

**CURRENT PROGRESS ON
UNDERGROUND UTILITY MAPPING
IN MALAYSIA**

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PRESENTATION OUTLINE

- Introduction
- JUPEM's Role in Underground Utility Mapping
- Progress in Underground Utility Mapping
- Concluding Remarks



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INTRODUCTION

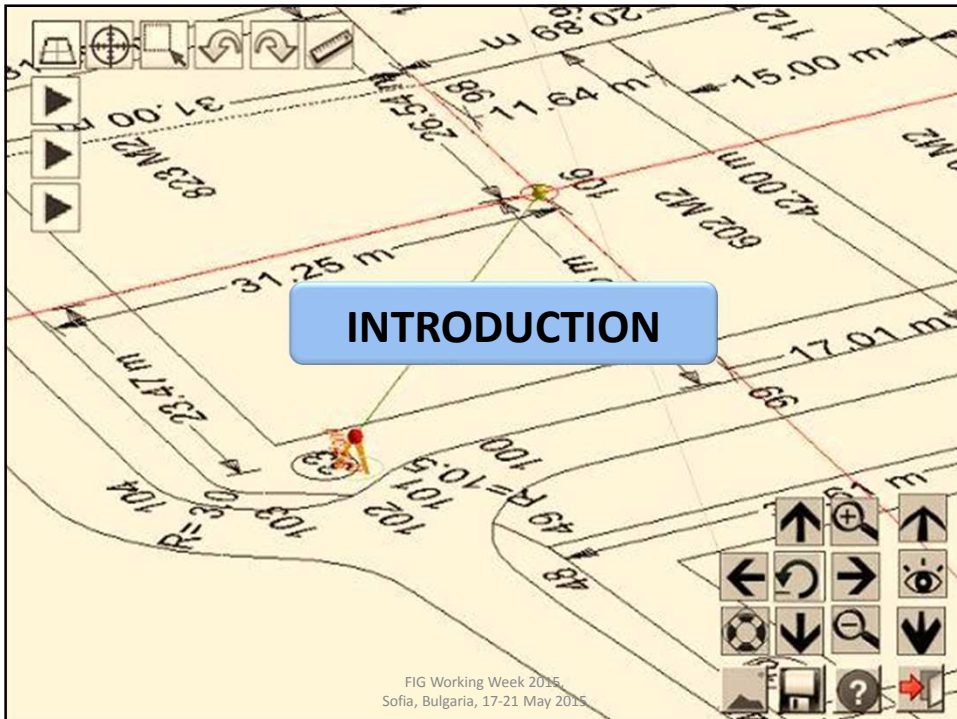


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JUPEM AND LAND SURVEYORS AS PLAYERS IN UTILITY MAPPING

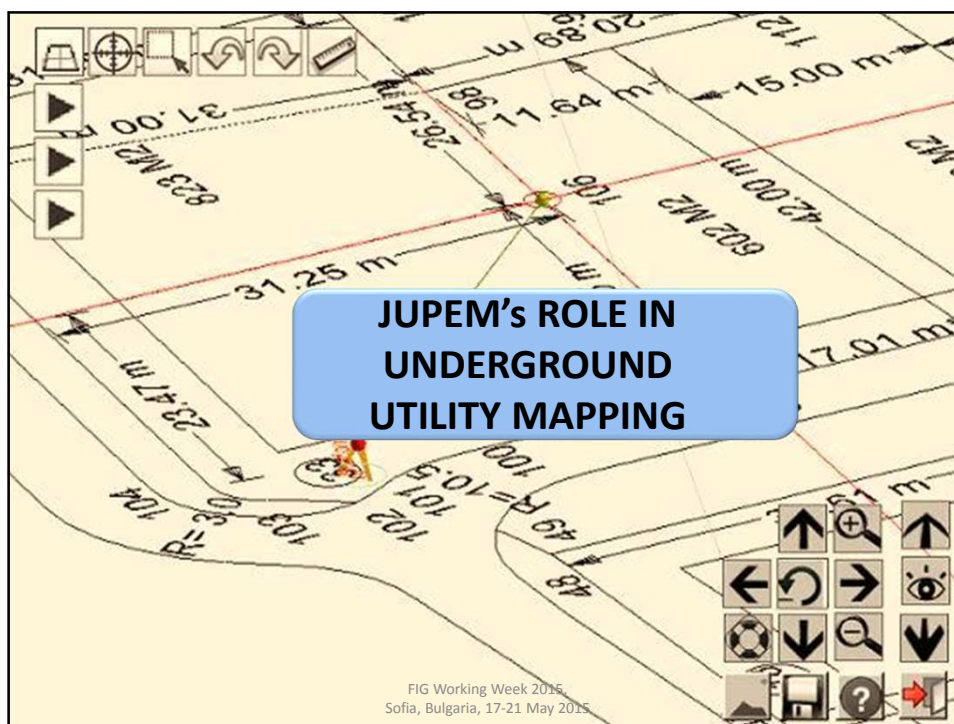
- JUPEM – a government agency responsible for cadastral and mapping activities including underground utility mapping in Malaysia.
- In the private sector, Licensed Land Surveyors are now beginning to establish themselves as the prime service provider for utility detection and mapping.

