

パレスチナ自治区
パレスチナ水利庁
ジェニン市役所

パレスチナ
ジェニン市水道事業実施能力強化
プロジェクト

プロジェクト業務完了報告書
(別冊資料編 CD)

2022年10月

独立行政法人
国際協力機構 (JICA)

株式会社 TEC インターナショナル
株式会社パデコ

環境
JR
22-109

別冊資料編 CD リスト

No.	資 料	英語	アラビ ア語
1.	マニュアル、ガイドライン、資料		
1.1	Procedure Manuals for major tasks of Customer Service Management Activities	1.1.1	1.1.2
1.2	Report on Mobile Billing System (MBS) for Jenin Municipality	1.2	
1.3	Customer Database Survey (CDS) & GIS Work	1.3	
1.4	MIS Report ‘Digital Business Transformation for Major Operations of Customer Service Management’	1.4	
1.5	Your City Water Explained Part 1, 2 and 3 (for Customer information)	1.5.1	1.5.2
1.6	Revised Water Supply Contract	1.6.1	1.6.2
1.7	Capacity Building Assessment of CSS and PR	1.7	
1.8	Collection Ratio Calculations and Charts (2017 to 2021)	1.8	
1.9	NRW Management Manual (Basic Version)	1.9.1	1.9.2
1.10	Equipment Usage Manual (Standard version)	1.10.1	1.10.2
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1.14	PPWM Booklet – for customers	1.14.1	1.14.2
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2.	報告書		
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2.3	Annual Report on Water Supply Service in Jenin Municipality for the Year 2018, June 2019	2.3.1	2.3.2
2.4	Annual Report on Water Supply Service in Jenin Municipality for the Year 2018, June 2019- Digest Version	2.4.1	2.4.2
2.5	Annual Report on Water Supply Service in Jenin Municipality for the Year 2019, March 2020	2.5.1	2.5.2
2.6	Annual Report on Water Supply Service in Jenin Municipality for the Year 2019, March 2020- Digest Version	2.6.1	2.6.2
2.7	Annual Report on Water Supply Service in Jenin Municipality for the Year 2020, March 2021	2.7.1	2.7.2
2.8	Annual Report on Water Supply Service in Jenin Municipality for the Year 2020, March 2021- Digest Version	2.8.1	2.8.2
2.9	Annual Report on Water Supply Service in Jenin Municipality for the Year 2021, August 2022	2.9.1	2.9.2
2.10	Annual Report on Water Supply Service in Jenin Municipality for the Year 2021, August 2022- Digest Version	2.10.1	2.10.2
2.11	Terminal Evaluation Report August 2021	2.11.1	2.11.2
3.	計画、ジョブ・ディスクリプション		
3.1	Water Service Management Plan 2018 – 2027 for Jenin Municipality- Initial 2018 Version – March 2019	3.1.1	3.1.2
3.2	District Service Improvement Plan (DSIP), 2019	3.2	
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注：ソフトコピーのみを付属資料（CD）に添付する。

別冊資料 CD

別冊資料 CD 1

マニュアル、ガイドライン、資料

別冊資料 CD 1.1

**Procedure Manuals for Major Customer Service
Management Activities**

別冊資料 CD 1.1.1 English Version



Jenin Municipality

Project for Strengthening the Capacity of Water
Service Management in Jenin Municipality
(WaSIP)

Procedure Manual

for Major Operations of Customer Service Management

December 2021



Japan International Cooperation Agency
وكالة التعاون الدولي الياباني

Use of the manual:

This manual has been developed by the Municipality of Jenin, Water and Wastewater Department in 2020, under the Project for Strengthening the Capacity of Water Service Management in Jenin Municipality, funded by JICA (Japan International Cooperation Agency).

The manual is intended primarily for the municipality managers and technicians in-charge of the customer service management of the urban drinking water.

The aim of the manual is to serve as a procedural guide for strengthening the operational capabilities required of the concerned personnel to operate activities related to customer service management.

This manual provides procedures for the following activities practice by the Customer Service Section of the Water and Wastewater Department at the Jenin Municipality:

1) Examination of Water Meters with Zero or Minimum Monthly Consumptions

(page 3)

The purpose of this activity is to examine the reasons some water meters have a recorded zero or minimum consumption of water on the customer database system (AlShamel in case of the Jenin Municipality) i.e. past 6 months. A field visit of the water meter is necessary for the examination of the water meters and the customer status. The possible reasons could be:

- i. The customer's building is still under construction though has a registered water meter,
- ii. There is no water supply by the JM thus no consumption,
- iii. Customer receives water from private well,
- iv. The water meter is broken,
- v. The customer is not using the water meter i.e. they are away from the city or the house is not occupied by tenant or owner,
- vi. Illegal use,
- vii. The water meter had wrong readings by the JM,
- viii. No water meter on the site (which resulted readers to record as zero or minimum consumption).

2) Examination of Potential Illegal Connections

(page 6)

The aim is to periodically check for any illegal use in a selected area. The selected area can be chosen randomly or cover the whole city.

3) Random Check of the Installed PPWMs

(page 9)

The purpose of this activity is to check the installed PPWM meters after a certain period for any issues and malfunctions. The examination may discover issues such as:

- i. Damage of the PPWM protection box i.e. the sliding cover is broken,
- ii. Closed valves,
- iii. Uncharged PPWM cards (no consumptions),
- iv. Inactivated Lora system,
- v. Brocken or damaged PPWM,
- vi. Unsealed PPWM box,

- vii. Illegal connections,
- viii. Issues with the installation of PPWM by the subcontractor.

4) Preparation of Customers; Door-to-Door Visitation of Customers Prior to PPWM Installation *(page 13)*

The main purpose of this activity is to increase the acceptance of customers for replacement of PPWM and to avoid objections on the installation day.

At the door visits, the activity ensures:

- i. To provide details how PPWM works, purchasing PPWM credit, maintaining PPWM and report damage, etc. (a preliminary training on use of PPWM)
- ii. To distribute related usage manuals with detailed written instructions.
- iii. To confirm customers understanding of the PPWM and their questions are answered before the installation day.
- iv. To explain PPWM installation schedule a couple of weeks before the installation and if any customers would have a preference of a different installation day (on a case base)
- v. To pinpoint possible difficult/disagreed customers and obtain their consensus for PPWM installation before the installation day.

5) Monitoring of Bill Collection Ratio; Preparation of Necessary Data and Calculation of Ratio *(page 18)*

The main purpose of this activity is to calculate the collection ratio, on a monthly basis, for the monitoring purpose. The ratio monitoring helps the Customer Service Management and the WWD have a close look at the status of the collection ratio and the steps would need to be taken to improve the ratio for the entire city and/or for certain areas.

6) Collection Campaign; Soft Approach *(page 22)*

The purpose of this activity is to approach debtors especially those customers with 24h/7d or fairly good water supply who fail to pay their billed fees and have high amount of debts. The activity is based on a soft approach for collection and a settlement plan can be set if necessary and requested by the customers. Several follow up sessions are needed to ensure customer commitment to the payment.

7) Public Relations Activities *(page 26)*

The manual provides the general steps for preparation and implementation of different PR activities. It also includes the steps for preparation and use of PR materials and cooperation with the WWD's Customer Service Section for activities on collection such as use of SMS reminders for customers with debt.

1) Examination of Water Meters with Zero or Minimum Monthly Consumptions

Activity Procedure

A. Preparation and planning

1. Set up the area of visit for minimum reading
2. Extract a list of numbers water meters with zero and minimum readings from the AlShamel database for the selected area and filter according to the following before going to the site:
 - 1) Building status (e.g. under construction); if under construction then no need to visit
 - 2) Water supply status; no need to visit if the area has no water supply or has minimum supply
 - 3) Usage category (e.g. commercial), etc.
3. Set up visit schedule, team members, transportation, support materials
 - a) Suggested team members: Head of Customer Service section, a support staff, technician
 - b) Suggested time: Weekdays mornings when it is expected that customers are present at home
4. Accompanied documents
 - a) List of the filtered customers including their name, water meter number, subscription number, last month meter reading
 - b) Hard copy of reading history in past year
 - c) Request letter/form for change of meter/major repair of meter by the stated deadline; JM keeps a copy
 - d) Notice form if meter is taken off for minor free repair (within one day) by JM on the visiting day, if customer agrees; JM keeps a copy
 - e) If customer does not agree his meter to be taken off for minor free repair within a day, a notice letter should be hand to customer to bring the meter by himself to WWD for a free repair by the stated deadline; JM keeps a copy
 - f) In case of just simply a wrong reading, prepare the new bill manually and hand it to the customer to pay by a stated deadline.
 - g) Map of the visiting area with the customer locations (water meter locations)
5. Set up follow up person(s)
 - a) Suggested team member: a staff specifically assigned for the follow ups:
In case if customer was requested to change/repair by themselves: 1st follow up visit to check if the meter is repaired or changed after two weeks. If not repaired/changed, the 2nd follow up visit should be conducted after two weeks. If not repaired at the final follow up, the customer will be referred to JM for further action like illegal usage, etc.
 - b) In case if customer's meter was taken off by JM on same day for minor changes; follow up with the maintenance office has completed the procedure in one day and that if the meter is installed back.
 - c) In case customer was requested to bring the meter to the WWD for the minor repair, 1st follow up by one week after the stated deadline with WWD if the customer has visited. If not, if customer has not visited WWD for the minor repair, 2nd letter should be handed in as a warning with new deadline for two weeks. In the 2nd follow up in two weeks, if customer has not repaired by the new deadline, the customer will be referred to JM for further action like illegal usage, etc.
 - d) Follow up after two weeks if the bill is paid by the customer for the wrong reading cases. If not, refer the customer to the collection unit for further follow up.
 - e) All follow ups should be documented and recorded.

B. Visiting day

6. Purpose: to check the meters and the situation of meters
7. Approach: Soft approach to discuss the situation with the customer; explain the reason of the visit, and the findings, and discuss what JM is going to do and what the customer responsibility is according to the findings.
8. Method: Door-to-door visits
9. Check the meter and read it.
10. Keep a note of the visited houses, the meter situation and the reasons for minimum reading, and keep notes for follow up with customers case by case situations.
11. Take actions as needed:
 - a) Repair the meter by the technician, if possible, on the site
 - b) Take meter off to be repaired for minor issues for free at the WWD and return within a day, if customer agrees. If not agree, set up a deadline by when the customer should bring the meter to WWD for minor repair for free.
 - c) Hand in a request letter to the customer to change the meter if not repairable by a set deadline on the customer cost.
 - d) Estimation of consumption difference and issue manual bill on the site in case of wrong reading.



0- meter reading visit- broken meter and new meter after replacement

C. After the visits

12. Finalize the notes on the recorded cases
13. Prepare a list of customers for 1st follow up whom meter was taken off on visiting day to be repaired for free at WWD and be re-installed next day. Take immediate actions if JM failed to re-installed
14. Prepare a list of customers for 1st follow up who were requested to bring meters for minor repair to WWD
15. Prepare a list of customers for 1st follow up who were requested to change their meters by deadline
16. Update the new readings on AlShamel in case on wrong readings
17. Update payments, phone numbers or any other customer information like water meter number, etc. on AlShamel. If possible, record the notes in AlShamel's new version

D. 1st Follow up

After two weeks

Approach: soft approach by visiting/call as follow up or reminder

18. Check with WWD if customers brought their meters for minor repair at WWD
19. Visit customers who were requested to change their meters by deadline

- 20. Follow up if the new readings on AlShamel were updated in case on wrong readings
- 21. Update phone numbers or any other customer information like water meter number, etc.
- 22. Record the responses and prepare a list of customers for 2nd follow up.

E. 2nd Follow up

After two other weeks- in case the first follow up is failed

Approach: firmer approach by delivering a written notice with deadline to the customer

- 23. Check with WWD if customers brought meters for minor repair to WWD; if not, send warning letter with new deadline.
- 24. Visit customers who were requested to change their meters by deadline; if not, send warning letter with new deadline.

F. 3rd Follow up in case of no response after the notice

Approach: introduce to JM for illegal usage procedure

- 25. In case of no actions from customers, prepare a list of customers for JM for more actions.



Inspection of Minimum Readings Plan

Total Customers:		Door-to-Door visit date: MM/DD/YY		
Approach	Soft approach to inspect meters with minimum reading and the reasons, take proper actions			
Teaming/Transportation				
Members		Surveyed customers per day	Other tasks	Accompanied documents
Team members	JM: Head of Customer Service, Customer Service Staff, Technician	Depends on the area of visit and the number of cases	Updating any discovered customer data in Al Shamel	1) Map 2) Reading history 3) Request forms 4) Manual bill
Transportation		As needed		

Sample Mapping of the Location of Water Meters with Zero Readings
Marah Saad Neighborhood (15 customers)



Sample Written Notice

/ 2019

إخطار بالحضور لدائرة المياه

نرجو من حضرتكم الحضور إلى دائرة المياه خلال أسبوع من استلام هذا الإخطار وذلك من أجل تصحيح وضع اشتراك المياه حسب الأصول .

*في حال عدم الحضور سيتم تحويل ملف الاشتراك إلى الشؤون القانونية .

