INTERNATIONAL SOCIETY FOR TRENCHLESS TECHNOLOGY	**TRENCHLESS TECHNOLOGY RESOURCE CENTRE**	
	TRENCHLESS TECHNOLOGY GUIDELINES	SECOND EDITION
	OVERVIEW OF SITE SURVEY, INVESTIGATION AND PIPE PREPARATION	NEW VERSION MAY 2006

1. OVERVIEW

This section of the TRC provides information on techniques and systems used before and after the rehabilitation work. The proper use of these techniques is as important to success as the correct selection and installation of the rehabilitation system. The techniques are summarised in the table below. Additional information on the topics listed can either be accessed from the Table where indicated or from the notes below the Table

TASK	DESCRIPTION	PURPOSE	TOPICS
SITE SURVEY AND BURIED INFRASTRUCTURE LOCATION (CLICK HERE FOR GUIDELINES)	LOCATION OF PIPES TO BE REHBILITATED	ESSENTIAL FIRST STEP	TRIAL HOLES GEOPHYSICAL LOCATION DEVICES SUBSURFACE UTILITY ENGINEERING (SUE)
	LOCATION OF ADJACENT UTILITIES	AVOIDANCE OF COLLATERAL DAMAGE	
	ACCESS POINTS	CONFIRM LOCATION OF EXISTING ACCESS AND/OR SELECT NEW LOCATIONS	VISUAL INSPECTION
PIPE CLEANING AND PRE REHABILITATION INSPECTION CLICK HERE FOR GUIDELINE	PRE REHABILITATION INSPECTION	CONFIRM PIPE CONDITION AND LOCATION OF LATERALS, JUNCTIONS BENDS ETC	CCTV SURVEYS
	SEWER CLEANING TECHNIQUES	ALLOW SAFE LINER INSERTION	HYDRAULIC CLEANING MECHANICAL CLEANING
	PRESSURE PIPE CLEANING TECHNIQUES	MAXIMISE BORE ACHIEVE REQUIRED SURFACE CONDITION	FLUSHING, SCRAPING RACK FEED BORING HP WATER JETTING PIGGING
	SPECIAL TECHNIQUES	REMOVE ROOTS AND OTHER OBSTACLES	SPECIALIST EQUIPMENT
MAINTAINING SERVICE AVAILBILITY	BYPASSING SEWER FLOWS	MAINTAIN SEWER SERVICE DURING REHAB	OVERPUMPING
	PROVIDING ALTERNATIVE WATER SUPPLY	MAINTAIN SERVICE TO CUSTOMERS	TEMPORARY SURFACE MAINS
POST REHABILITATION ASSESMENT	LINING INSPECTION	DEMONSTRATE SPECIFICATION COMPLIANCE	CCTV SURVEY
	PERFORMANCE TESTS		PRESSURE TEST
SAFETY ASPECTS OF ACCESSING PIPE	PUBLIC SAFETY OPERATOR SAFETY	MINIMISE SAFETY HAZARDS	SIGNING AND SAFETY BARRIERS OPERATOR SAFETY TRAINING

MAINTAINING SERVICE AVAILABILITY

In many circumstances, even with the use of Trenchless Technology, there is a requirement to take sections of a service offline during the course of the replacement or rehabilitation work.
In the case of sewers this often means that, unless the storage capacity upstream of the worksite is sufficient, a flow Bypass/over pumping system has to be established to ensure continuing sewer services to customers.
In terms of water or gas supply, unless the work downtime is very short, there may be a need to establish a temporary supply service to affected customers. Power and telecommunications cables are not generally affected by this type of interruption. Since it is normal to install a new cable before the supply switch occurs, a move that is normally planned to be of short duration.

In both the sewer bypass and the temporary service supply scenarios, the requirement and the cost of providing temporary services may have a significant impact on the selection of the replacement or renovation technique that will be used,. The cost of such a service provision must be taken fully into account when comparing the cost of alternative rehabilitation technologies.

SEWER BYPASS

Sewer Bypass/over pumping systems are generally required where the work is likely to take longer than the storage capacity of the pipeline remaining in service can handle. More often than not the bypass set up for any particular job works on the adage that the bigger the sewer, the bigger the operation and therefore the bigger the likely need for over pumping.
Flow monitoring undertaken during the investigation and analysis of a pipeline will indicate the levels of flow likely to be encountered and therefore the level of over pumping capacity required. If this information was not obtained at the during the condition assessment of the pipeline it will need to be established accurately before any system can be adequately designed.
The general layout of a bypass system requires the section to be renovated/replaced to be isolated from the remainder of the system, which will continue to operate normally. This would be achieved with adequate sealing techniques or stoppers in the pipelines at either side of the work site, probably at least one manhole further upstream and downstream of the work site.
An adequate pumping system is then installed at the final operating manhole on the upstream side of the site to raise the flows out of the manhole and pass them to the first available operating manhole on the downstream side of the work site via the bypass pipeline.

A typical large-capacity bypass pumping system working from an existing manhole. Picture courtesy of Hampton Roads Sanitation District, Virginia, USA.