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DATA PROVIDERS

- Data providers are major players in providing underground utility information
 - Tenaga Nasional – Electricity
 - Telekom – Telecommunication
 - Water Authorities - Water
 - IWK – Sewerage
 - Gas Malaysia - Gas
- Private entities or government link companies
- Controlled and governed by legislation but not legislatively mandated to deposit their data to any repository body

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As an Authority on Underground Utility Mapping

- Entrusted by the government to compile and manage underground utility information due to frequent disruption of services caused by damage to underground utilities
- Damage due to unknown or inaccurately determined location and depth of underground utilities
- Mandate given through the Cabinet Decisions in 1994 and 1998.

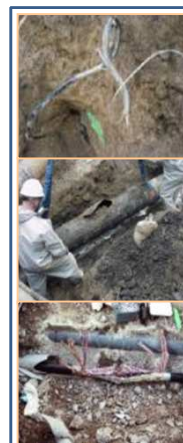


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Issues of Damages to Underground Utilities

- Damages and accidents happened during earth excavation for road widening and shifting of underground utilities.



ROAD WIDENING



SHIFTING OF EXISTING UNDERGROUND UTILITIES

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9

Activities during Installation of Underground Utility



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Reported Damages to Underground Utilities



There is little coordination between utility providers resulting in damages to underground utilities

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Consequences due to damage underground utility Installations

- Increase in cost for project
- Delays to project implementation
- Disruption to consumers and industries
- Increase in Insurance premium




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Main reasons for Damages




Data in the form of design Layout



Data not up-to-date (existence of gaps)



Surveying not done during installation



Works done by unqualified parties

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JUPEM's Initiatives

- To mitigate the problem JUPEM established a Utility Mapping Division in 2006.
- Started with a workforce of 55 personnel.
- Development of National Underground Utility Database known as PADU.




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NATIONAL UNDERGROUND UTILITY DATABASE (PADU)

- Seamless database consisting of 4 major components; 1:500 base map, cadastral data, utility data and imageries