Sample Recording Note

No.	HC.ID	Customer Name	Mobile No.	REGION	1st Visit date for	Avg. consumption	Last Reading	Current reading	Reasons	Comments
1	W4259	xxxxxxx		Marah Saad	22-10-19	0	1084	1084	The house is not inhabited, closed	
2	W9979	xxxxxxx		Marah Saad	22-10-19	0	15	15	The house is closed,the meter not exist	
3	W2511	xxxxxxx	xxxxxxx	Marah Saad	22-10-19	0	1349	1349	The meter does not count , broken	
4	W8143	xxxxxxx	xxxxxxx	Marah Saad	22-10-19	0	1496	1496	The meter does not count , broken	
5	W6441	xxxxxxx	xxxxxxx	Marah Saad	22-10-19	6	3099	3099	The house is not inhabited, closed	
6	W7864	xxxxxxx		Marah Saad	22-10-19	2	1139	1139	Water is not reach	
7	W4938	xxxxxxx		Marah Saad	22-10-19	13	334	334	Water is not reach	Low pressure
8	W10417	xxxxxxx	xxxxxxx	Marah Saad	22-10-19	0	30	30	The meter does not count , broken	
9	W10815	xxxxxxx		Marah Saad	22-10-19	3	15	15	Water is not reach	
10	W8839	xxxxxxx	xxxxxxx	Marah Saad	22-10-19	2	491	491	The meter does not count , broken	High pressure
11	W9904	xxxxxxx		Marah Saad	22-10-19	0	63	63	The house is not inhabited, closed	
12	W6673	xxxxxxx		Marah Saad	18-11-19	0	838	838	The meter does not count, broken	
13	W6639	xxxxxxx		Marah Saad	18-11-19	0	1451	1453	Water is not reach	
14	W900183	xxxxxxx		Marah Saad	18-11-19	0	1203	1203	The meter does not count, broken	
15	W7609	xxxxxxx		Marah Saad	18-11-19	0	675	676	Consume minimum Tariff	

Sample Recorded Actions Taken and Follow up

No.	HC.ID	Customer Name	1st Follow Up		2nd Follow Up	3rd follow Up	
			2nd visit date (with official letter for replacement)	CSS Team members	Call for reminding	Action was taken by CSS	Replacement date
1	W4259	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad			
2	W9979	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad			
3	W2511	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad		Meter replacement	31-10-19
4	W8143	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad	02-11-19	Meter replacement	03-11-19
5	W6441	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad			
6	W7864	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad			
7	W4938	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad			
8	W10417	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad	02-11-19	Meter replacement	03-11-19
9	W10815	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad			
10	W8839	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad		Meter replacement	29-10-19
11	W9904	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad			
12	W6673	xxxxxxx	28-11-19	Mr. Omar & Mr. Imad	09-12-19	Meter replacement	19-12-19
13	W6639	xxxxxxx	28-11-19	Mr. Omar & Mr. Imad			
14	W900183	xxxxxxx	28-11-19	Mr. Omar & Mr. Imad		Meter replacement	09-12-19
15	W7609	xxxxxxx	28-11-19	Mr. Omar & Mr. Imad			

2) Examination of Potential Illegal Connections

Activity Procedure

A. Preparation and planning

1. Set up the area of visit for illegal connection inspection
2. Extract the customers from the AlShamel database for the selected area.
3. Set up visit schedule, team members, transportation.
 - a) Suggested team members: Customers service staff, a support staff, technician
 - b) Suggested time: Weekdays mornings.
4. Accompanied documents
 - a) List of the customers including their name, water meter number, subscription number.
 - b) Map of the visiting area with the customer locations (water meter locations)
5. Accompanied equipment.
 - a) Camera for take photos to document the illegal cases.
 - b) Spanners to remove the customer meter in case an illegal connection has been found.
 - c) Some fittings to close the pipes or water source in illegal use case.

B. Visiting day and the actions taken in the same day

6. Purpose: to check if there is any illegal use in the selected area.
7. Map of the visiting area with the customer locations (water meter locations)
8. Check the connection if it was legal or illegal.
9. Closure the pipeline or the water source in case the illegal use.
10. Take some photos of the illegal connection and of the site in general.

C. After the visits

11. The visitor (CSS staff) will fill the illegal use's report in the office after visit and sign it with his name.
12. Extract the customer data (consumption and bills) for last years.
13. Estimate the consumption difference from the beginning of illegal use and put 1000 JD as a penalty of illegal use.
14. Send the last documents with photos to the WWD head.
15. WWD head approve the report and send it directly to the legal unit in Jenin municipality and recommend to take strict and quick actions.
16. If the customer refuses to respond or cooperate, the Legal unit will transfer the customer file to the Court for more actions.

Sample: Illegal Use Report to Jenin Municipality

 **دولة فلسطين**
وزارة الحكم المحلي
بلدية جنين
قسم المياه والصرف الصحي



ضبط مشترك
حضرة السيد مدير قسم خدمات المشتركين لدائرة المياه - المحترم

الموضوع : ضبط مشترك

تعلمكم أنه في يوم : _____ الموافق : / / ٢٠١٠ م تم ضبط

السيد : _____

صاحب المشترك رقم : _____

يقوم بالاستفادة من شبكة المياه بطريقة غير قانونية ، نرجو اتخاذ الاجراءات القانونية بحقه .

فني مياه لوجي _____ فني مياه لوجي _____

مسؤول الحماية الميدانية _____

Sample Discovered Illegal Connections of the Mechanical Meters



3) Random Check of the Installed PPWMs

Activity Procedure

A. Preparation and planning

1. Set up the area of visit for random check
2. Extract the customers from the AlShamel database for the selected area.
3. Set up visit schedule, team members, transportation.
 - a) Suggested team members: Customers service staff, a support staff, technician
 - b) Suggested time: Weekdays mornings when it is expected that customers are present at home
4. Accompanied documents:
 - a) List of the customers including their name, water meter number, subscription number, and the date of last charge.
 - b) Hard copy of the check list which include the following for the check:
 - i. PPWM situation (Working well or not)
 - ii. PPWM's box.
 - iii. PPWM's valves.
 - iv. The date of the last charge, in case last charge was from long time the visitor have to know the reasons.
 - v. PPWM's sealing.
 - vi. Activating the Lora.
 - c) Notice form if meter is taken off for minor free repair (within one day) by JM on the visiting day, if customer agrees; JM keeps a copy
 - d) If customer does not agree his meter to be taken off for minor free repair within a day, a notice letter should be hand to customer to bring the meter by himself to WWD for a free repair by the stated deadline; JM keeps a copy
 - e) Map of the visiting area with the customer locations (water meter locations)
5. Set up follow up person(s)
 - a) Suggested team member: a staff specifically assigned for the follow ups:
 - b) In case if customer's meter was taken off by JM on same day for minor changes; follow up with the maintenance office has completed the procedure in one day and that if the meter is installed back.
 - c) In case customer was requested to bring the meter to the WWD for the minor repair, 1st follow up by one week after the stated deadline with WWD if the customer has visited. If not, if customer has not visited WWD for the minor repair, 2nd letter should be handed in as a warning with new deadline for two weeks. In the 2nd follow up in two weeks, if customer has not repaired by the new deadline, the customer will be referred to JM for further action like illegal usage, etc.
 - d) All follow ups should be documented and recorded.

Sample Mapping of Meter Locations:
Nazareth Street Visits (15
Customers)



B. Visiting day

6. Purpose: to check the meters and the situation of meters
7. Approach: Soft approach to discuss the situation with the customer; explain the reason of the visit, and the findings, and discuss what JM is going to do and what the customer responsibility is according to the findings.
8. Method: Door-to-door visits
9. Check the meter and read it.
10. Fill out the check list after checking all items.
11. Take actions as needed:
 - a) Repair the meter by the technician, if possible, on the site
 - b) Take meter off to be repaired for minor issues for free at the WWD and return within a day, if customer agrees. If not agree, set up a deadline by when the customer should bring the meter to WWD for minor repair for free.

C. After the visits

12. Finalize the notes on the check list paper.
13. Prepare a list of customers for follow up whom meter was taken off on visiting day to be repaired for free at WWD and be re-installed next day. Take immediate actions if JM failed to re-installed.
14. Prepare a list of customers who need an action by the head of CSS if any.

Sample Illegal Connection at PPWM; before and after



Some other Illegal Connections



Actions Taken



Uncharged PPWM Check



Sealing



Randomly check

PPWM Random Check Plan

Total Customers:		Door-to-Door visit date: MM/DD/YY		
Approach	Soft approach to inspect the PPWMs and to take proper actions			
Teaming/Transportation				
Members		Surveyed customers per day	Other tasks	Accompanied documents
Team members	JM: Customer Service Staff, Technician	Depends on the area of visit and the number of cases	Updating any discovered customer data in AlShamel	1) Map 2) Customers list 3) Request forms 4) Randomly check list
Transportation:		As needed		

Sample Checklist Records

Meter #	Date of Check	Box	Valve	Charge	Lora Activate	Sealin	Region	Notes
W10002	Dec-19	k	k	k	k	k	NSt	
W10153	Dec-19	k	k	k	k	Issue	NSt	
W10167	Dec-19	k	k	No	k	Issue	NSt	No water
W10199	Dec-19	k	k	k	k	k	NSt	
W10443	Dec-19	Issue	k	k	k	Issue	NSt	
W10466	Dec-19	k	k	k	k	Issue	NSt	
W10490	Dec-19	k	k	k	k	k	NSt	
W1105	Dec-19	k	k	No	k	k	NSt	No water
W1204	Dec-19	k	k	No	k	Issue	NSt	Abounded house
W208	Dec-19	k	k	k	k	k	NSt	
W3490	Dec-19	k	k	k	k	k	NSt	
W4244	Dec-19	k	k	No	k	k	NSt	Private well
W4622	Dec-19	k	k	k	k	k	NSt	
W4694	Dec-19	k	k	k	k	k	NSt	
W5406	Dec-19	k	k	k	k	k	NSt	
W5458	Dec-19	k	k	k	k	k	NSt	
W5463	Dec-19	k	k	k	k	k	NSt	
W5498	Dec-19	k	k	k	k	Issue	NSt	

Sample Recording Table to Report to Head of CSS

PPWM Random Check - Monthly Activity - CSS						
Issues	Dec-19			Jan-20		
	Total	# of Cases	Status	Total	# of Cases	Status
Box issues	47	1	Top part was removed.	60	2	Brocken, slide issue
Valves issues		0			0	
Meter uncharged		11	They use private well or no consumption (no illegal use found.)		6	They use private well. (no illegal use found.)
Lora not activated		0			0	
Meter is broken						
Box not sealed		12			0	
Total		24			8	

4) Preparation of Customers; Door-to-Door Visitation of Customers Prior to PPWM Installation

Activity procedure

A. Preparation and planning

1. Set up the area of visit for PPWM pre-installation
2. Extract customers from the AlShamel database for the selected area.
3. Prepare hardcopy map of the visiting area using GIS map of the CDS activity
4. Prepare questionnaire form and PR materials including the PPWM booklet, vending station (VS) location and service time.
5. Prepare PR materials such as PPWM booklet, VS time/schedule.
6. Set up the visit schedule, team members, transportation, support materials
 - a) Suggested team members: PR staff.
 - b) Suggested time: Weekdays mornings when it is expected that customers are present at home
7. Accompanied documents
 1. List of the customers including their name, water meter number, subscription number.
 2. Hard copy of questionnaire form and PR materials including the PPWM booklet, VS location and service time.
 3. Map of the visiting area with the customer locations (water meter locations)

B. Pre-Installation Plan (Pre-Installation Questionnaire (Form 1))

8. To explain PPWM installation in- person by door-to-door visits.
9. To hear customer's opinion or expectation on the PPWM installation schedule/time/day.
10. To pinpoint possible difficult/disagreed customers and obtain their consensus before installation day.
11. The collected data will be scanned and recorded in GIS format for location base storing of the collected data.

C. Preliminary customer training on proper use of PPWM (Instruction Checklist (Form 2))

12. To provide details how PPWM works, credit charge, maintaining PPWM and damage report, etc.
13. To distribute related usage manuals with detailed written instructions.
14. To ensure that the customers understand the PPWM and their questions are answered before the installation day.

Note:

※ The final readings (**Form 3**) also needs to be filled out by the PPWM installation team on the same day of the installation.

※ A few months after the PPWM installation, a post-installation questionnaire (**Form 4**) will be also conducted in order to evaluate the public satisfaction of the PPWM. A separate team will be organized to conduct the questionnaire by the 30% of the installed customers as a sample for measuring the customer satisfaction after use of PPMW.

(Work period, workload, team, and staff recruitment)

Required period and workload		Estimated pre-installation questionnaire time for each customer: 0.5 hour	
Teaming/Transportation			
Members		Customers per day	Other tasks
Team 1	1) JM PR Staff: 2 PR staff	6 to 8 customers (10am to 14pm)	Initial training, filling out forms 1 and 2 on the field, taking photos, pinpoint absent/disagreed customers for re-visits
Team 2	1) JM PR Staff: 2 PR staff	6 to 8 customers (10am to 14pm)	Initial training, filling out forms 1 and 2 on the field, taking photos, pinpoint absent/disagreed customers for re-visits
Data entry	Assistant PR	18- 24 customer data entry daily (8am to 4pm)	Data entry in GIS, scanning, photo filing, tabulating data
Transportation		JM Car	

Pre-Installation Questionnaire (Form 1)

Customer ID/ House ID / Name of Interviewee Phone Number Date of Interview Name of Neighborhood:
<p>1. About PPWM Project</p> <p>1.1 Have you heard that JM is going to install PPWM for your area? Yes <input type="radio"/> No <input type="radio"/> If Yes: from JM <input type="radio"/> neighbors <input type="radio"/> Community leaders <input type="radio"/> project activities in the area <input type="radio"/> other <input type="radio"/></p> <p>1.2 The water meter of your premise will be replaced with PPWM by JM. Do you have any comments? Positive comments <input type="radio"/> Negative comments <input type="radio"/> Indifferent comments <input type="radio"/> No comments at all <input type="radio"/> Details of the comment:</p>
<p>2. PPWM Device</p> <p>2.1 Do you know about these types of PPWMs: PP Velocity: Yes <input type="radio"/> No <input type="radio"/> Some extent <input type="radio"/> PP Volumetric: Yes <input type="radio"/> No <input type="radio"/> Some extent <input type="radio"/> PP Ultrasonic: Yes <input type="radio"/> No <input type="radio"/> Some extent <input type="radio"/></p> <p>✘Interviewer: Please explain about each type briefly after the answer as below: <u>PP Velocity:</u> 1) With mechanical parts, it can be damaged. 2) The accuracy is reduced according to age. 3) Air is counted even though it does not likely affect the measurement. 4) Cheaper <u>PP Volumetric:</u> 1) Dirt problems are severe. 2) Air is counted even though it does not likely affect the measurement. 3) Cheaper <u>PP Ultrasonic:</u> 1) Water with air and air bubble is not measured. 2) Without mechanical parts, life is longer. 2) It is less likely to be blocked by any dirt or sand particles. 3) More expensive</p> <p>2.2 PP Ultrasonic is been selected as the best choice and will be installed in your premise. After hearing the comparison, do you understand why it is the best choice? I understand that Ultrasonic is the best choice <input type="radio"/> I need more explanation <input type="radio"/></p> <p>3. PPWM Implementation</p> <p>3.1 What is your expectation of JM at any stage of the replacement:</p>

a. Time of the replacement: Weekday Weekend Morning Time Afternoon Time Evening Time

b. Woman in the replacement team: No need Needed

4. PPWM Charge and Use

✘Interviewer: Please explain how to use PPWM and the charging card and locations based on the instruction material.

