows for greater cost efficiency.

In addition to human taste deterrents, sewer baiting formulations invariably contain mould inhibitors to slow down the rate of decomposition of the bait base whilst in the humid atmosphere found in the sewer environment.

Rodenticides cleared for use in sewers usually contain a higher concentration of the active ingredient than those used for outdoor use. It would be illegal for rodenticides cleared only for sewer rodent control to be used for the control of surface infestations.

Sewer bait is available in a number of formulations, namely loose grain, wax blocks and sachets.



### Loose Grain Baits

There are a number of ways to introduce loose grain baits into a sewer system. The objective is to place the bait onto the benching of the drainage inspection chamber in such quantities as directed on the product label. In shallow chambers, such as those found in domestic drainage systems, this can usually be achieved by spooning the rodenticide onto the benching with the aid of a long handled spoon. In deeper manholes a bait depositor would be required. The required quantity of bait is placed into the depositor and lowered onto the benching. On contact with the benching the bait is released as the hinged "floor" of the depositor is no longer held closed against the weight of bait and the depositor.

An alternative is the telescopic baiting tube. The telescopic tube is introduced into the chamber and lowered onto the surface of the benching. The required quantity of sewer bait is then spooned into the tube and is gravity fed onto the benching. The use of this piece of equipment is generally limited in deeper chambers by the total extended length of the equipment.

Loose gain bait placed either in polythene bags or preferably in bags produced from tubular synthetic stockinette the openings of which have been sealed using a bagging machine is suitable for all depths of manholes, and is particularly useful in deep chambers. The sachets or stockinette bags which have the additional advantage of being slightly self-sealing and containing the bait if the bag is punctured by the rat during bait take, are attached to a length of chord or preferably wire and lowered onto the benching or just above invert level. The chord/wire is then fastened to a convenient step iron or affixed at a suitable point in the chamber close to ground level. This method is particularly useful when subsequently checking for takes on the bait by allowing easy recovery of the bait for inspection and guards against the risk of "wash off" during flash flooding of the system. Stockinette bags containing the bait are usually made up in bulk at the operations depot the day before treatment is to commence.

Ideally the selection of bait formulation e.g. loose grain, bait blocks and method of application should be based on the individual assessment of the manhole to be treated, taking into account its depth, presence of benching etc.



### Bait Blocks

Bait blocks are a useful alternative to grain baits. They are usually manufactured with a hole through the centre of the block which can be used to secure the block by passing a length of wire or nylon string through this hole and tied. The block can then be lowered onto the chamber benching or to just above the invert level of the chamber and the wire secured to a step iron or to a convenient point on the brickwork at the surface of the chamber.

This method of laying bait has the advantage that the block can easily be recovered on subsequent visits to check for "takes" and is especially useful for preventing "wash off" in the chamber during storm surcharges.

### 3.8.2 Rodenticide treatment methodology

It is essential to achieve as high mortality as possible. Population recovery of poorly controlled rat populations in the sewers can be at a rate of 3% a week, but with re-invasion this can be as high as 12%. Thus it is possible for populations to recover within six months of treatment.

Sewerage undertakers are responsible for the public sewers where most sewer baiting has been carried out. The former private sewer system can also provide a means of re-invasion. An effective sewer-baiting programme requires understanding of all the difficulties that can exist in attempting such an exercise, from availability of funding to access to sewers, from the nature of catchment areas, to practical problems of clearing of keyholes in manhole covers before any attempt at lifting can be made.

To enable any sewer-baiting programme to be successful, the staff employed need to have an enthusiasm for the job, be fit, agile and able to record evidence of the programme in detail and with accuracy.

If these criteria cannot be satisfied, the whole programme will fail with both financial and operational consequences.

The main problem with applying an effective rodenticide strategy is to ensure that the necessary revisits to manholes can be made on a consistent basis. The simplest way of doing this to a seven day strategy. When using anticoagulants, revisits to manholes should be made at seven day intervals or as indicated on the product label,



When selecting a sewer system for baiting, the number of manholes should not exceed that which can be effectively baited within one day or working week (5 days) by the assigned team. This will vary according to the area to be baited, travelling distances and traffic flows etc. It might be necessary for example in city centres to arrange for sewer baiting to be carried out in the early morning before traffic becomes congested or on Sunday mornings at weekend.