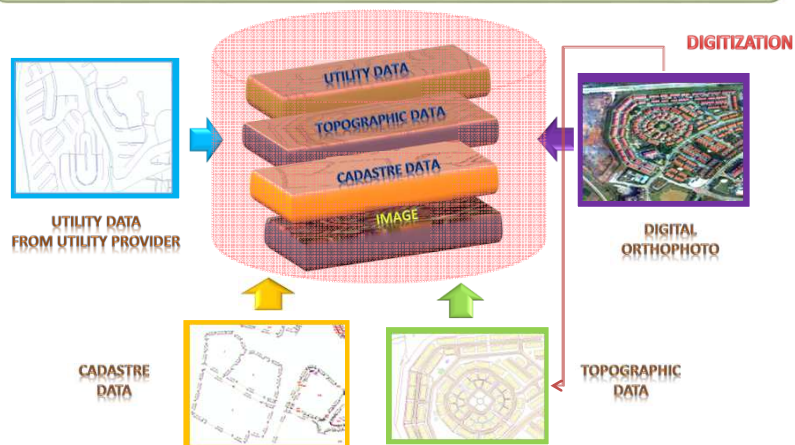
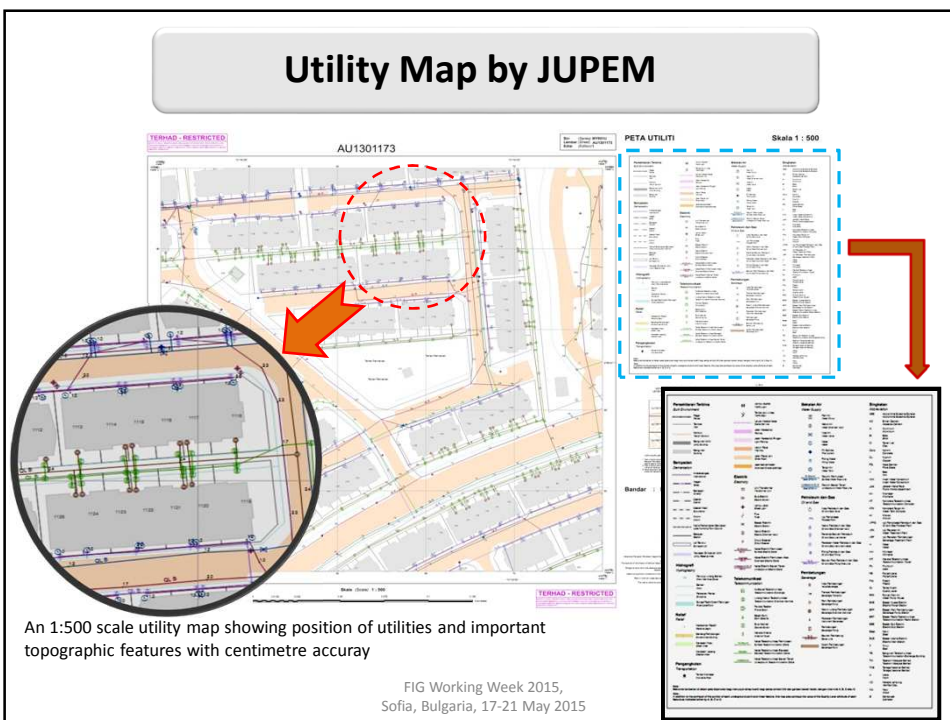


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Utility Map by JUPEM



An 1:500 scale utility map showing position of utilities and important topographic features with centimetre accuracy

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Managing Underground Utility Mapping Activities

- JUPEM collaborates with utility providers and related agencies to ensure an orderly management of utility data.
- Specification, standards and guidelines in Utility Mapping to allow standardization vital for data sharing.
- Several Circulars produced by JUPEM:
 - 2006 Guidelines for Underground Utility Mapping
 - 2007 Guidelines for utility surveying and detection
 - 2013 Guidelines for surveying of New Utility Installation



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UTILITY MAPPING GUIDELINES

- Circular KPUP 1/2006 – describes the roles of stakeholders, quality levels in utility mapping, way of obtaining utility information, deliverables and the national underground utility database (PADU) maintained by JUPEM.
 - Circular KPUP 1/2007 – provides surveyors with the recommended technique and practice for the execution of utility detection for quality level A and B.
 - Circular KPUP 1/2013 – provides surveying procedures for installation of new underground utility.