4.1 After explaining, do you understand now how to use the PPWM/card and charging the card? Yes No

4.2 Where do you prefer to charge your prepaid card? ✘Multiple answer is OK.

JM AlJalil supermarket on the street Haifa St. charge center Downtown charge center Other

5. PPWM PR Activities

5.1 What method you would like to be reached for the PPWM project information?

Public meetings workshops door to door JM website Phone call SMS Neighborhood committee Social Media Others




6. Satisfaction

6.1 What factors will make you satisfied with the PPWM installation procedure?






Sampl Survey Map

PPWM Pre-Instruction Checklist (Form 2)

<p>Team #:</p> <p>PPWM Instruction Checklist (Form 2)</p> <p>Date of Installation/Replacement: (mm/dd/yy)</p> <p>Customer ID/House ID:</p> <p>Neighborhood: <u>Khroube</u> <input type="radio"/> <u>Sobah Alkheir</u> <input type="radio"/> N. Street</p> <p>Address in the neighborhood</p> <p>Name of the Water Meter Owner:</p> <p>New PPWM No.:</p> <p>Customer Phone Number:</p>	 <p>“Project for Strengthening the Capacity of Water Service Management in Jenin Municipality”</p>   <p>Japan International Cooperation Agency</p>																						
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%; padding: 2px;">The customer is informed:1. An introduction on the PPWM’s type, how it works, and its parts</td> <td style="width: 20%;"></td> </tr> <tr> <td style="padding: 2px;">2. Water tariff fee and PPWM ownership</td> <td></td> </tr> <tr> <td style="padding: 2px;">3. How to use the water meter and how to charge</td> <td></td> </tr> <tr> <td style="padding: 2px;">4. How to maintain the PPWM from damages, or misuse</td> <td></td> </tr> <tr> <td style="padding: 2px;">5. The initial available credit of water for first time use</td> <td></td> </tr> <tr> <td style="padding: 2px;">6. How and where to charge the card</td> <td></td> </tr> <tr> <td style="padding: 2px;">7. Where to report if notice any defect in the PPWM or malfunction</td> <td></td> </tr> <tr> <td style="padding: 2px;">8. What to do if the charging card is stolen or lost</td> <td></td> </tr> <tr> <td style="padding: 2px;">9. JM website complaint system and live chat</td> <td></td> </tr> <tr> <td style="padding: 2px;">10. Apply for different services at the PCSC</td> <td></td> </tr> <tr> <td style="padding: 2px;">11. Customer’s other questions are answered.</td> <td></td> </tr> </table>		The customer is informed:1. An introduction on the PPWM’s type, how it works, and its parts		2. Water tariff fee and PPWM ownership		3. How to use the water meter and how to charge		4. How to maintain the PPWM from damages, or misuse		5. The initial available credit of water for first time use		6. How and where to charge the card		7. Where to report if notice any defect in the PPWM or malfunction		8. What to do if the charging card is stolen or lost		9. JM website complaint system and live chat		10. Apply for different services at the PCSC		11. Customer’s other questions are answered.	
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<p>Survey Staff</p> <p>Name:</p> <p>Position:</p> <p>Signature</p>	<p>Customer</p> <p>Name:</p> <p>Signature</p>																						

Final Water Meter Reading before Replacement (Form 3)

Final Water Meter Reading before Replacing with PPWM		
<p>The final water meter reading is confirmed as below:</p> <p>Date of Reading/Replacement: (mm/dd/yy)</p> <p>House ID:</p> <p>Neighborhood: Khroube <input type="checkbox"/> Sobah AlKheir <input type="checkbox"/> N. Street <input type="checkbox"/></p> <p>Address:</p> <p>Name of the Water Meter Owner:</p> <p>Type of Regular Water Meter:</p> <p>Water Meter No.:</p> <p>Final Reading:</p> <p>New PPWM No.:</p>		
 <p style="text-align: center;">"Project for Strengthening the Capacity of Water Service Management in Jenin Municipality"</p>   <p style="text-align: center;">Japan International Cooperation Agency</p>		
<p>The following photos were also taken:</p> <p>Photo 1: Water Meter <input type="checkbox"/></p> <p>Photo 2: Water Meter showing the surroundings <input type="checkbox"/></p> <p>Photo 3: PPWM <input type="checkbox"/></p> <p>Photo 4: PPWM showing the surroundings <input type="checkbox"/></p>		
<p>Replacement Staff</p> <p>Name:</p> <p>Position:</p> <p>Signature</p>	<p>Customer (if Present)</p> <p>Name:</p> <p>Signature</p>	<p>Customer Service Section</p> <p>Name: Khaled Abu Obeid</p> <p>Position: Section Head</p> <p>Signature</p>

5) Monitoring of Bill Collection Ratio; Measurement and Preparation of Data

Activity Procedure

Collection ratio is often calculated for the entire city. However, depending on the purpose and detailed ratios for certain groups of customers, there will be collection ratios for several groups. In case of Jenin Municipality, the targets for monthly collection ratio analysis were as follow and needs some data collection and preparation at first.

Area	Total		PPWMs		Mechanical Meters		
	With Debt	Without Debt	With Debt	Without Debt	With Debt	Without Debt	Without Debt
All City							
Pilot Areas							

A. Data collection of the billed fees and collected fees

- 1) All city (for all customers).
 - a) Mechanical water meters customers:
 1. Extracted from the database of AlShamel, the data needed are the billed fees, and the paid fees with debts and without debts, for the month in which you want to calculate the collection ratio for.
 2. The amount of purchased water via private wells (delivered by water tanks) for all city customers for the same month (from Alshamel software).
 - b) PPWM customers:
 1. Extract customers data for all city from PPWM software for the month in which you want to calculate the collection ratio.
 2. The necessary data is the total purchased amounts (via the PPWM charging card) with debt deduction and without debt deducted amount.

- 2) For pilot areas or for any other particular areas (if needed):
 - a) Non-PPWM customers:
 1. Extract customers data for the targeted area from Alshamel software for the month which you want to calculate the collection ratio for. (Manually or by GIS to extract the customers of the certain area from the origin table).
Note: you have to prepare the shape file on GIS for the targeted area.
 2. The data needed are the bills amounts, the payment with debts and the payment without debts.
 - b) PPWM customers:
 1. Extract customers data for the targeted area from PPWM software for the month which you want to calculate the collection ratio. (Manually or by GIS)
 2. The data needed are the total charge amounts with debt deduction and the charge without debt deducted amount.

B. Preparation for the calculation method

- 1) Prepare the calculation table which include the following columns:
 - a) Billed month from January to December for each raw.
 - b) Total billed fees (separated by the billed fees to non PPWM customers, billed amount to PPWM customers and billed amount by the private wells called Tankers).

- c) Total collected fees separated by collected debt and without debt, also separated by the collected fees by non-PPWM customers, collected fees by PPWM customers and by the Tankers.

C. Calculations

1. All city:
 - a) Collection ratio with debts:
 1. Calculate the total billed fee for the targeted month for Non-PPWM customers, PPWM customers, and by the tankers).
 2. Calculate the total collected fees of the target month including debts (for Non-PPWM customers, for PPWM customers and by the tankers).
 3. Divide the total collected fee *including debts* by total bills.
Note: You have to remove the debts payment by PPWM customers from the total collected from non PPWM customers.
 - b) Collection ratio without debts:
 1. Calculate the total billed fee for the targeted month for Non-PPWM customers, PPWM customers, and by the tankers).
 2. Calculate the total collected fees excluding debts (by Non-PPWM customers, by PPWM customers and by the tankers).
 3. Divide the total collected fees *excluding debts* by total billed fee.
 - c) Collection ratio of debts only:
 1. Deduct the collection ratio excluding debts from the collection ratio including debts.
2. For pilot areas or for any other subareas:
 - a) Collection ratio with debts:
 1. Calculate the total billed fee for the area's customers (customer water meter numbers can be extracted manually or by joining the origin excel file on GIS for non PPWM bills and for PPWM excel file which extracted by PPWM software).
 2. Calculate the total collected fees including debts for the area customers (customer water meter numbers can be manually or by joining the origin excel file on GIS for non PPWM bills and for PPWM excel file which extracted by PPWM software).
 3. Divide the total collected fees including debts by total bills.
Note: You have to remove the debts payment by PPWM customers from the total collected from non PPWM customers.
 - b) Collection ratio without debts:
 1. Calculate the total collected excluding debts for the area customers (Manually or by join the origin excel file on GIS for non PPWM bills and for PPWM excel file which extracted by PPWM software).
 - 2) Divide the total collected excluding debts by total bills.
 - c) Collection ratio of debts only:
 1. Deduct the collection ratio excluding debts from collection ratio including debts.

Important Notes:

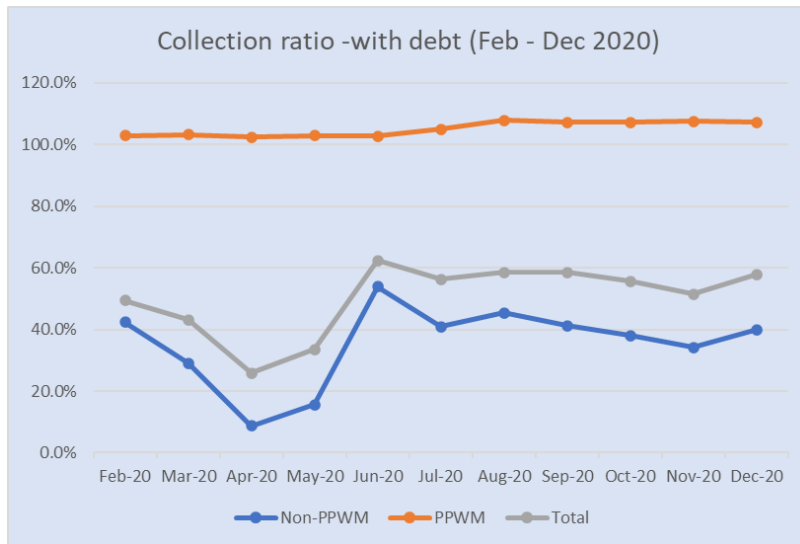
AlShamel does not separately record collection amount for 'without debt' in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December should be estimated using the average ratio of the previous 11 months (C/B= xx %).

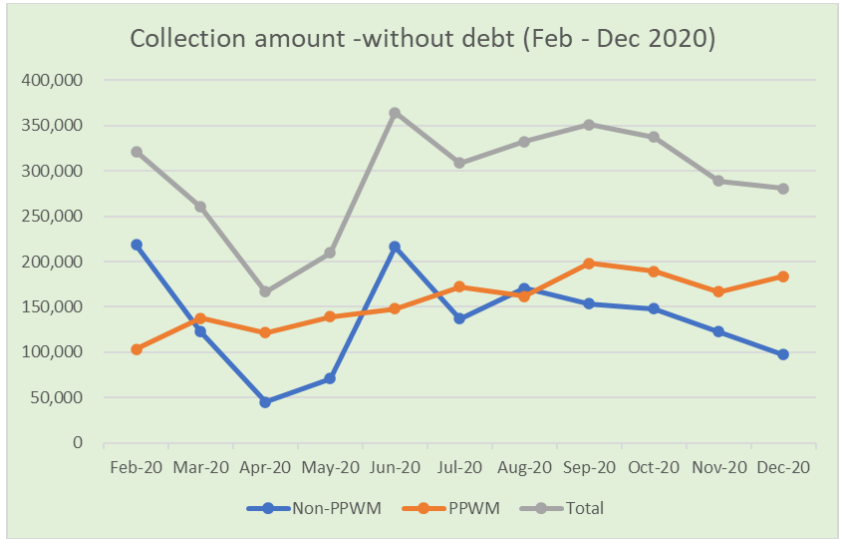
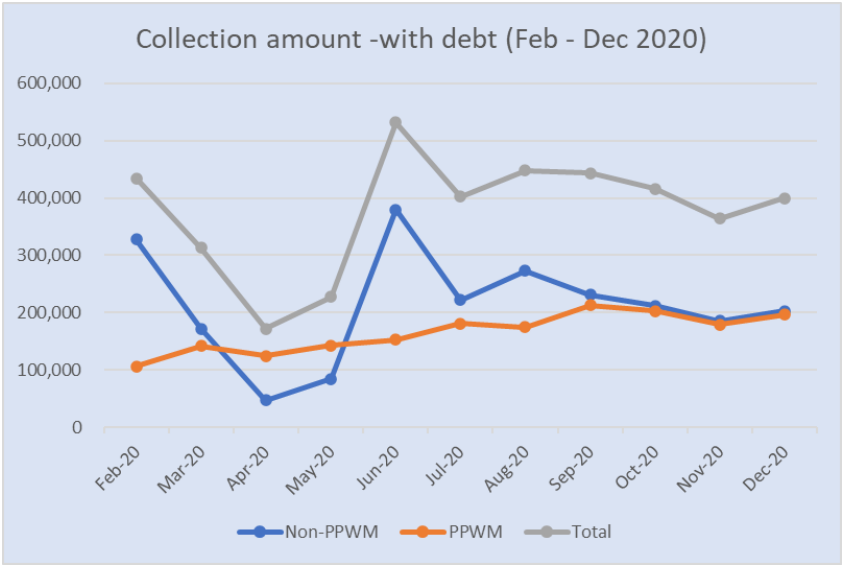
The collected amounts (including debts and excluding debts) are for the same months of bills due to using the MBS.

Sample Collection Ratio of All City for the Year of 2019 for each Month Including Debt and without Debt for PPWM Customers and Mechanical Meter Customers

Billed Month- Year (as recorded in same month in Al-Shamel)	Total Bills			Total Bills (A)	Collected including Debts			Total including debts (B)	Collected without Debts (Current Collectio			Total without debt (C)	Collection Ratio%(with debts) N=B/A	Collectio n Ratio of Debt Only D= O-N	Collection Ratio%(without debts) O=C/A
	Issued to non- PPWM customers (Alshamel data)	Issued to customers by tanker water	PPWM customers		By Non- PPWM customers (AlShamel data) (b)	By tanker water	By PPWM customers including 15% dept pay		By Non-PPWM customers (AlShamel data) (c)	By tanker water	By PPWM customers excluding 15% dept pay				
Jan-19	667661.48	4125	0	671786.5	345428.01	4125	0	349553.01	157385.44	4125	0	161510.4	52.03%	27.99%	24.04%
Feb-19	654366.66	3625	0	657991.7	342798.81	3625	0	346423.81	212547.75	3625	0	216172.8	52.65%	19.80%	32.85%
Mar-19	580546.5	3300	112.5	583959	295766.59	3300	150	299216.59	215825.51	3300	112.5	219238	51.24%	13.70%	37.54%
Apr-19	753381.52	4200	1943.94	759525.5	316857.66	4200	2390	323447.66	210525.52	4200	1943.94	216669.5	42.59%	14.06%	28.53%
May-19	577764.02	4900	5923.94	588588	279286.89	4900	6800	290986.89	193137.72	4900	5923.94	203961.7	49.44%	14.79%	34.65%
Jun-19	716088.92	7100	9681.2	732870.1	376748.12	7100	10799	394647.12	251911.23	7100	9681.2	268692.4	53.85%	17.19%	36.66%
Jul-19	634939.34	10000	23241.75	668181.1	271093.6	10000	24595	305688.6	228229.71	10000	23241.75	261471.5	45.75%	6.62%	39.13%
Aug-19	630360.94	7725	27234.7	665320.6	372518.25	7725	28587	408830.25	278504	7725	27234.7	313463.7	61.45%	14.33%	47.11%
Sep-19	700981.88	12115	49924.66	763021.5	366262.04	12115	52748.8	431125.84	296684.74	12115	49924.66	358724.4	56.50%	9.49%	47.01%
Oct-19	678321.8	10385	52270.62	740977.4	325917.11	10385	55151	391453.11	238666.75	10385	52270.62	301322.4	52.83%	12.16%	40.67%
Nov-19	908321.82	9200	53553.3	971075.1	303461.02	9200	56127	368788.02	264101.14	9200	53553.3	326854.4	37.98%	4.32%	33.66%
Dec-19	590965.38	7175	52029.22	650169.6	379785.473	7175	54480.6	441441.07	202267.7004	7175	52029.22	261471.9	67.90%	27.68%	40.22%
												Avg.	52.02%	15.18%	36.84%