Adequate supervision and maintenance, fuel/power supplies, noise regulation, site access, traffic control and disruption to the local area of such a pumping system are all aspects of the temporary system that are vital to control correctly during the operation as it is likely to have to work 24 hours per day for as long as the work site is open. Positioning the pumping system and its pipelines correctly will not only make life easier for the contractor but also reduce the likelihood of complaints for local residences and businesses.
Where expected flows are relatively small the bypass pipe may be able to be placed in the open across the work site with some form of protection shield to prevent damage/leakage. If

the system is to operate for a significant length of time or where the over pumping main crosses working highways there may be a need to find a way/route along which it could run to ensure continued uninterrupted operation.
If the sewer under renovation or replacement has significant inflow into it under the normal course of operation which is outside of the storage capacity of the lateral connections, bypass arrangements for these lateral connections may also have to be put into place during the course of the main works. This may involve one or more smaller pumping systems taking flows from laterals and feeding to a downstream manhole.

MAINTENANCE OF SERVICE SUPPLY

Where supply main replacement or renovation is being undertaken there is often a need to establish a temporary supply, which may cover either water or gas supplies, in order to keep the customers effected by the works 'on line'. The need for such supplies depends on the legal framework governing access to utilities, the maximum allowable planned outage time. And utility philosophy to customer needs. In the UK as technologies have evolved which can offer same day return to services the utilities have evaluated them and conducted trials and this approach is rapidly gaining in popularity
With temporary supply pipelines, more often than not a connection is made at a convenient position either side of the work site. As the service is normally pressurised, connection to a surface laid temporary pipe that is directly connected to the customer's service pipe will allow continued supplies to be maintained. The main disadvantage to this of course is that the service pipes have to be exposed to allow this connection to be made and unmade at the beginning and at the end of the main work programme. The temporary supply pipe is also often found running along surface in the street. Covers prevent damage and therefore the potential for leakage but often this also makes for poor pavement surfaces, which can limit access to many, particularly the less able. Therefore routing of these services has to be carefully planned and executed. The contractor must also maintain large stocks of the pipe used for temporary mains, and must be able to provide 24 hour monitoring and maintenance.

POST REHABILITATION ASSESSMENT

When rehabilitation work is complete, acceptance by the client is normally subject to assessment criteria. In the case of sewer renovation, the assessment normally consists of a CCTV survey of the lined pipe. This is used to check the general appearance of the liner, the presence of any obvious defects, such as wrinkles, and the quality of lateral reinstatement.

The acceptance of lined pressure pipes is often based on a combination of CCTV survey and pressure tests. It should be noted that a lined pipe behaves differently to the original pipeline, when pressure tested. As the internal pressure is applied, the liner will expand until any micro annulus is eliminated. This occurs over a period of time, during which, additional water must be added, to remain the test pressure. This could be interpreted as a test failure, in terms of standard pressure tests. If the liner is designed to be semi structural, then the test pressure should be carefully selected, to reflect the structural condition of the host pipe.

SITE SAFETY AND ACCESS

General site safety is always a concern to buried service operators, and the specifics of site safety arrangements guidelines, and regulations, differ from country to country, and so are far too numerous to cover in detail here. Although it should be stressed that safety is of the utmost importance wherever you may be in the world and that local regulations should be adhered to stringently for the safety of all.

One of the main arguments for the use of trenchless technology for the past 30 years has been its ability to reduce disruption to local communities and businesses. More often than not this has been achieved in one of two ways. First the work sites tend to be there for less time, so reducing the impact of the works in terms of time, and secondly, the technologies tend to utilise much smaller footprints in terms of operating space. This latter 'advantage' does carry with it some provisos however.

Confined space access requires the correct equipment and training. Picture courtesy of CAS Ltd,

With generally smaller openings and accesses, trenchless technologies do offer a smaller 'vision' target, so it is very important that signing and fencing are of a high standard, wherever they may be. This in turn leads to the argument that positioning of access pits, shafts, working areas must be taken into account in laying out a project. This involves both public, and workforce safety, and also the requirement for significant vehicular access. Such access is needed for everything from continual delivery and removal equipment (pipe delivery to a micro tunnel for example where storage space in minimal) through active participation of equipment in the trenchless process (boilers for water-based CIPP lining for example). The limitations this access will place on others, such as business / residential access (if placed close to industrial site gates etc), must also be considered.

As well as positioning, the access to the shafts/pits etc should be made as difficult as possible out of working hours, and even during working hours where open pits may be left for some time unattended, with not only sufficient fencing but also top covers where necessary. Signing and lighting may also be required.

As well as preventing access to unauthorised personnel there is a general requirement for safe working practice according to national regulations, which should be rigorously adhered to. In specific circumstances with certain trenchless technologies where chemical or other hazardous potential exists, personnel should be issued with the relevant safety clothing and equipment and the training necessary to use this equipment correctly.

Where man-entry is required into confined spaces, the relevant nationally recognised Training should have been completed by all necessary personnel and Certification achieved as required. This should include not only the use of access equipment but also site ventilation, breathing apparatus, communications and monitoring systems, such as gas detectors, and rescue systems where necessary.