Numbers of manholes baited per day by a two or three man team will vary according to how much traffic there is, the distance from the depot, the ease of finding and lifting the manholes, parked cars and other factors. The expected realistic figure for any area needs to be identified before detailed planning can be achieved.

It is extremely important to ensure that baiting of drainage chambers recording positive rat activity is carried out until no further activity is recorded. This may necessitate revisits being scheduled for between 2-3 occasions.

A treatment strategy involving only an initial baiting followed by just one revisit is considered to be bad practice; it is not cost effective and will not successfully control sewer rat populations.

#### **Pulse baiting technique**

The pulse baiting technique is particularly appropriate for use in sewers and is the favoured approach. This technique of pulsed baiting was introduced with the more toxic anticoagulants, such as brodifacoum, flocoumafen and difethialone.

This contrasts with saturation baiting, using the other, less toxic anticoagulant rodenticides, in which more bait has to be laid and the rats have to eat more of the bait to consume a lethal dose. Pulse baiting is not necessarily more effective, but it is certainly cheaper, because the amount of labour and the quantity of bait required is much lower than in saturation baiting.

Ideally baiting of manholes are chosen in discreet catchment areas, focussing on those where problems have been identified using previously obtained data such as on sewer condition, levels of surface infestations over time, and other historical data such as previous positive manholes.

A different sample is chosen each time to ensure all manholes are test-baited over a number of years.

Junctions must be included, along with difficult to reach manholes in busy roads. Early morning starts will ensure these manholes are not missed. Pulse baiting using the more toxic second generation anticoagulants such as brodifacoum, flocoumafen or difethialone sewer baiting formulations are recommended.

Normally three baiting pulses are sufficient to remove almost the entire population more may be required in heavily infested systems.. The intensity of baiting periods (pulses) depends on the rat population in a sewer or in and around the building and the rate of immigration from neighbouring areas. The intervals between pulses and the number of pulses have to be decided for each location based on the results of monitoring of the rodent population by test baiting.

#### **Test baiting manholes**

It is recommended that 50 grams of rodenticide be laid in each manhole to be test-baited. The manhole must be revisited 7 days later. If no takes are recorded, then no further action is necessary unless there is fresh evidence of rats within the manhole.

#### **3.8.3 Recommended sewer baiting procedure**

(This recommended sewer baiting procedure is summarised in an operational procedural flow chart in the Appendices 3.12.3)

##### **Initial Baiting (Week 1)**

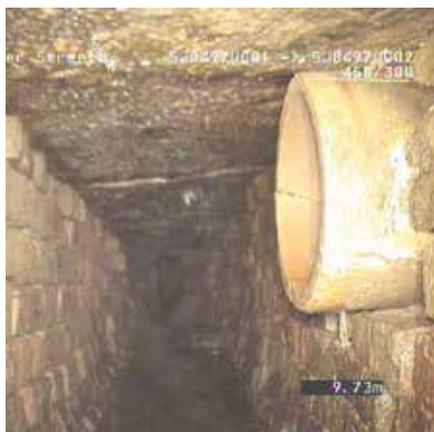
Lift and treat all manholes within the system to be treated. The amount of bait laid at each manhole may vary between 150-200gms, according to the rodenticide used. The quantity of bait laid must always be in accordance with the label instructions.

##### **Revisit 1 (Week 2)**

Revisits should be made to all the manholes visited during the initial baiting (week 1) after a period of 7 days. There is often a delay in rats finding the bait and eating it, therefore any revisit scheduled sooner than this will mean that some activity will be missed.

Those manholes with 'complete' takes of bait should be re-baited with the same quantity of bait applied at the initial visit (week1) In addition, where positive takes are recorded, two manholes either side of the positive take in all directions must also be poison-baited and included in subsequent revisits.

No additional bait needs to be added to those manholes showing no rat activity on the bait. Manholes recording incomplete bait "takes" should be "topped-up" to the level of bait applied at the initial visit (week1)



Manholes recording complete bait “takes” with a total absence of bait and where there is a suspicion that this has been caused by a surcharge (due for example to heavy rainfall) can be classed as “wash-off’s”.

If this is suspected, re-bait the chamber with the same quantity of bait used on the initial visit - 200gms and place 50-75gms of sawdust/wood shavings adjacent to the bait.

If on the subsequent revisit both the bait and sawdust/wood shavings are absent from the benching a “wash off” is confirmed. Re-bait with rodenticide blocks secured to wires from the top of the manhole or from available foot irons or other attachment points. The blocks should rest on the benching where they will be easily found by the rats, Avoid suspending the blocks above the benching as these are unlikely to be found in the dark environment of the sewer.