Sample Analysis of Collection Ratios for with Debt, without Debt and Collected Amount for (c) with Debt and without Debt (d)





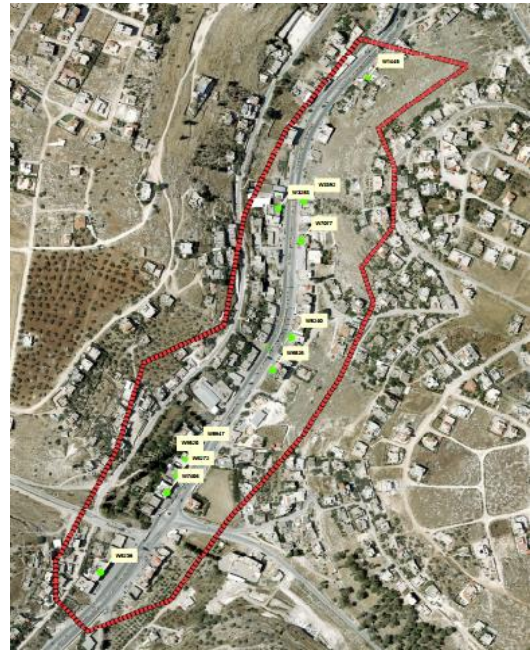
6) Collection Campaign; Soft Approach

Activity Procedure

A. Preparation and planning

- 1) Set up the area of visit based on categories
 - a) Debtors with 24/7 water who don't pay
 - b) Debtors with fairly good water supply
 - c) High debtors
- 2) Set up visit schedule, team members, transportation, support materials
 - a) Suggested team members: Head of collection unit, collector of the area, technician
 - b) Suggested time: Saturdays and after salary days
- 3) Accompanied documents
 - a) List of the debtors including their name, water meter number, subscription number, debt amount, last meter reading, last pay
 - b) Hard copy of payment history in past two or three years printed out from AlShamel
 - c) Last bill
 - d) Map of the visiting area with customer locations (water meter locations) labeled by house ID or water meter number
 - e) Hard copy receipts for when customers pay in cash on the visiting day
- 4) Set up follow up person(s)
 - a) Suggested team member: a staff specifically assigned for the 1st follow up call after two weeks, the 2nd follow up by sending notice letter with deadline, and 3rd follow up by preparing a list of not-paying customers for JM for further action like court procedure
 - b) Suggested time: call at any day during JM working hours

Sample Location of High Debtors & Debtors with Fairly Good Water Supply in Nablus Street



B. Visiting day

Approach: Soft approach to request the customer to pay the due amount in cash or by multiple checks

Method: Door-to-door visits

- 5) Keep a note of the visited houses, the collected amount from each customer, and keep notes for follow up with phone numbers
- 6) Keep a note of list of the unpaid/partially paid customers with phone number for the 1st follow up
- 7) Update the map of the visiting customer locations if needed.

C. After the visits

- 8) Finalize the record of the visited houses, the collected amount from each customer, and keep notes for follow up with phone numbers
- 9) Prepare a list of customers for 1st follow up who promised to pay

- 10) Update payments, phone numbers or any other customer information like water meter number, etc. on AlShamel. If possible, record the notes in AlShamel and GIS.

D. 1st Follow up

After two extra weeks

Approach: soft approach by phone call as follow up or reminder

- 11) Check AlShamel for any updates in the payment by customers who said they will pay
 12) In case no payments are made, follow up with the customer by phone call as a reminder.
 13) Record the responses and prepare a list of customers for 2nd follow up.

E. 2nd Follow up

In case of no response/payment after two extra weeks

Approach: firmer approach by delivering a written notice with deadline to pay

- 14) Check AlShamel for any updates in payment by customers who said they will pay in the 1st follow up.
 15) In case no payments are made, prepare a notice letter and send to customer with a deadline to pay.

F. 3rd Follow up

In case of no response/payment after the notice

Approach: introduce to JM for court procedure


- 16) Check AlShamel for any updates in payment by customers of the 2nd follow up.
 17) In case of no payment, prepare a list of customers for JM for more actions.

Sample Agenda and Plan

Total Visiting Customers		Door-to-Door visit date		
Approach		Soft approach to request the customer to pay the due amount in cash or by multiple checks		
Teaming/Transportation				
Members		Surveyed customers per day	Other tasks	Accompanied documents
Team members	Collection Unit staff, Customer Service staff, Collector of the visiting area	# of customers in one day	Updating any discovered customer data in AlShamel and GIS database	1) Map 2) Payment history 3) Last bill
Transportation		CSS Car		

Sample Notice as a Soft Approach to Request the Customer to Pay the Due Amount (in Cash or by Multiple Checks or by Installing PPWM)

إخطار سويّة لاهيّة لى دائرّة لاهيّه لى صرف لى حى



رقم ا عري زيميش ترك لاهيّه:

لعلّمك بافتوص بهدفنك الكغلو ورد (لى دب لى دج ين - نظره لى م ا) لى صه راحصه ذع دل ه
 ن خطر كم ضره دة كراي عى لى دج ين وى فاي م غل و لى م ح و ج دى دى ج لى د لى نظام ترك ب داهى وى فاي م ح و غ
 نى ك خ ل م ح ج ش ر و ك ا ك تا نغ غل ك ه ذا ا
 اى م خ ص ج .

ت ر ا د ا خ : / / 2020 م
 كك ات لى دج ين ،
 رى س بلى لى دج ين
 فلى زى فواس ال س عدى

ك اى زال لى مشرك هف ف يتر م
 اى م ح و ج س م ك اى لى دج ك ت ح
 اى خ ك ات لى شتووم د ف ر ه ل م واطن

Sample List of Visiting Customers and the Note of the Day of Visit

No.	Owne_Name	HC_ID	REGION	Last Bill/NIS	Total Debt/NIS	Visit_date	Mobile No.	Customer Impresion
1	xxxxxxx	W6236	Nablus St.	98.16	2398.28	04-12-19	xxxxx	Negative
2	xxxxxxx	W6272	Nablus St.	23.56	2427.16	04-12-19		Positive
3	xxxxxxx	W9520	Nablus St.	23	919	04-12-19		Positive
4	xxxxxxx	W8947	Nablus St.	15497.8	16436.14	04-12-19	xxxxx	Positive
5	xxxxxxx	W7406	Nablus St.	23.56	11102.7	04-12-19	xxxxx	Positive
6	xxxxxxx	W6826	Nablus St.	24.56	4280.94	04-12-19	xxxxx	Positive
7	xxxxxxx	W8240	Nablus St.	23.56	554.44	04-12-19	xxxxx	Positive
8	xxxxxxx	W1445	Nablus St.	233.68	39760.5	04-12-19	xxxxx	Positive
9	xxxxxxx	W3283	Nablus St.	54.6	3758.34	04-12-19	xxxxx	Positive
10	xxxxxxx	W3392	Nablus St.	24.06	3361.24	04-12-19		Positive
11	xxxxxxx	W7077	Nablus St.	281.7	7921.46	04-12-19	xxxxx	Positive
12	xxxxxxx	W3574	Nablus St.	30.4	5762.61	04-01-20	xxxxx	Positive
13	xxxxxxx	W900151	Nablus St.	23.56	7488.98	04-01-20	xxxxx	Positive
14	xxxxxxx	W6432	Nablus St.	23.56	1845.09	04-01-20	xxxxx	Positive
15	xxxxxxx	W4611	Nablus St.	25.06	4840.91	04-01-20	xxxxx	Positive
Total				16410.82	112857.79			

Sample Record of the Customers for Follow Up: 1st, 2nd, and 3rd Follow Up

No.	Owne_Nam	HC_ID	1st Reminder	2nd Reminder	3rd Reminder (by Delivering a written notice)	Customer Payments	Notes
1	xxxxxxx	W6236	15-12-19	18-01-20	27-01-20		
2	xxxxxxx	W6272	15-12-19	18-01-20	27-01-20	1252.88	
3	xxxxxxx	W9520	15-12-19	18-01-20	27-01-20		
4	xxxxxxx	W8947	15-12-19	18-01-20	27-01-20		The customer requested PPWM
5	xxxxxxx	W7406	15-12-19	18-01-20	27-01-20		
6	xxxxxxx	W6826	15-12-19	18-01-20	27-01-20		
7	xxxxxxx	W8240	15-12-19	18-01-20	27-01-20		Zero Reading (being followed up by CSS)
8	xxxxxxx	W1445	15-12-19	18-01-20	27-01-20		Will make a deal and requested PPWM with 50% debt recovery
9	xxxxxxx	W3283	15-12-19	18-01-20	27-01-20		Requested PPWM
10	xxxxxxx	W3392	15-12-19	18-01-20	27-01-20		
11	xxxxxxx	W7077	15-12-19	18-01-20	27-01-20	1000	Abcentee customer
12	xxxxxxx	W3574	04-01-20	18-01-20	27-01-20		
13	xxxxxxx	W900151	04-01-20	18-01-20	27-01-20		
14	xxxxxxx	W6432	04-01-20	18-01-20	27-01-20		
15	xxxxxxx	W4611	04-01-20	18-01-20	27-01-20		
Total						2252.88	

7) Public Relations Activities

Activity procedure

A. Preparation and planning

- 1) Set up the area of visit for any activity to raise the public awareness
- 2) Extract customers from the AlShamel database for the selected area
- 3) Prepare hardcopy map of the visiting area using GIS map
- 4) Prepare the required PR materials
- 5) Set up visit schedule, team members, transportation, support materials
- 6) Suggested team members: PR staff
- 7) Suggested time: Weekdays mornings when it is expected that customers are present at home
- 8) Accompanied documents
- 9) List of the customers including their name, water meter number, subscription number.
- 10) Hardcopy map of the visiting area Map of the visiting area with the customer locations (water meter locations)
- 11) The events and Holidays are much recommended for these activities (such as Christmas Eid Elfetr, Land day and etc.).

B. Social media posts

- 12) Select the target and the goals of the posts (information, municipality's notice, municipality's activities, request bills payments and etc.)
- 13) Set up post schedule-timing, team members, type of materials
- 14) Suggested team members: PR staff, in some cases the outsourcing designer will be recommended
- 15) Prepare the required PR material using the design software such as Photoshop and Adobe premiere pro or Camtasia studio or other similar software:
 - a) Prepare the suitable design to match your goals (Municipality's activities or special events for example) with consideration the targeted people
 - b) In the case of the video: the duration should be appropriate to the topic and it is recommended that it be as short as possible
- 16) The PR staff must prepare special posts for the municipality's activities and the religious events or any other events

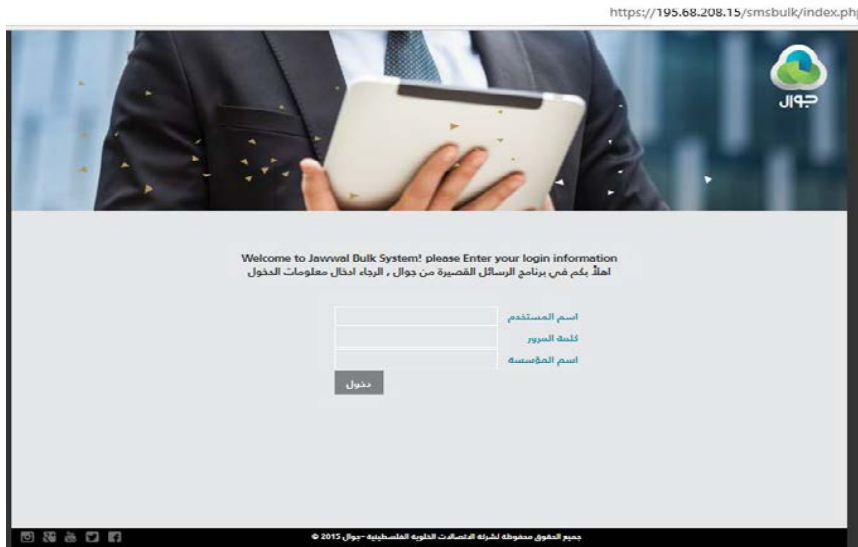


C. SMS reminder activity

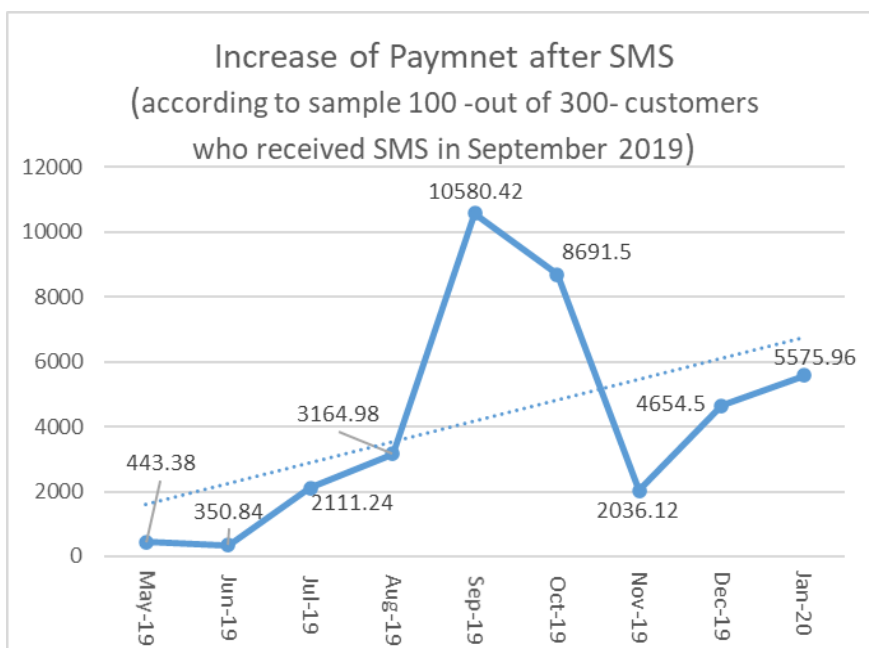
- 17) SMS reminder will be for the whole city
- 18) Collect the customers' phone numbers in the selected area. (By PR staff or CSS)
- 19) Extract debtor's info. from the AlShamel database for the selected in cooperation with CSS
- 20) Prepare an excel list contain the customer name and phone number
- 21) Set up schedule-timing, team members
 - a) Suggested team members: PR staff and Head of Customer Service section or CSS' staff.