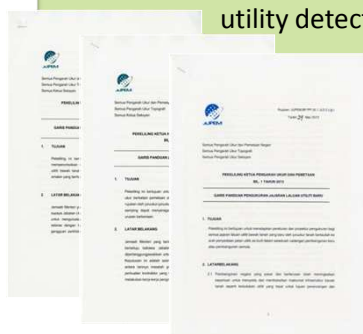
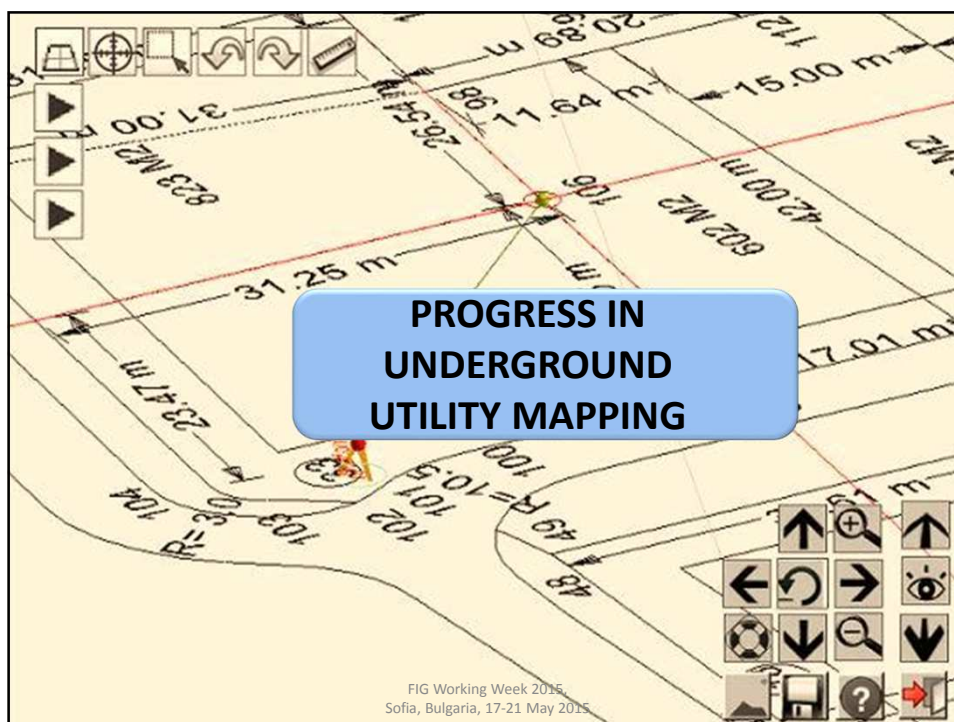


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Quality of Utility Data

- Getting accurate data from utility providers remains the biggest challenge.
- Data quality varies based on providers specification.
- Comparison made with field verification shows large positional differences.
- Mainly due to data kept comprise of proposed/design/schematics plans rather than as-built plans where survey are not required during installation

**Data
Quality**

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EQUIPMENT AND TECHNOLOGY

- Available technology has accuracy limitation and requires skilled operators and knowledgeable personnel to analyse the results.
- The different type of detection equipment (EML & GPR) have its advantages and disadvantages in the form of:
 - Equipment Cost
 - Capabilities and Limitations
 - Size
 - Etc.
- Proper equipment calibration required.



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GROUND PENETRATING RADAR (GPR)

- To detect all type of utilities.
- Requires expert knowledge in interpreting the GPR profiles or tomographic images

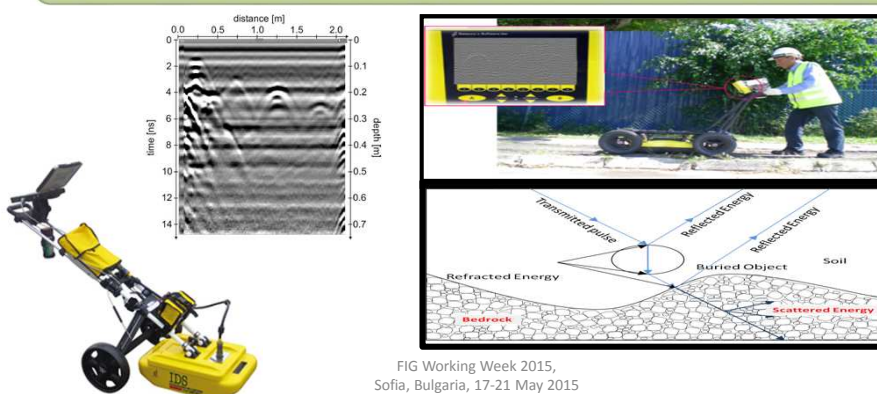
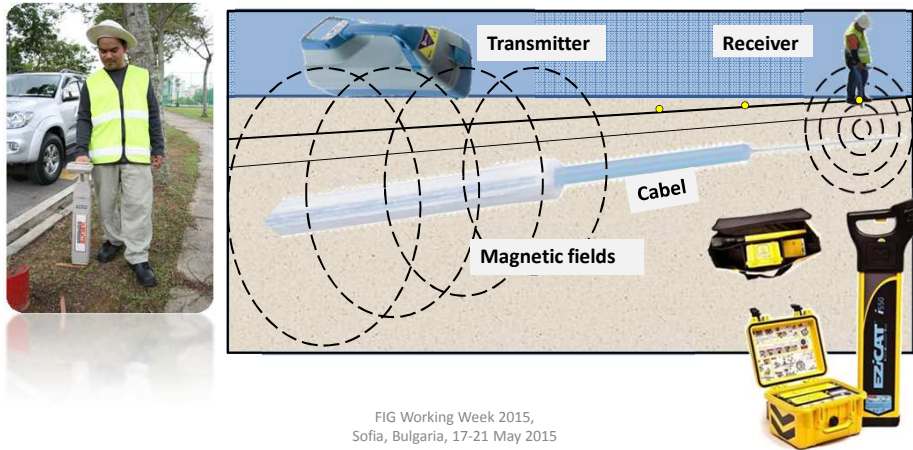