#### Revisit 2 (Week3)

A revisit should be carried out to only those manholes showing bait ‘take’ on the first revisit (week 2) or those showing a potential ‘wash-off’. Manholes adjacent to these “active” manholes should also be baited i.e. two manholes either side of the positive take in all directions.

Those manholes showing “partial takes” of bait should be topped up to the level applied in the initial baiting week 1 (200gms) those showing “complete takes” should be rebaited with a similar quantity.

#### Revisit 3 (Week4/5)

As for Revisit 2 (Week 3) only those manholes showing a ‘take’ of bait the previous week need be visited and rebaited. Subsequent revisits should be scheduled until all rat activity in the chamber ceases.

Recovery rates of rat populations in sewers following treatment is high, therefore, the more successful the baiting programme is in achieving the complete elimination of the rat population, the slower any potential recovery of the population will be and the more cost effective the programme will become.

#### Reactive baiting

Provision should be made in conjunction with the local authority for reactive sewer baiting to be carried out as and when required. It is therefore important for local authorities to liaise with the water company on a day to day basis and to notify them when investigation of reports of surface rat activity indicate that the source of the infestation may be drainage related.

When the local authority investigates a rat infestation and suspects a defect in the sewerage infrastructure, it is useful to arrange for localised sewer baiting to be carried out in the vicinity.

The sewerage undertaker should be prepared to carry this out at relatively short notice. It is also important to deal with any defects in the private system. This may involve testing of drains and private sewers using smoke/dye tests or in some cases CCTV.

Results should be fed back into the infestation investigation to allow appropriate action and legal enforcement if necessary.

### 3.9 Record Keeping

#### 3.9.1 Treatment Records

Accurate records must be maintained to enable accurate revisits to be made; to build up knowledge of heavily infested areas; to compare with surface infestations; and to investigate re-infestation. If this process is to be effective, coordination with neighbouring LAs will be required.

#### 3.9.2 Sewer Maps & Mapping software

Access to the Water and Sewerage Companies electronic sewer mapping software is essential if effective records are to be produced and maintained. The software provides essential details such as the direction of flow, depth of chamber, size of sewer and most importantly the unique reference number assigned to the chamber can be used to identify the chamber in the sewer network and record details of the treatment carried out using electronic data recording equipment such as PDA’s or hand held computers.

In the absence of any access to an electronic mapping system hard copies of sewer maps should be provided by the Water and Sewerage Companies together with any additional drainage maps which may have been obtained from the relevant local authority when the transfer of private sewers and lateral drains on the 1st October 2011 was completed.

### 3.10 Communications

Regular operational meetings with the Water and Sewerage Companies are essential. Keeping all parties informed is paramount to a successful sewer baiting programme. This will involve monthly written reports on what manholes have been treated, what level of takes have been recorded along with any infrastructure issues that you may have encountered, broken step irons, damaged covers or rims, partial blockages etc. It is recommended that quarterly meetings are held with the Water and Sewerage Companies to enable an exchange of views to take place and to plan the way forward. This enables both parties to understand the difficulties and successes encountered in providing a professional sewer baiting programme.

Local authorities may additionally find it useful to set up call-out baiting with their sewerage undertaker. When the local authority investigates a rat infestation and suspects a defect in the sewerage infrastructure, it is useful to arrange for localised sewer baiting in the vicinity. The sewerage undertaker should be prepared to carry this out at relatively short notice. It is also important to deal with any defects in the private system. This may involve testing of drains and private sewers using smoke tests or in some cases CCTV.

### 3.11 Conclusion

The only way to successfully control rats in sewers is to provide a comprehensive and effective sewer-baiting programme. This requires adequate funding, an excellent dialogue with the sewerage undertaker, a detailed planned approach, continuous monitoring, committed staff, good equipment and protective clothing. All these issues will ensure that the sewer-baiting programme will be a success.

However, it should be remembered that sewers can be very dangerous places and safe working practices are essential.

*When using rodenticides always read and understand the label instruction.*

*The only way to successfully control rats in sewers is to provide a comprehensive and effective sewer-baiting programme*





## **SAFE LIFTING OF DRAINAGE MANHOLE COVERS**

Technicians will comply with the Safe System of Working on Roads. All technicians must be trained and certificated to comply with the New Roads and Street Works Act 1991 regarding traffic signage.