- b) Suggested time: monthly after employees' salaries
- 22) Use the JM user on Jawwal website (Telecommunication Company) to send the SMS
 - a) Create a group on the website for the targeted customers
 - b) Upload the excel file into the fit form
 - c) Send the SMS for the month required
- 23) Update the customers' list after each month to check the customers who paid and respond to this reminder. (This point will be in cooperation with CSS)
- 24) Check the effectiveness of the SMS reminder every 3 months (Quarterly)
- 25) Take an action with customers who did not respond to the SMS reminder. (Transfer the list to the Legal unit for more strict actions.)

Sample JM User on Jawwal Website for Preparation of SMS Reminder



Effectiveness of SMS Reminders; A Sample Analysis



別冊資料 CD 1.1

**Procedure Manuals for Major Customer Service
Management Activities**

別冊資料 CD 1.1.2 Arabic Version



بلدية جنين

مشروع تعزيز قدرة ادارة خدمات المياه في بلدية جنين

للإيل رش ادي

الانشاطات الريفيه ارة خدمات مشروع كين

December 2021



Japan International Cooperation Agency
وكالة التعاون الدولي الياباني

تحت طهر هذا الدليل من قبل بلدية حنين ، نظراً لنهاية والصرف الصحي عام 2020 في إطار مشروع وعزز قدرة إدارة خدمات المياه في بلدية حنين بمشروع من JICA (الوكالة اليابانية للتعاون الدولي).

الدليل مخصص في المقام الأول للمباني البلدية وللبيوت الريفية عن إدارة خدمة مشتركة المياه.

الهدف من الدليل هو أن يكون بمثابة دليل إرشادي لتعريف القدرات التشغيلية المطلوبة من الموظفين المبرمجين لتشغيل أنظمة التمرير قب إدارة خدمة المشتركين.

يقدم هذا الدليل إجراءات ممارسة أنظمة التمرير من قبل قسم خدمات المشتركين في نهاية المياه والصرف الصحي في بلدية حنين:

1- فحص عدادات المياه ذات النفاثات الأولية أو الصفيحة (الصفحة 3).

الغرض من هذا النظام هو فحص أسباب التغيرات في بعض عدادات المياه المتصلة بكافة أول حد النفاثات من المياه كما هو مبين في نظام إحصاءات المشتركين (المساحة المبرمجة) (المساحة المبرمجة ، أي المساحة المضربة). الزيادة في عدد العدادات هي ما ضروري لفحص عداد المياه وحل العيوب التي يمكن أن تكون أخطاء معقدة:

- i. بمعنى المشترك الذي يحتوي على عداد مياه مسجول في تاريخ إنشاء.
- ii. توجد إمدادات المياه من قبل البلدية.
- iii. يستخدم المشترك المياه من غير الخواص.
- iv. عداد المياه معطل.
- v. عدم استكمال العدادات المياه أي لم يحدد عن المقيمة أو الميزل غير مشغول.
- vi. استبدال غير قانوني.
- vii. عداد المياه لم يقرأ خطأ من قبل البلدية.
- viii. يوجد عداد مياهي للوقوف (مما أدى إلى تقسيم القراءات على طرف أول حد النفاثات ك).

2- فحص النفاثات لاجتماع (الصفحة 6)

الهدف من هذا النظام هو التحقق من كل دور من أي استبدال غير قانوني في النفاثات من فئات المقيمة التي يمكن الترخيص النفاثات التي ارتبطت بالمشروع وأي أول تخفيض القيمة بأكملها.

3- فحص شح و إيواء مواد PWM مثبتة (الصفحة 9)

الغرض من هذا النظام هو فحص عدادات الفعالة المسبقة لفترة معينة من تاريخها عن أي شح أو أعطال. قد يتسبب فحص مشكل بخل:

- i. أبتل فصوص دوق حطية عدادات الفعالة المسبقة.
- ii. صمامات تم غلقها.
- iii. عدادات غير مشحونة.
- iv. نظام اللورا معطل.
- v. عدادات الفعالة المسبقة التالية أو المعطلة.
- vi. عدادات غير مشحونة.
- vii. نلصا غير قانوني.
- viii. مشكل في التمرير المشترك بعدادات الفعالة المسبقة من قبل القبول.

4- محضير المشركي الرئيسي عداد الفع المسبق بزيارة المشركين من لهاب لابلاب (DtD visit) (الصفحة 13)

الغرض الرئيسي من هذا النشاط هو زيادة قبول المشتركين بتبادل عداد الفع المسبق وتجنب التعرضات في يوم التركيبي.

يتضمن هذا النشاط ما يلي:

- i. تقييم فطيريل حول التغييرات لعمل عداد الفع المسبق، شحن الكرت للض بال عداد الفع فاضل على العادنتوقير الضرر ، وم إلى ذلك بهدي ب أولي تخدام عداد الفع المسبق)
- ii. توزي عدلي بلت خدامل عدا ب ا ضافة لالتعليقات المتوتقشركل فمصل.
- iii. لتكثيف مم المشتركين لعداد الفع المسبق ويوتم الرد على أي شكوى لتهم قبل يوم التركيبي.
- iv. لشرح جدول مواجيت تركيب بال عداد الفع المسبق وعين من التركيبي وما إذا كان أي من المشتركين يفضلون يوم التركيبي مطلق على حساب حاجتهم)
- v. لتحيي المشتركين الصعيين / المغيين المتمعين في حصول على موفقتهم على يتركيب بال عداد الفع المسبق.

5- مرقين سب تج بليل قهلو انير وإعدال بديانات ا زمة وحس البن سب بة (الصفحة 18)

الغرض الرئيسي من هذا النشاط هو تحسين سبب العجبية على أسس ش هري لغرض ال مراقب قس اعدال مرقة إدارة خدمة المشتركين ونظره الياه والصرف الصحيفي القاء عن ظر تدقيق على سبب العجبية ولخطوات التي يجب اتخاذها لسبب قبل ميقه بلقملها أول فناطق معينة.

6- حلم قلص يل. أسل و س لس (الصفحة 22)

الغرض من هذا النشاط هو تراب من المييين ، وخصه المشتركين الذين لم يعم إمداداتيه جي دة على مدار الساعة او طول أيام البوع ، والذين يمتعون بخدماتهم ولا يغيرون من الليون بعمدالنش اطع على س هل لتحصيل هلكن وضع خطة تسوية إذالزم ا مر او طلب المشتركين ذلك . فاك حاجه إلى عدخل س اتم تبليغ لعضمان التزام المشترك بالفع.

7- أنشطة ا قات لاعامة (الصفحة 26)

يفر لليل لخطوات لاعامة عداد وتفيذ أنشطة لعا قات لاعامة لم تفعه. ويتضمن أيضا خطوات إعداد وبلت خدام مواد الاعامة ولتعاون مع سبب خدمه المشتركين في نظره الياه والصرف الصحيفي نشطة التعلق قبل العجبية نحل استخدام تظيرات لارسائل القصير لاشركين لتقاضي بلليون.

ب- في حالة ما إذا كانت طوقم الليوية قد أخذت عداد الميثرك لفي في نفس اليوم راعت في مرات فليفتتت الميثرك قس م لطيوية كم ال ا را في يوم واحد.

ت- في حالة طلب من الميثرك إحضار ال عداد لى الميه والصر ف الصرح ح اذا كان سري طافي جب الميثرك قبع عد أسبوع واحد مبع عدال موع والى ال م حدد اذال جي حصر الميثرك لى داليرة. في ح س لى م طار س ال ا ث لى ف تفتح ذير بموع دن ها ئي جي ل مدة أسبوعين. في الميثرك لى ف ي غرضون أسبوعين ، اذال جي م الميثرك با حصر ال عداد ال ياه بحلول ال موع والى ها ئي لى يدي سبتتم ا حل الميثرك لى ال طار لى ق ل و ي ف ي ال يوية ا حراءات أخرى نحل ا تخلم غي ر ال ق ل و ي ، ا ل خ.

ث- في حالة قراءة ال خطية تم الميثرك قبع أسبوع لى تكدم من فعال الميثرك لى فستور ال جي دة. اذال جي لى لى لى ف ، قم با حلة للميثرك لى وحدة ال جي لى لى م يدي من الميثرك قبع. ج- ي ج ب ت و ي ق ت و س م ل جي ال ميثرك قات.

2. يوم قيارة

1. ال هدف حصر ال عدادات وحل ال عدادات
2. ال سياسة: هي ان س ل س لى اقش ال وض ع لى م مع الميثرك و شرح سبب لى زيارة ، و ال ميثرك ج ، و مرقاشة م ا ف ت ع ال ال يوية و م ي جب لى الميثرك ف عمل ه.
3. ال طويقة: زيارة تم ال باب ال باب
4. حصر ال عدل و قرائته.
5. ا حصر ال عدال موع الميثرك لى ال يوية زيارة و حل ال عدال موع ال باب ال حد ا من ال قراءه. و ا حصر ال عدال موع الميثرك لى ال يوية كل حلة لى حدة.
6. ا حراءات ال موع:

أ- قم با حصر ال عدال موع لى ط ق ل ن ي ، ا ن ال ميثرك لى الموق ع

ب- ا حصر ال عدال موع لى حصر ال ميثرك لى لى س يطة م لى لى ن طرة ال ياه والصر ف الصرحي و ال موع لى ف ي غرضون ال يوم ، اذال جي لى موق ع ال ميثرك. اذال جي لى موق ع ال موع لى ف ي و لى حصر ال موع لى ف ي حصر ال ميثرك ا حصر ال عداده الى WWD اذا كان ف ي ف ي لى م لى ي.

تتسليم رسالة طلب ال لى ال ع لى لى ف ي ال عدال اذال جي م ا موبل س طوقم ال يوية قبع موع دن ها ئي م حدد ثقت دي رف ر ق ا ت ص دار فستور ي دي ف ي الموق ع لى ال قراءه ال خاطية.



0- meter reading visit- broken meter and new meter after replacement

3.3 ب عد ت ي ارة

1. رض غلامسات ا يرة على ل ل ح ا ل ل م س ح لة.
2. إعدا قوائم الم ش ت ر ك ل ل ل م ت ب ل عة ا و ل ل ك ت ي ف ي ه ا أ خ ذ ل ع د ا ف ي ي و م ل ل ز ي ا رة و ت م ل س ح ه م ح ل ل ل ف ي ل ل ط ا رة و ي ت م إ ع ا دة ت ش ب ية ه ف ي ال ه ي و ال ت ل ا ي ب ك خ ذ إ ج ا ا ت ف و ر ية ف ل ن ا ش ل ت ل ل ط ق م ب ا ل ع د ا د ع ا دة ت ر ك ل ي ي ه .
3. إعدا قوائم ل م ش ت ر ك ل ل ل م ت ب ل عة ا و ل ل ذ ي ن ط ب ف ي م إ ح ض ر ا ل ع د ا ف ي ط ا رة ل ي ا ه .
4. إعدا قوائم الم ش ت ر ك ل ل ل م ت ب ل عة ا و ل ل ف ي ن ط ب ف ي م ت ب ي ي ر ع د ا ن ك م ب ل ح و ل م و ع د ن ط ا ي .
5. ت ح ي ث ال ق ر ا ا ت ال ج ي دة ل ل ي و ا ل ش ا م ل ف ي ل ل ل ق ر ا ا ت ال خ ا ط اة .
6. ت ح ي ث ال م د ف و ع ا ت ، و ر ق ا م ال ا ت ف أ و أ ي ع ل و م ا ت أ خ ر ي ن ه ل ر ق م ع د ا د ا ل ي ا ه ، ل ل ع ل ش ا م ل .
- ل م ت ب ل عة ل ل م ب ا ه و ب و ع ي ن . ل ه ي ا س رة : س و ا س ل س ل سة ع ن ط ر ي ق ز ي ا رة / ا س ت د ع اء ل م ت ب ل عة أ و ت ف ي ر .
7. ت ح ق ق م ل ق س ا م ط ا رة ل ي ا ه ا ر ي إ ذ ا أ ح ض ر الم ش ت ر ك و ن ع د ا ن ك ه . ح .
8. ز ي ا رة ل ع ل ف ي ن ط ل ب ف ي م ت ب ي ي ر ع د ا ن ك م ق ب ل ا ل م و ع د ا ل ن غ ا ي .
9. م ت ب ل عة ن ا ت م ت ح ي ث ال ق ر ا ا ت ال ج ي دة ل ل ي و ا ل ش ل م ف ي ل لة ل ق ر ا ا ت ال خ ا ط اة .
10. ت س ج ل ل ر د و د و إ ع د ا ق و ا م الم ش ت ر ك ل ل ل م ت ب ل عة ل ل ش ر ية .
- ل م ت ب ل عة ل ل ا ت ي ق ب ع د ا س و ع ي ن آ ن ج ي ن ف ي ل ح ل ق ش ل ل م ت ب ل عة ا و ل ل . ل ل ن ه ج أ ك ث ر ح ز م ا م ي م ث ل ع ا ر خ ط ي ج ي ي ل م و ع د ا ل ن غ ا ي ل ي ل م ش ت ر ك .
11. ز ي ا رة ل ع م ء ل ف ي ن ط ب ف ي م ت ب ي ي ر ع د ا ن ك م ق ب ل ا ل م و ع د ا ل ن ط ا ي ؛ إ ذ ا ل ح ي ك ن ك ت ي ك ، أ ر س ل ت ح ف ي ر ا رسا لة م ع م و ع د ن غ ا ي ي ج ي د .
- ل م ت ب ل عة ل ل ل ل ث ق ي ح لة ع دم ل و ب ع د ا ا ر :
- ال ه ي ا س رة ف ي ح لة ع دم و ج و د إ ج ر ا ا ت م ت خ ذة ف ي ق ب ل الم ش ت ر ك ل ل م و ع د ا ق و ا م الم ش ت ر ك ل ل ل ط ا رة ل ل ف و ل و ية ل م ن و ي د م ن ا ر ا ا ت .

عينة تم طبب يقيها على 5مشترك

نشاط حسيين خدمة المشتركين

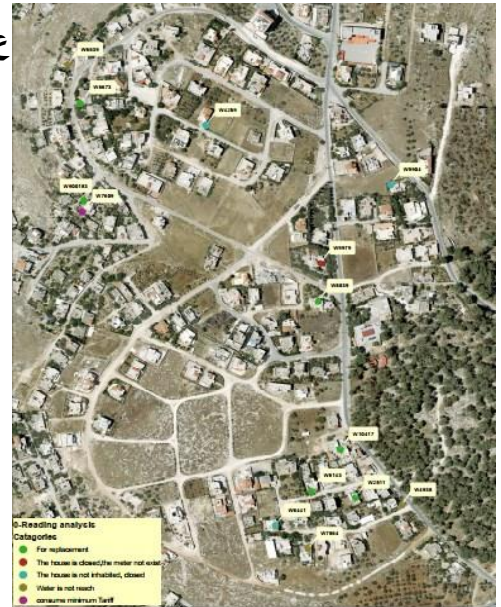
فحص القراءات الفيزية

الخطة

المشتركين		زيارات ميدانية : MM/DD/YY	
وب أول نياسة		ني اقترس ل نقل فحص الفيزية والح ني ولس ببل ، واتخاذ اجراءات المناسبة	
فريق ل نقل ول			
فريق	المشتركون الذين تمت زيارتهم اليوم	مهام أخرى	لوثق ا زمة
أعضاء فريق	البيانية: وهي قسم خدمات المشتركين، موظفو خدمات المشتركين الفني	تحيث أبيتات وجدت	1) خريطة 2) القراءات السابقة 3) طلب خطي 4) اخفستورة
الموا ت	حسب الحاجة		

عينة من طقة مرجس ع تم لهافحص 5مشترك

من أصحاب القراءات الفيزية



نموذجية ار لخطي



1 / 2019

إخطار بالحضور لدائرة المياه

نرجو من حضرتكم الحضور إلى دائرة المياه خلال أسبوع من استلام هذا الإخطار وذلك من أجل تصحيح وضع اشتراك المياه حسب الأصول .