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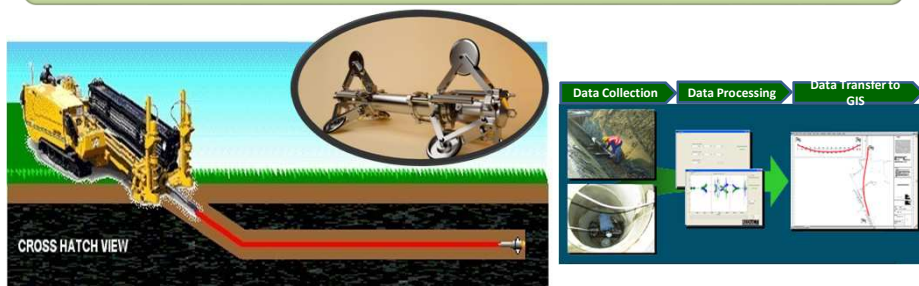
ELECTROMAGNETIC LOCATOR (EML)

- Limited to detecting utilities made of metal



Gyro-Based Inertial System

- For detection of utilities installed using Horizontal Directional Drilling (HDD) a gyro-based inertial measurement system is recommended before the utility is installed
- Could be done during the drilling or before installation of utility



GPR Calibration Facility

- Appropriate testing and calibration of GPR equipment is necessary to maintain data integrity
- In the latest development - JUPEM is building an indoor build-for-purpose GPR Testbase where equipment are tested in a controlled environment.



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Location of GPR Calibration Facility

- Located within JUPEM Complex in Kuala Lumpur

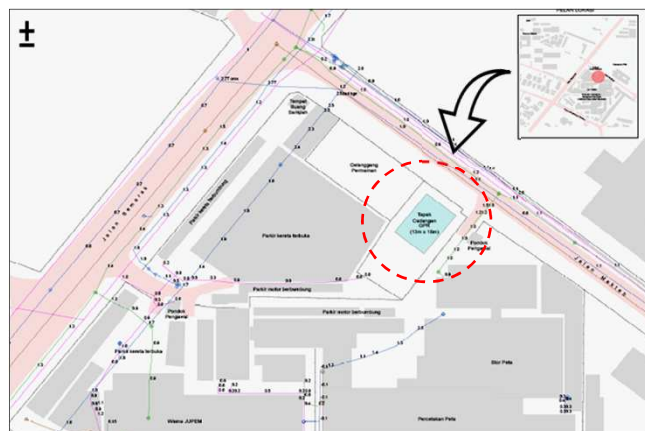
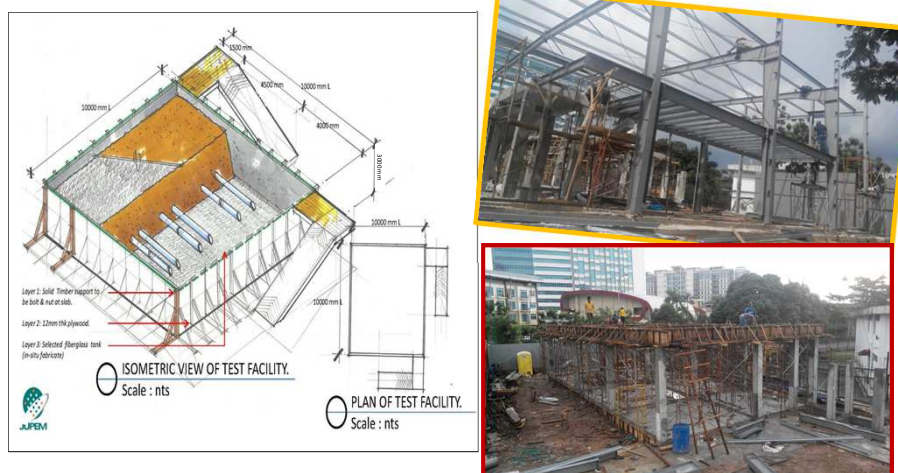