8. Technicians shall use wherever possible manhole-lifting machines supplied, to reduce the risk of muscle/back strain.
9. Technicians shall ensure that the ground surrounding the manhole is as level as possible and sufficient to take the weight of both the machine and manhole cover.
10. Technicians shall ensure that all key slots in the respective covers are free from debris to enable keys to be easily and properly located.
11. Key-holes that are enlarged rendering the lifting of the cover unsafe shall not be lifted by machine or manually. Such incidents shall be reported.
12. Lifting keys once located in the cover are to be connected to the lifting machine and hydraulic pressure increased or leverage applied until the cover has been lifted clear of the frame. The cover shall be moved away from the manhole and rested at ground level.
13. Covers found to be stuck may be struck with a sledgehammer to break the seal created by debris between cover and rim. During this operation a visor to protect the eyes must be worn.
14. Technicians shall ensure that at all times their hands and feet are clear of any raised cover to avoid injury.
15. Technicians shall ensure that all debris is cleared from around the frame and exposed cover before the cover is inserted back into the frame.
16. No equipment or exposed manhole cover shall be left unattended.
17. When replacing manhole covers and manually assisting in guiding the cover back over the chamber, technicians shall ensure that their hands/feet remain clear of any potential injury.
18. Technicians shall ensure that when the cover has been replaced that it is re-seated properly in the frame providing a safe level road surface with no raised edges.
19. Technicians shall ensure that a manhole cover found to be in an unsafe condition has the necessary warning signs and cones and barriers suitably positioned and the water company notified immediately of the situation.

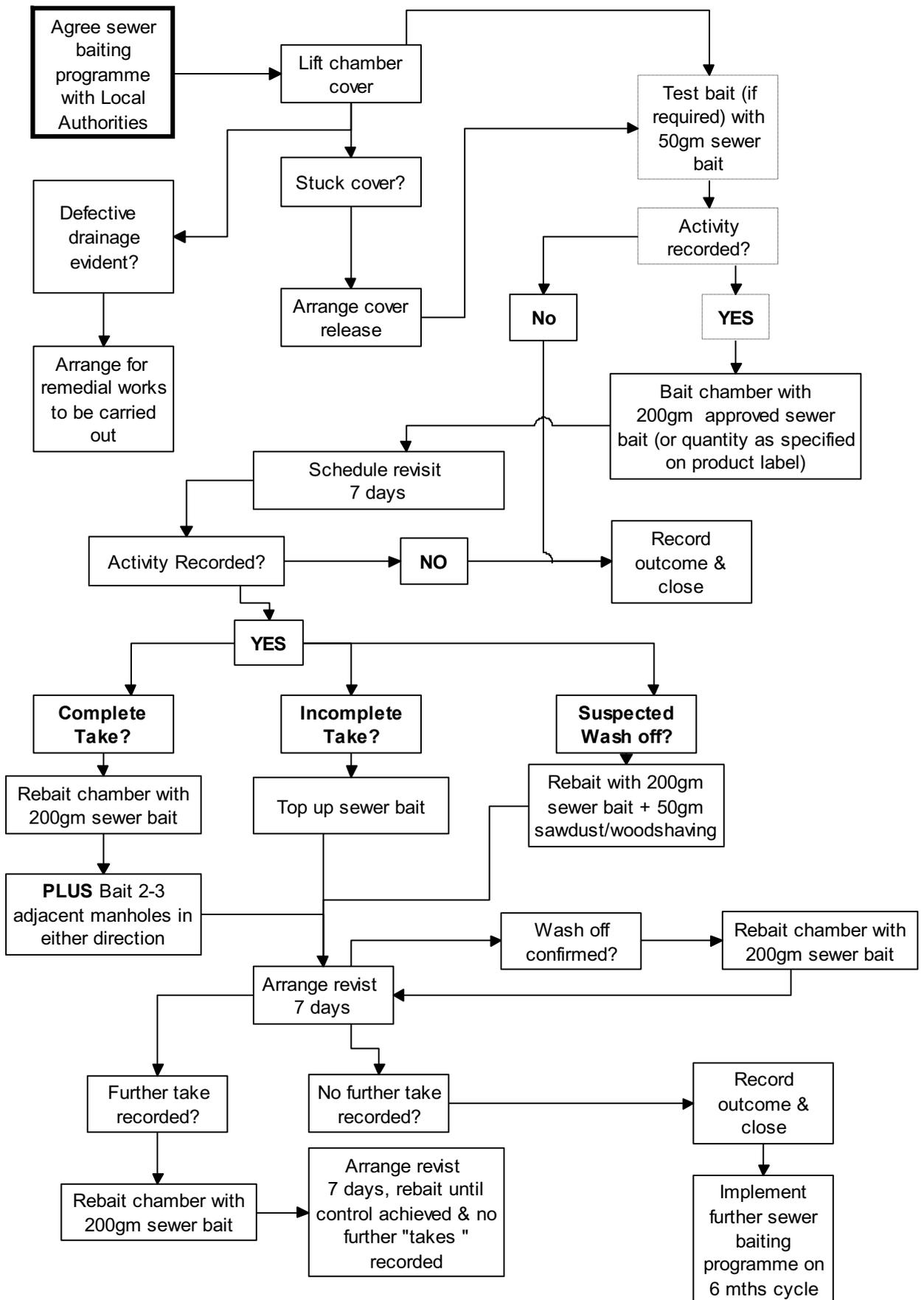
20. Protective clothing must be worn and shall include safety shoes, coveralls, gloves, visors (when using chisels, sledgehammers) and high visibility jackets to EN471 class 3.
21. Any breakdown of equipment shall be reported immediately.
22. Technicians must when contacting their GP show the instruction card for working in contact with potential water contaminated with Leptospirosis.