*في حال عدم الحضور سيتم تحويل ملف الاشتراك إلى الشؤون القانونية .

عين قيسج يل بلديات

No.	HC.ID	Customer Name	Mobile No.	REGION	1st Visit date for	Avg. consumption	Last Reading	Current reading	Reasons	Comments
1	W4259	xxxxxxx		Marah Saad	22-10-19	0	1084	1084	The house is not inhabited, closed	
2	W9979	xxxxxxx		Marah Saad	22-10-19	0	15	15	The house is closed,the meter not exist	
3	W2511	xxxxxxx	xxxxxxx	Marah Saad	22-10-19	0	1349	1349	The meter does not count , broken	
4	W8143	xxxxxxx	xxxxxxx	Marah Saad	22-10-19	0	1496	1496	The meter does not count , broken	
5	W6441	xxxxxxx	xxxxxxx	Marah Saad	22-10-19	6	3099	3099	The house is not inhabited, closed	
6	W7864	xxxxxxx		Marah Saad	22-10-19	2	1139	1139	Water is not reach	
7	W4938	xxxxxxx		Marah Saad	22-10-19	13	334	334	Water is not reach	Low pressure
8	W10417	xxxxxxx	xxxxxxx	Marah Saad	22-10-19	0	30	30	The meter does not count , broken	
9	W10815	xxxxxxx		Marah Saad	22-10-19	3	15	15	Water is not reach	
10	W8839	xxxxxxx	xxxxxxx	Marah Saad	22-10-19	2	491	491	The meter does not count , broken	High pressure
11	W9904	xxxxxxx		Marah Saad	22-10-19	0	63	63	The house is not inhabited, closed	
12	W6673	xxxxxxx		Marah Saad	18-11-19	0	838	838	The meter does not count, broken	
13	W6639	xxxxxxx		Marah Saad	18-11-19	0	1451	1453	Water is not reach	
14	W900183	xxxxxxx		Marah Saad	18-11-19	0	1203	1203	The meter does not count, broken	
15	W7609	xxxxxxx		Marah Saad	18-11-19	0	675	676	Consume minimum Tariff	

عينة: ا جراءات لهتخذة

No.	HC.ID	Customer Name	1st Follow Up		2nd Follow Up	3rd follow Up	
			2nd visit date (with official letter for replacement)	CSS Team members	Call for reminding	Action was taken by CSS	Replacement date
1	W4259	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad			
2	W9979	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad			
3	W2511	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad		Meter replacement	31-10-19
4	W8143	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad	02-11-19	Meter replacement	03-11-19
5	W6441	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad			
6	W7864	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad			
7	W4938	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad			
8	W10417	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad	02-11-19	Meter replacement	03-11-19
9	W10815	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad			
10	W8839	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad		Meter replacement	29-10-19
11	W9904	xxxxxxx	28-10-19	Mr. Shareef & Mr. Imad			
12	W6673	xxxxxxx	28-11-19	Mr. Omar & Mr. Imad	09-12-19	Meter replacement	19-12-19
13	W6639	xxxxxxx	28-11-19	Mr. Omar & Mr. Imad			
14	W900183	xxxxxxx	28-11-19	Mr. Omar & Mr. Imad		Meter replacement	09-12-19
15	W7609	xxxxxxx	28-11-19	Mr. Omar & Mr. Imad			

خطواتاللفبيذ

أ - اعدادوالنخطيظ

1. قم بإعداد فيطة الزيارة فيحص وجود و تغيرقلهوية.
- 2 استخراجهقائمالمشتريين منقاعدهياناتلشاملالفيطةالمستارة.
3. وضع جدولالزيارة ، وأعضالفريق ، وطرقالنقل.
- أ) أعضالفريقالقترح: موظقسم خدماتالمشتريين باضافة فيبين.
- بالوقتالتقح: صبلخ أيام ا بوع.
4. الوشقالمصاطفيزيارات:
- أ) قائمالمشتريينبمطي لك ا قم عدادالمياه رقم ا تراك.
- ب) خريطة فيطة الزيارة مع موقعالمشتريين (موقع عداداتالمياه)
5. الاعداتالمصاطفيزيارة:
- أ) كاهي تقاطالصورتوثيقالاح القلهوية.
- بعدهفنيياه الةعدادالمشتريينحلعالغور فيصلالغيرقلوني.
- ج) عضالتطبات بيب أوجدرالياهي حللة استخلمغيرالمشروع.

بي ومطريارة وا جراءاتالمخذة في فسلأيوم.

1. ال هدفالتقح مما إذاكان منالك في استخدام غيرقلونيفيالفيطةالمحددة.
2. خريطة فيطة الزيارة مع موقعالمشتريين (موقع عداداتالمياه)
3. بتقح من اتصال إذاكانقلهويًا أو غيرقلوني.
4. بيب أوجدرالياهي حللة ا تخدام غيرقلوني.
5. التقاطعضال متصلغيرالقلوني والموقعيشكل عملتوثيقالحللة.

ج. بعدادالزيارات

- 1 يقومالزطر (موظو خدماتالمشتريين) بملتقير ا تخلم غيرالقلونيفياللمتسبعللزيارتتووقعه.
- 2 استخراجهيانالمشتريين) ا ت الوبييرللسنواتالمضوية.
- تحقديفرقا ت منبطية ا تخلم غيرالقلوني وضع 1000 بيناركشوب تخلم غيرالقلوني.

4. إرسال المستندات الى ادارة مصرف المياه والصرف الصحي.

5. يوافق رئيس طرة المياه والصرف الصحي على اقتراح يوريسر لسحب اشرة الى الودنقن في يبلية نجين ويصيات خاذ اجراءات تصارمة وسيرة.

6. إذا فضل العميل الرد أو لتعازن ، سيقوم الودنقن بيقول له الفاع عمل الى الودنقن لمزيد من اراءات. نمودجت قهر ضبط ا ت خدالم فغير قلهني

**دولة فلسطين**
وزارة الحكم المحلي
بلدية جنين
قسم المياه والصرف الصحي



ضبط مشترك

حضرة السيد مدير قسم خدمات المشتركين لدائرة المياه - الاحترم

الموضوع : **ضبط مشترك**

تعلمكم أنه في يوم : _____ الموافق : / / ٢٠١١ م ضبط

السيد : _____

مباحث المشترك رقم: _____

يقوم بالاستفادة من شبكة المياه بطريقة غير قانونية ، نرحو إخذاء الاجراءات القانونية بحقه .

فني مياه أو حالي _____ فني مياه أو حالي _____

مسؤول الحماية الميدانية _____

عينة لو ت غير قلهني ق ا قس م خدمات الم شت ط ل ك ت ش اف ا



خطوات تنفيذ

أ. عداد وخطوط

1. تحديد فئة لوائح العمل حسب شروط وشروط

2. استخراج قوائم المشتركين من قوائم العمل التي تم التوصل إليها من قبل إدارة.

3. وضع جدول للزيارة ، وأخذ الفيزيق ، والنقل.

أ- أخذ الفيزيقال قترح: موظفو خدم المشتركين، فيرق للدعم الفني بالوقوفات الفيزيق: ص بلخ أيام ا بوع عن دم لوكون من التوقوع وجود المشتركين في ال منزل

4. الوثائق الصالحة:

أ- قوائم المشتركين بظني لك ا م ورقم عداد المي اه رقم ا تر الفوت اريخ آخرت همة.

ب- نسخة مطبوعة من قوائم المراجع ة لوثيتيش مل م ليل ليل حص:

i. وضع ال عدل بشكل عام ي عمل بشكل جيد أم

ii. صن دوق ال عداد.

iii. مجلس ال عداد.

iv. تاريخ آخر شخ نقل عداد في حال كل تأخر شخ في وقت طويل ليل ال اير مخفة لم باب.

v. تفحص ن دوق ال عداد.

vi. تفحص لن ظم لورا.

ت- نموذج إشعار إنتم أخذ ال عدا ح الم جان ي لبري طف، ي غرض ونيوم واحد (ب بولس طة طول لبل بي في يوم ال زيارة

، إذا لوق ل المشترك؛ و ليل ال موظف ا تفاظن سخة من اش عار.

ث- إذا لوق ل المشترك ليل ال عدا ي جتس ليم هل عارب موع دنه اي ي ضار عداد لعل م سبق

ال خا صبه لى طارة الم ياه وال صرف الص ح ي جراء ا س ج لول ال موع دنه اي ال م حدد؛ على موظف ال ليلية أن ي تفظن سخة من ا

ج- خريطة فئة لزيارة مع موقع المشتركين (موقع عدادات الم ياه)

5. تعيين موظف لمتابعة

أ- فيرق ال عمل ال قترح فيرق عمل م خص ل لمتابعة:

ب- في حلة ما إذا كلت ال ليلية قد أخذت عداد المشترك في فيق ال ال عداد.

ت- في حلة طلب من ليل ترك إحضار ال عداد لى داية لى اب موع دن ه ل الفظي ي جب لتبع تاريخ

تامل ل ليل موع دنه اي ال م حدد. إذا لوق ل المشترك لزيارة طارة الم ياه وال صرف الص ح ح في ي سول يم

ل لرسال الفيزيق متفحذير مع موع دنه اي ي جيل لمة أسبو عي ن في ال متبع ل ليل ل أسبو عي ن ، إذا ل حيتم ا ح

عداد ال شخو ح لول ال موع دنه اي ال جي، فسيتم إعل ال عمل لى ال ليلية ذ مريد من ا راءات ليل

ا تخلم غي رال قون ي ، وم ال لى ذلك.

ث- ي جبتو في قوس ليل جي ال متبعات.

ب. يوم قزيارة

6. ال هدف حصال عدادات و حلال عدادات م سبق اللف عيشكل عام.

7. السياسي اسناد سلسل سلس من اقش فالوضع مع المبتكر. شرح سبل الزيارة ، وللتناج مع اقشة لم فتعمل الهديّة وما هي مسؤوليّة المبتكر.

8. الطريقة: زيارات لمن ازل

9. فلحصال عداد وقرأه.

10. قوائم فالمرجع قب عدالتحقق من جميع العنصر.

11. اتخاذا راءات امة:

- أ- قم بإحال عداب ولس طقلني ، إن أمكن ، على الموقع
 ب- أخذال عداد لهم لسل شركت لسيطة من لني طائرة لاياه وللصرف للصحي والعود في غن ونيوم واحد إذا
 فلق المبتكر. إذال يمكن موقفاً فحدد موعداً هلياً وبالحول لاموعني جب نوى المبتكر إحضارال عداد لى طائرة
 المياه وللصرف للصحي .

ج. بعد ليارات

12. اتها من ال ت نوى ورق قوائم فالمرجعة.

3. قم بإعداد قوائم المبتكرين للتعليق والفيتم لبت م لعداد لاصب هفي يوم لني ار قهيم لسل حه من لني طائرة لاياه
 وإعداد قوائم في اليوم التالي. بخ لجراءت فوق في حال عدسات لجملة المبتكر

14. إعداد قوائم قبل المبتكرين لني في حاجون الى إجراء في قبل هفي قسم خدمات المبتكرين إن وجد.

عمدة

لش طقة حسيين خدمات المبتكرين

ال فحصل الحش وني لعداد الفع المسبق

تاريخ الزيارة MM/DD/YY		عدد المبتكرين اللتي		
سلس و مرن مع المبتكر ل ف حص عداد الفع المسبق شركل دوري		ا ب		
هتيق / ل				
ل ونيق لمصحبة لتيارة	م هام اخرى	عدد المبتكرين في اليوم	موظق س م خدمات المبتكرين	
1. خريطة 2. قوائم فالمبتكرين 3. نموذج لعار ذاوا ح ال عداد 4. قوائم ف حص ال عداد	تحيث أبي نات جيده ليعتش افه لني برن ام لشل ام ل	يعمد نوى ل فنيقة المسنتهفة ووجود المبتكرين في المن ازل	أخص الفتيق	
حسب المطلوب			س ل فالتيق ل	

عينة: شارع الناصر لوقف حصص 15 مشترك لجمعية الفون
عداد مدفوع مسبقاً.



عينة: تقيس مجل قوطة لمكاف حصول لمشتريين أع

Meter #	Date of Check	Box	Valve	Charge	Lora Activate	Sealin	Region	Notes
W10002	Dec-19	k	k	k	k	k	NSt	
W10153	Dec-19	k	k	k	k	Issue	NSt	
W10167	Dec-19	k	k	No	k	Issue	NSt	No water
W10199	Dec-19	k	k	k	k	k	NSt	
W10443	Dec-19	Issue	k	k	k	Issue	NSt	
W10466	Dec-19	k	k	k	k	Issue	NSt	
W10490	Dec-19	k	k	k	k	k	NSt	
W1105	Dec-19	k	k	No	k	k	NSt	No water
W1204	Dec-19	k	k	No	k	Issue	NSt	Abounded house
W208	Dec-19	k	k	k	k	k	NSt	
W3490	Dec-19	k	k	k	k	k	NSt	
W4244	Dec-19	k	k	No	k	k	NSt	Private well
W4622	Dec-19	k	k	k	k	k	NSt	
W4694	Dec-19	k	k	k	k	k	NSt	
W5406	Dec-19	k	k	k	k	k	NSt	
W5458	Dec-19	k	k	k	k	k	NSt	
W5463	Dec-19	k	k	k	k	k	NSt	
W5498	Dec-19	k	k	k	k	Issue	NSt	

PPWM Random Check - Monthly Activity - CSS						
Issues	Dec-19			Jan-20		
	Total	# of Cases	Status	Total	# of Cases	Status
Box issues	47	1	Top part was removed.	60	2	Brocken, slide issue
Valves issues		0			0	
Meter uncharged		11	They use private well or no consumption (no illegal use found.)		6	They use private well. (no illegal use found.)
Lora not activated		0			0	
Meter is broken						
Box not sealed		12			0	
Total		24			8	

خطوات تنفيذ

1. لتخطيط

1. قم ببلتخياري فبطقة الولاية لترنيب عدادات دفع لمسبق.
- 2 استخرج اوت حزي ر قوائم الم شتر ليين من قاعدي ان ا ش ام الال فبطقة الم صارة.
3. إعداد خريطة ورقية لبطقة الولاية اربقاس خدام خري طن ظم الم عمل وماتال جغرافية ل ش اط CDS
4. إعداد نموذج ا ستيان و مواد تال عام قب لذي ك لني ب عدادات دفع لمسبق ، موق ع مرك ل ش ح ن و وقت ال خدم .
5. إعداد مواد تال عام ، ن ل لني ب PPWM، ومرك ل ش ح ن ال وقت / ل ج دول ل ل ز ف ي .
6. إعداد جدول لزيارة ، أعض الفريق ، طوق ال تقبل ، واي مواد أخرى:
- أ) أعض الفريقي ال قترح: موطو تال عام .
- ب) لوقت ال قترح لقتل لقطب ا مة أيام ا بوع عن دم لويون من ل تقوع و ا ج دال م ش تر ل ي ف ي من ل ل م .
7. ل ل ش طاق ا ل ف ي ز ي ا ر ا ت :
- أ) قوائم الم ش تر ل ي ن ب ط ي ل ك ا قم عداد الم ياه ورقم ا ت ر ا ك .
- ب) ن س خة ورقية من نموذج ا ستيان و مواد تال عام قب ا م ف ي ذ ل ك لني ب PPWM ، موق ع مرك ل ش ح ن و وقت ال خدم .
- ج) خريطة فبطقة الولاية مع موق ع الم ش تر ل ي ن (موق ع عدادات ال ياه).