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Design of GPR Calibration Facility



Legislation On Underground Utility Mapping

- Regulatory bodies governing utility providers, eg. Malaysia Communication & Multimedia Commission (MCMC) and National Water Services Commission (SPAN) have own requirements and guidelines
- However there is lack of legal requirement to provide sharing of accurate data
- Difficulties is usually attributed to collecting, sharing, contributing and maintaining of data



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National Repository for Underground Utility Data

- There is no national repository body sanction by law for safe keeping of utility data
- Utility mapping is the responsibility of every utility provider.
- JUPEM (through the cabinet decisions) is given the responsibility of compiling and managing underground utility data from providers for the purpose of data sharing thereby acting as national repository centre.

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Available Acts

- No specific Act governing utility mapping
- However power is given to the local government to impose condition necessary under Street, Drainage and Building Act 1974 but silent on mandatory requirement for utility mapping
- Condition set by local government such as submission of “as-built survey plan” upon completion of any project can become a good source for updating but there is no requirement to provide the information to a any repository centre.

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Latest Government Decision On Underground Utility Mapping

- A decision by the National Council for Local Governments on 18th September 2014:
 - All new underground utility installed using open trenching must be surveyed during instalation.
 - An Accurate positioning method must be used when installing using HDD method.
 - Needs for engagement of qualified surveyors for surveying work and for producing digital utility data and as-built plan.
 - A copy of the digital data must be submitted to JUPEM for updating on PADU.
 - The requirement to become part of the approval criteria in the Development Order.

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Accreditation and Role of Qualified Land Surveyors

- LLS will be involved directly in:
 - Survey of newly laid utilities before they are covered.
 - Preparation of as-built plan (this will also include detected utilities if any).
 - Submission of plan to JUPEM.



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Standard Rates For Utility Mapping

- A new standard rates have been introduced for utility detection work and as-built survey during utility installation.



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STANDARD CODES & MARKING

- The latest revision on Malaysian Standard 1759 – Geographic Information/Geomatics Feature and Attribute Codes allows inclusion of more features for better data sharing amongst users.
- A new guidelines on standard markings and colour codes to depict the location of all underground utilities at site has been introduced.

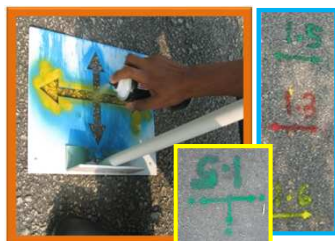


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COMPETENCY IN UTILITY MAPPING

- LLS or utility players must keep abreast with latest knowledge on:
 - Equipment for detection and surveying
 - Techniques used and equipment limitation
 - Coordinate systems
 - Understand of existing laws and regulations.
 - Understand health and safety aspect as require under the Occupational Safety and Health Acts (OSHA, 1994) :

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SHORT COMPETENCY COURSES AND ACCREDITATION

- To mitigate the shortage of experts in Utility Mapping:
 - On-going short professional courses leading to certificate of competency in utility mapping is being conducted by Land Surveyors Board (LJT) for the licensed land surveyors yearly.
 - Current number of Qualified Surveyors with competency certificate is approximately 79.