## **SAFE SEWER BAITING PROCEDURE**

1. Prior to the commencement of any sewer baiting operation the drainage chamber shall be checked for the presence of flammable/toxic gases with a toxic gas meter.
2. Sewer baiting operations shall be undertaken only when the manhole has been suitably ventilated and subsequent toxic gas meter readings record a clear atmosphere.
3. Sewer bait shall be deposited in accordance with labelling instructions onto the chamber benching with the aid of suitable bait depositing equipment, or suspended close to invert level where benching is absent by wire secured to a step iron close to the surface.
4. The quantity of bait laid and location reference of the baited chamber shall be accurately recorded.
5. Any accidental spillage of rodenticide shall be immediately recovered and removed from the highway surface and recycled/disposed of in accordance with approved safe disposal procedures.
6. During sewer baiting operations once the required sewer bait necessary for the task has been obtained, the vehicle's onboard rodenticide storage compartment shall at all times remain locked and secured.

Any incident occurring involving an inappropriate use/ incident of rodenticide shall be reported immediately to the operations manager.

4.3 Sewer baiting procedural flow chart



#### 4.4 Equipment checklist

- Steel toecap safety shoes
- One-piece coverall
- High visibility jackets or waistcoats
- Good quality gloves (NBR-coated are the best and are hard-wearing)
- Visors or goggles for face/eye protection when manual force is required with hammers and chisels to loosen manhole covers from their frames (visors are preferred, as they protect the whole face)
- Waterproof suits for wet weather protection
- First aid box adequately equipped
- Washing facilities on board vehicle
- Traffic cones, signs and barriers
- Sledge/Lump hammers
- Cold chisels
- Prising bar 2 metre, chisel and pointed tips
- "T" Keys
- Hydraulic manhole cover lifting equipment
- Quarts halogen torch
- Bait depositor
- Nails, wire

#### 4.5 Specimen treatment spreadsheet

### Main Contact :

Planned / Reactive	Date Requested	Ref Number	Area & Street Name	Manhole Ref No.	No. of Lifts Planned	Visit 1		Visit 2	
						Actual No of Lifts	Comments/Actions Stuck, Traffic or Vehicle?	No. of Lifts	Result - None, Part, Full or Other?
Proactive							date tbc		date tbc
			Any Street	9301	3				
				9203	3				
				9302	3				
				9305	3				
				9304	3				
				9303	3				
				<b>Total</b>	<b>18</b>				

Visit 3		Visit 4		Visit 5		Visit 6		Visit 7		Team	Contact No.
No. of Lifts	Result - None, Part, Full or Other?	No. of Lifts	Result - None, Part, Full or Other?	No. of Lifts	Result - None, Part, Full or Other?	No. of Lifts	Result - None, Part, Full or Other?	No. of Lifts	Result - None, Part, Full or Other?		
	date tbc										

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*Sewers can be very dangerous places  
and safe working practices are essential.  
When using rodenticides always read  
and understand the label instruction.*



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