2. خطة ماقبل لني ب ا س ت ب ي ا ن ماقبل ل ترنيب لمان نموذج 1

- 1 لشرح ترنيب عدادات دفع لمسبق عن طري ق ل ز ي ا ر ا ت ن م ال ب ا ب ل ال ب ا ب .
 - 2 ت م ا ع ل ي رأ ي الم ش تر ك ل ت و ق ع ل م ش ا ن ج د ل / و ق ت ل ي و م تر ل ي ب عدادات دفع لمسبق PPWM.
 - 3 بت ح ي دال م ش تر ل ي ن ل ل ي ن من ال م ق ع ص ع ب ق ا و ن ا ع م ب ا ل تر ل ي ب ل ا ح ص و ل ل و ي م ف و ق ت م ب ا م ا ح ل ي و م ال تر ل ي ب .
- ي ه ت ب ن س خ ال ل ي ا ن ا ن ت ل ل ي ت م ج م ع م ل س ج ي ل ه ل و ي ن ظ ا م ال ع ل و م ا ت ل ل ج غ ل ف ية GIS و ت خ ر ي ه ل و ي ن ا ع د ل ل ي ن ا ت ل ل خ ص ق ب ل ي ية م ي ن .

3 بتوي بلع ا و ل ي ل و ي ا خ ا م ال س ر ي م ل - PPWM : قوائم مرجعية لتلخيصات PPWM لمان نموذج 2

1. لقيدي مخلص ي ل حول لنيية عمل عدادات دفع لمسبق PPWM ، و ع م ل ي ل ش ح ن ، و ل ل ض ا ظ ع ل ي ل ق ا ر ي ر ، إل خ .
 2. ل ط و ز ي ع ل لة ا ت خ د ا م ذ ا ت ل ل س لة م ع ل ل ع ل ي م ا ت ا ل م ت و ب ال ف ص لة .
 3. ل ل ل ت ك د من أن ال ع ع ي م م و ن ال ية عمل عدادات دفع لمسبق ه ي م ل ر د ي ل و ا س ئ ل ت م ق ب ل ي و م ال تر ل ي ب .
- م :
ي ج ب أ ن ي ف ر ي ق تر ل ي ب ع د ا ت ا ل ف ع الم س ب ق PPWM ل ق ر ا ا ت ا ل ن ه ي ل ا ق ل ع د ا ت ق ب ل ل ن ت ب ل ه ا ل ل ن م و د ج 3 (ب ي ف س ي و م ال تر ل ي ب .

ب: عد اش ه ر ل ي ل ق ت م ب ي ت PPWM ي ت م ا ج ا س ل ت ب ي ا ن ا ج ع س ل ي ت لمان نموذج 4

- من أ ج ل ت ق ي ي م ر ص الم ش تر ل ي ن عن ع د ا د ل ف ع الم س ب ق PPWM . و س ي ل و ر ف ي ق ف ي ص ل ي ت م ن ظ م ه اء ا س ت ي ا ن ف ي ق ب ل 30 % من الم ش تر ل ي ب ي ت ل ك ا ل ف ي ق طة .

فنترة العمل ، حجم العمل في وقت العمل ، تعيين الموظفين
لعمل 1 تمارة 1 وللمودج 2

لوقت 1		م العمل		لوقت 1	
تحويل قبل التثبيت لكل عمل: 0.5 ساعة					
فريق العمل					
أعضاء الفريق		شركاء اليوم		مهام أخرى	
فريق رقم 1	1) موظف قسم موظفين	تالعامة : 2	من 6 لى 8 عم (من 10 صباحاً حتى 2 بعد الظهر)	التدريب ا لى ، وملاء ا تمارين 1 و هي الميدان ، وثيق اطلصور ، وتحيدالمشترلين ال غليين / غير اقباليين عادائزيارات	
فريق رقم 2	2) موظف قسم موظفين	تالعامة : 2	من 6 لى 8 عم (من 10 صباحاً حتى 2 بعد الظهر)	التدريب ا لى ، وملاء ا تمارين 1 و هي الميدان ، وثيق اطلصور ، وتحيدالمشترلين ال غليين / غير اقباليين عادائزيارات	
مدخل الهيئات	مساع ل موظف	تالعامة	18- 24 استمارتيوي (8am to 4pm)	إدخال الهيئات تفيد نظم العمل وماتال جغرافية ، المس خاضوي ، فضالصور ، محولة الهيئات.	
الموا ت والتقل		سريارة اليدية			

استبيان ما قبل تركيب عداد الدفع المسبق (نموذج 1) Team #

رقم المشترك رقم البيت
اسم الذي تجري معه المقابلة رقم الهاتف
تاريخ المقابلة: اسم الحي

1 عن عداد الدفع المسبق
1. هل سمعت ان بلدية جنين ستقوم بتركيب عدادات دفع مسبق للمياه في منطقتك
نعم لا اذا نعم من: البلدية من الجيران رئيس لجنة الحي أنشطة المشروع في المنطقة اخرى
1.2 على فرض انه سيتم استبدال عدادك الحالي بأخر مسبق الدفع من قبل البلدية ما تعليقك ؟
تعليق ايجابي تعليق سلبي غير مبالي لا توجد تعليقات على الاطلاق
تفاصيل التعليق

2 . عداد الدفع المسبق
2.1 هل تعرف عن انواع عدادات الدفع المسبق هذه
عداد السرعة : نعم لا الى حد ما
العداد الحججي : نعم لا الى حد ما
عداد الالتراسونيك : نعم لا حد ما
الباحث: كما يظهر ادناه الرجاء الشرح عن كل عداد باختصار بعد الاجابة
عداد السرعة: 1. يوجد فيه اجزاء ميكانيكية، يمكن ان يتعطل 2. الدقة تقل حسب العمر 3. يتم احتساب الهواء على الرغم من أنه من غير المحتمل أن يؤثر على القياس (4. رخيص الثمن
العداد الحججي: 1. مشاكل الاوساخ كثيرة 2. يتم احتساب الهواء على الرغم من أنه من غير المحتمل أن يؤثر على القياس 3. رخيص الثمن
عداد الالتراسونيك 1: لا يحتسب الهواء الداخل مع الماء ولا حتى فقاعات الهواء 2. بدون اجزاء ميكانيكية، والعمر الافتراضي للعداد أطول 2. من غير المحتمل ان يتم اغلاقه بالوساخ او جزئيات الرمل 3. اعلى تكلفة
2.2 عداد الالتراسونيك تم اختياره كأفضل الخيارات وعلى فرض انه سيتم تركيبه لك وبعد سماعك عن المقارنة بين العدادات هل فهمت لماذا هو أفضل الخيارات ؟
فهمت ان عداد الالتراسونيك افضل خيار احتاج مزيد من الشرح
3. التنفيذ
3.1 ماذا تفضل في أي من التالية وقت التنفيذ
أ. وقت الاستبدال: ايام الاسبوع نهاية الاسبوع الفترة الصباحية فترة ما بعد الظهر الفترة المسائية
ب. وجود مرآة في فريق الاستبدال: لا يوجد حاجة بحاجة

4. شحن عداد الدفع المسبق واستخدامه
✳ الباحث: الرجاء الشرح حول كيفية استخدام عداد الدفع المسبق وشحن الكرت ومواقع الشحن اعتمادا على مادة الارشادات
4.1 بعد الشرح هل فهمت كيفية استخدام عداد الدفع المسبق وشحن الكرت ؟ نعم لا
4.2 اين تفضل شحن الكرت؟ ✳ اكثر من اجابة ممكنة
سوبرماركت الجليل مكتب شارع حيفا مكتب وسط المدينة اخرى

5. أنشطة العلاقات العامة لعداد الدفع المسبق
5.1 ما هي الطرق التي ترغب من خلالها الوصول الى معلومات المشروع
اجتماعات عامة ورشات عمل زيارة البيوت موقع البلدية الاتصالات الهاتفية لرسائل القصيرة لجنة الحي اخرى

6. الرضا
6.1 ما هي العوامل التي تجعلك راضيا عن اجراءات تركيب عداد الدفع المسبق



مشروع تحسين إدارة خدمات مياه
فلسطينية



Japan International Cooperation Agency

ملحق
نموذ (2) إلقاء مآرشادات عدادلاميامسبقللفع

إلى التركيب | تبدال
تيم المبتترك ارقم البعت
حى الشؤفة ○ حلقةالمس عفة ○
العنوان داخلال حى
اسمصاحبالعداد
قمالعدادال حى
مطالمبتترك

م إ ترك :

1	قمة عن نوع العداد مسبق الفع وليفى عمل ، وأجزئه
2	تؤفة للمياه والملمة العداد
3	بلفى ؤاستخدام العداد وحالرصرد
4	لفى تملظعل إلى العدلن الكسر اوسوء تخدام
5	لرصردالمبفرل
6	لمفت عىدشحنالبطة
7	لمتلع اذا ظت أوكسرفى ؤلففع الممسبق للمياه اوخللمصنوعى
8	مادقتعل اذاضاعتبطة العداد اوسوقت
9	نظالمشك اوىعلى مقعللملمة كمترونى والملمة للماشرة) لفشات (
10	ملق دمطبلم حصولعلى خدماتلملمة فى مركز خدماتالجمور
11	تدمت بةعلى أىة المبتترك رى

نرىق للمس

.....
المسمى فى فى :
.....

اس

لمشتر :
.....
للق ع

Final Water Meter Reading before Replacing with PPWM

The final water meter reading is confirmed as below:

Date of Reading/Replacement: (mm/dd/yy)

House ID:

Neighborhood: Khroube Sobah Alkheir N. Street

Address:

Name of the Water Meter Owner:

Type of Regular Water Meter:

Water Meter No.:

Final Reading:

New PPWM No.:

The following photos were also taken:

Photo 1: Water Meter

Photo 2: Water Meter showing the surroundings

Photo 3: PPWM

Photo 4: PPWM showing the surroundings



“Project for Strengthening the Capacity of Water Service Management in Jenin Municipality”



Japan International Cooperation Agency

Replacement Staff

Name:
Position:
Signature

Customer (if Present)

Name:
Signature

Customer Service Section

Name: Khaled Abu Obeid
Position: Section Head
Signature

خطوات تنفيذي

غالباً ما يتم سحب عينات لتحرير الدم من قبلها. ومع ذلك من أجل عرض النتائج للتحليل في مجموعات معينة من المشركين، ستكون في التمسك بجباية كل مجموعة عددي دقيقي على قلبية معين، كالتالي: هدايات حالي للشهري لسبب الجباية لغى الناحية التي يتوحدت الى جمع العينات وإعدادها على بطة.

المنطقة	المجموع الكلي		عدادت الفع المسبق		العدادت الاعيية	
	مع يون	بدون يون	مع يون	بدون يون	مع يون	بدون يون
لمهينة						
فناطى الدرلة						

أ. تحضير وإعداد البيانات

1) جباية ككل للمهينة لجمع عينات تكين).

- أ) من مشتركى العدادات عادية (الميكروبيية):
1. استخراج بيانات المشركين لكل المهينة من ن امل شام للشهري ال ذيتوي حساس بسبب الجباية ل هالوت يتم إدخاله بولس طقة نظام الفوترة ال حمل (MBS).
 2. الهيات المطلوبة هي مبلل الفوترة وتقوم ال قهوض مع ال يون وتقوم ال قهوض بكون يون.
 3. بيان التفتك ال الهياه ل جمع مشتركين المهينة لفرساله مر (من ن امل شام).

ب) مشتركى اللف المسبق PPWM:

1. استخراج بيانات المشركين لكل المهينة من ن امل شام اللف المسبق للشهري ال ذيتوي حساس بسبب الجباية ل ه.
2. الهيات المطلوبة هي إج طي مبلل شحرات مع مبلل غ خصم ال يون ال شحرات بكون بلغ ال يون.

2) من اطق لدراسة أو أي من طق هوعية أخرى:

- أ) من مشتركى العدادات عادية (الميكروبيية):
1. بلت خراج بيانات المشركين لل منطقة ال مهينة من ن امل شام للشهري ال ذيتوي حساس بسبب الجباية ل هالوت يتم إدخاله عن طوي قرة ن امل شام ال ع ل وم ات ال جغرافية (GIS).
 2. الهيات المطلوبة هي مبلل الفوترة وتقوم ال قهوض مع ال يون وتقوم ال قهوض بكون يون.

ب) مشتركى اللف المسبق PPWM:

- 1) سرات خراج بيانات المشركين لل منطقة ال مهينة من ن امل شام اللف المسبق للشهري ال ذيتوي حساس بسبب الجباية ل هالوت يتم إدخاله عن طوي قرة ن امل شام ال ع ل وم ات ال جغرافية (GIS).
- 2) الهيات المطلوبة هي مبلل الفوترة وتقوم ال قهوض مع ال يون وتقوم ال قهوض بكون يون.

ب. تحضير واعداد جداول الحسبات:

1. إعداد جدول الحساس بالذيتوي من ا عمدة التلية:

أولسورة شهري - سرة. ب) إج طي مبلل الفوترة ل امل شام اللف المسبق في قة مشتركى العدادات الميكروبيية ومشاركى اللف المسبق بضع اف لقتكات. ج) ال قهوضك شاملة لل يون ل امل شام اللف المسبق في قة مشتركى العدادات الميكروبيية ومشاركى اللف المسبق

بعض اقل قبوضات من التناكات. (د)القبوضات بدون لليون (م)سمة لى القبوضات من المشتريين العييين ومن مشتركى اللفع المسبق بعض اقل قبوضات من التناكات. من سبب العجبية مع لليون. ونسب العجبية بدون يون. ز)سبب العجبية لليون فقط.