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Education, Capacity Building and Researches

- Effort made to create interest by introducing subject at tertiary level educations:
 - Introduced as part of syllabus for geomatic undergraduate studies at UiTM and USM and master program at UTM.
- On-going activities by Professional body in collaboration with universities in conducting training and research on:
 - Technical aspect
 - Policy and law



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3D Utility Mapping

- JUPEM is investing in 3D mapping of underground utility
 - This allows depiction from 3D perspective
 - Allows informed and intelligent decision making and planning

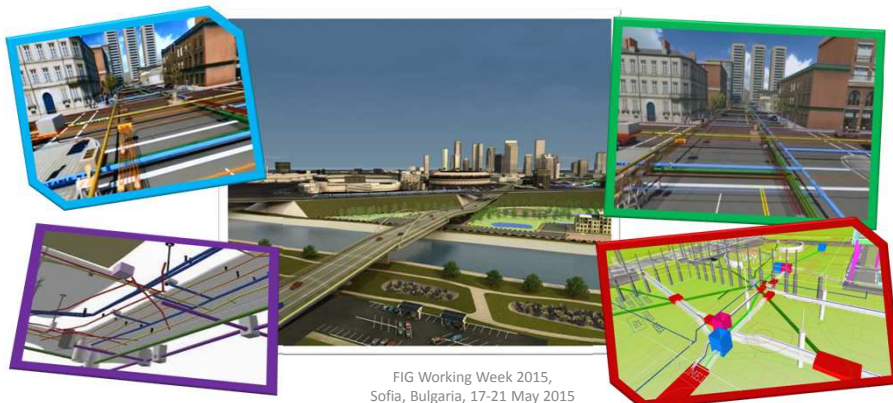


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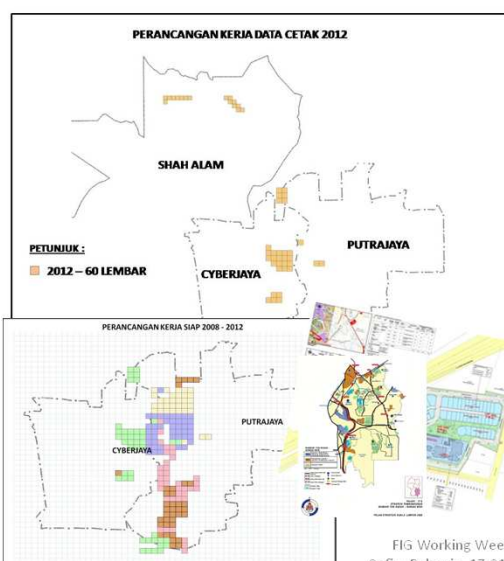
Progress in Utility Data Collection



- Data collected from utility providers for whole of Klang Valley completed for the following utilities:
 - Water
 - Sewerage
 - Electricity
 - Gas
 - Telecommunication

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Progress in Utility Data Detection



- Utility detected by JUPEM covering the following districts in the Klang Valley:
 - Putrajaya, Cyberjaya, Petaling Jaya, Shah Alam, Subang Jaya and Kajang
 - A total of **815.8 Km** completed
- Utility Map produced by JUPEM – **296 Sheet**

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Going Beyond Klang Valley

- JUPEM has expanded its underground utility activities nationwide.

- The initial role of the JUPEM at each state is to accept all as-built plan submitted by LLS, populate and manage the database at state level.

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CONCLUDING REMARKS

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Concluding Remarks

- National Underground Utility Mapping Database will be the basis for National Data repository for underground utility.
- The decision by the National Council for Local Governments enabled JUPEM to obtain accurate and quality data from development projects under the jurisdiction of Local Councils where:
 - All new utilities must be surveyed during installation.
 - A copy of the as-built plan forwarded to JUPEM for safe keeping and future references.

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Concluding Remarks

- Accuracy and quality of data obtained with the involvement of professional land surveyors as stipulated in the latest guidelines.
- The survey work is classified under the Professional Services with standard rate available for both detection and survey works.
- JUPEM is spearheading utility mapping for the country with plans for nationwide expansion.

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Thank you for your attention