ج. لعل يات لفس ابية: 1. كل لينة:

أنسب العجبية مع لليون

1) (حساب إج طلي فتقير أو اليجع انك لش مر المطلب) فتقير مشتركى العدادات اليك لى، وفتقير اللفع المسبق والتناكات. (2) حساب إج طليم مك حصيل م طي نك لليون) فى قبل مشتركى العدادات اليك لى، فى قبل مشتركى اللفع المسبق والتناكات. (3) (قسم إج طليم مك حصيل مع لليون على إج طلي فتقير) اليجعات.

م ةي جب علك ازالة نطغ لليون اللفع من مشتريين عداد اللفع المسبق من عمود اللفع مع لليون اللفع من استخراج منر نام ل ش ام ل.

بنسب العجبية بدون يون:

1) (حساب إج طلي اللفع بدون الليون لى قبوض اللفع لى الية) فى قبل مشتركى العدادات اليك لى، فى قبل مشتركى اللفع المسبق والتناكات. (2) (قسم إج طليم مك حصيل بدون لليون على إج طلي فتقير) اليجعات.

جنسب فت حصيل لليون فقط:

نسب العجبية مع لليون مطروح فى لسبب العجبية بدون لليون) أ-ب).

2. من اطق لدراسة أو أي من طق قوعية أخرى:

أنسب العجبية مع لليون

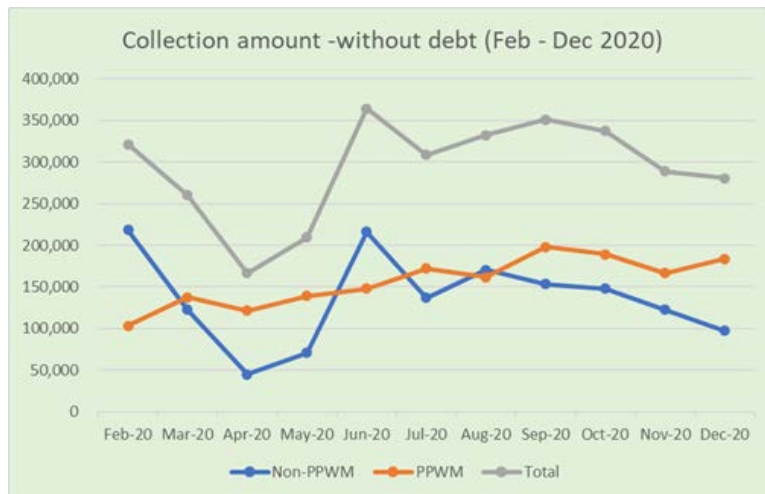
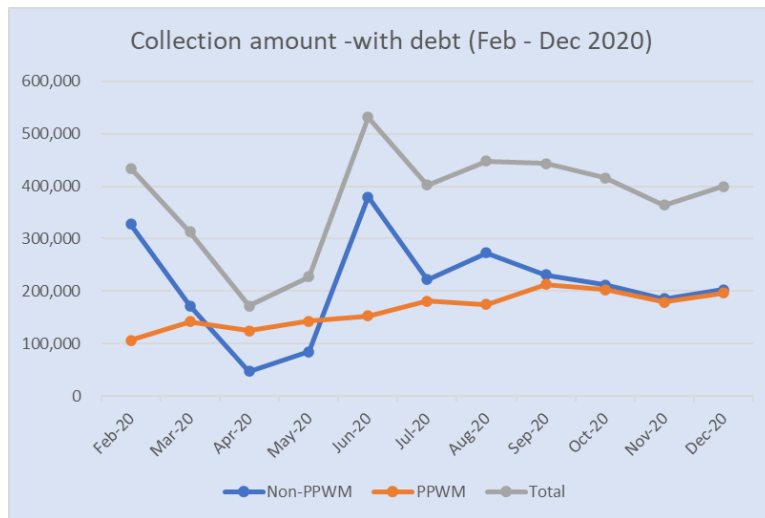
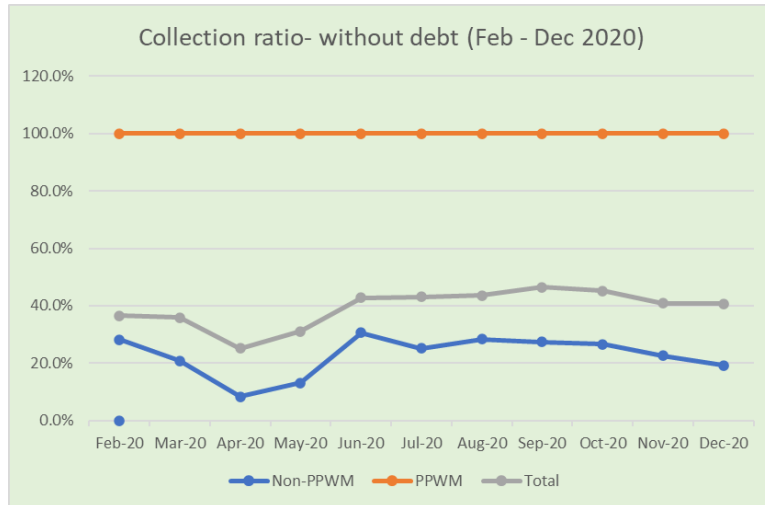
1) (حساب إج طلي فتقير لعم ء اللفع لى أو من خ ل انضمام لى لى لف الكسل اللفع منر نام ل ش ام ل أو عن نظام اللفع المسبق أو عن طريق نظم اللفع المسبق) (2) (حساب إج طلي مك حصيل م طي نك لليون لللفع المسبق) اللفع المسبق منر نام ل ش ام ل أو عن طريق نظم اللفع المسبق أو عن طريق نظم اللفع المسبق) (3) (قسم إج طليم مك حصيل مع لليون على إج طلي فتقير) اليجعات.

م ةي جب علك ازالة نطغ لليون اللفع من مشتريين عداد اللفع المسبق من عمود اللفع مع لليون اللفع من استخراج منر نام ل ش ام ل.

بنسب العجبية بدون يون:

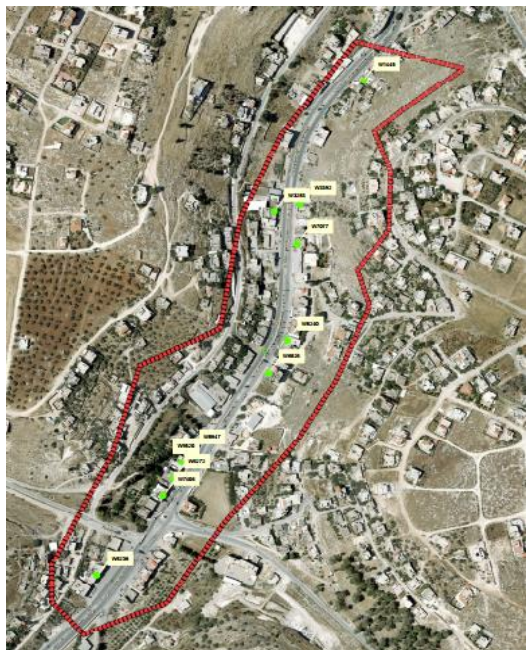
1) (حساب إج طلي مك حصيل بدون لليون لللفع المسبق) (2) (قسم إج طليم مك حصيل بدون لليون على إج طلي فتقير) اللفع المسبق منر نام ل ش ام ل أو عن طريق نظم اللفع المسبق) (3) (قسم إج طليم مك حصيل بدون لليون على إج طلي فتقير) اللفع المسبق منر نام ل ش ام ل أو عن طريق نظم اللفع المسبق) (4) (قسم إج طليم مك حصيل بدون لليون على إج طلي فتقير) اللفع المسبق منر نام ل ش ام ل.

جنسب فت حصيل لليون فقط:



خطوات تنفيذ

لجنة لم ي ل ل ش ر ل ك ن ل ص ح ب ال لمي و ا ن ة ال ن ف و ع ة
ول ي ه م ا م د ا د ا ت ي ا ه م ي د ف ي ش ا ر ع ن ل س) 15
م ش ت ر ك)



1. عدال و ت خ ط ي ط

1. اعد ت ح ص ي ر ف ي ط ة ال ن ي ا ر ة ح س ب ف ي ا ت الم ش ت ر ل ك ن .
أ (ال م ي ن و ن ل ل ف ي ن ل ي ه م 7/24 د و ر ة ي ا ه و ي ف ع و ن .
ج (ال م ي ن و ن م ع ا م د ا د ا ت ال ي ا ه ل م ي د ة ل ل ي ح د م .
د (ال م ي ن و ن ب م ي ن و ي ا ت ع ل ي ة .
2. اعد ا د ج د و ل ال ن ي ا ر ة ، ا ع ض ال ف ي ق ، الن ق ل ، ال م و ا د ز م ة .
أ (ا ع ض ال ف ي ق ال ق ت ر ح : ه ي س و ح د ة ال ج ب ي ، ج ا ب ي ال ف ي ط ة ع ل ن ي
ب (ال و ق ت ال ق ت ر ح : ط ي الم س ب و ع د ي ا م ص ر ف ال ر ي ت ب ل ش ه ر ي .
3. ال ي ش ل ق ال ص ا ل ف ل ن ي ا ر ة :
أ (ق ل م ة الم ش ت ر ل ك ن ال م ي ن و ن ب م ي ن و ي ل ن ك ا س م م ، و ر ق م ع د ا د ال ي ا ه ، و ر ق م
ش ت ر ك ، و ب ن ع ل ي ن ، و ق ر ا ة ال ع د ا د ا ي ر ة ، و ا خ ر د ف ع .
ب (س خ ة م ط ب و ع م ن ت ا ر ي خ ال ف ع ي ال ع ا ي ن ا و ال ث ة ا ع و ا م ال م ط ر ي ة
م ط ب و ع ة م ن ل ش ا م ل .
ج (ل ف س ث و ر ة ا ي ر ة .
د (خ ر ي ط ة ل ف ي ط ة ال ن ي ا ر ة م ع م و ق ع الم ش ت ر ل ك ن) م و ق ع ع د ا د ال ي ا ه)
م ع ر ف ن ق م ع ر ف ال ف ي ن ل ا و ر ق م ع د ا د ال ي ا ه
ه (ي ا ص ا ت ف س د ع ع ن د م و ي ف ع ال ع ف ي ق ك ي ي و م ل ن ي ا ر ة .
4. ب ت ح ي ش خ ص) ا ش خ ا ص ال ل م ت ب ل ع ة :
أ (ا ع ض و ف ي ق ق ت ر ح : م و ظ ف ت م ع ي ن ه خ ر ي ص ال ل م ت ب ل ع ة ا و ل ي ع د
ا س و ع ي ن ، و ل م ت ب ل ع ال ث ل ي ة ع ن ط ر ي ق ا ر س ال ش ع ا ر م ع ال م و ع د ال ف ا ي
، و ل م ت ب ل ع ال ث ل ث ل ا ل ا ع د ا د ق ل م ق ب ل م ش ت ر ل ك ن ل ل ف ي ن ي ف ع و ن
ذ ا ج ر ا ا ت ا خ ر ي ن ه ل ا ج ر ا ا ت ق ل و ي ة ع ن ط ر ي ق ال م ح ك م ة .
ب (ال و ق ت ال ق ت ر ح : ب ل ص ل ف ي ا ي ل س ا ع ا ت ع م ال ط ل ي ة .

2. ي و م ل ن ي ا ر ة

5. ال ب ي ا س ة : ب ي ا م س ل س ق ل م ط ل ب ة الم ش ت ر ل ك ن ب ف ع ال ب ل ع الم س ت ح ق ق ر د ا ا و ب ش ر ك ا ت ن ع د د ة .
6. ال ط و ق ة : ز ي ا ر ا ت ن م ال ب ا ب ا ل ب ا ب .
7. ا ع ي ظ ب : ط ل ق ل م ن ا ز ل ل ت ي ت م ز ي ا ت ه ا ، و ال ب ل ع ا ل ن ي ت م ج م ع ه م ن ك ل ش ر ت ر ك ، و ا ع ي ظ م ن ل ل م ت ب ل ع ة م ع ا ر ا ق ا م ال م و ي ت ف .
8. ا ع ي ظ ب ق ل م ة م ن الم ش ت ر ل ك ن ل ل ف ي ن ل ي ف ع و ا / ال ف ي ن د ف ع و ا م ي ن ي ل ب ق م ال م ت ف ل ل م ت ب ل ع ة ا ل ي .
9. ق م ت ح ي ث خ ر ي ط ة م و ق ع الم ش ت ر ل ك ن ل ل ف ي ن ت م ز ي ا ت م ا ذ ا ل م ا

3. ب ع د ل ن ي ا ر ا ت

10. و ض غ ا ل م س ا ت ا ي ر ة ل ع ي س ج ل م ن ا ز ل ل ت ي ت م ز ي ا ت ه ا و ال ب ل ع ا ل ن ي ت م ج م ع ه م ن ك ل ع ه ي ل و ا ت ع ي ا ظ
ب ن ل ل م ت ب ل ع ة م ع ا ر ا ق ا م ال م و ي ت ف
11. اعد ا د ق ل م ة ع ل م ت ب ل ع ة ا ي ل ن ي ن و ع د و ل ل ف ع
12. ب ت ح ي ش ل م د ف و ع ا ت و ر ا ق ا م ال ا ت ف ا و ا ي ع ل و م ا ت ا خ ر ط ل م ش ت ر ل ك ن ن ه ل ر ق م ع د ا د ال ي ا ه ، و م ال ل ي ذ ل ك ل و ل ش ا م ل .
ا ذ ا ل م ن ، س ج ل ل ي ل ا ش ا م ل و ن ظ م ال ع ل و م ا ت ال ج ج ر ف ي ة GIS .

ل م ت ب ل ع ة ل ي ب ا م س ب و ع ي ن ب ر ف ي ل ي ن . ل ن ه ج : ا س ل و ب س لس عن ط ر ي ق م ك ل م ة ف ت ي ة ل م ت ب ل ع ا و ذ ك ي ر
13. ب ت ح ي ق م ن ل ش ا م ل ا ل ح ص و ل ل و ي ا ي ت ي ح ي ا ت ف ي ال ف د ع ف ي ق ل ال ع ل ل ف ي ن ق ل و ا ل ه م س ر ي ف ع و ن .

14 أفي حللة مع وجود مدفوعك ، تتبدع مع العمل عن طريق المظلمة هنيئلتغير .
15 تبس حيل الردود وإعدادقوائم الع لامتبلعالتلبية .

لمتبلع التلثي قبي حللة عدم لرد / لفع ب عدأبوعين إهنيطين: ا ب إلتصر رامة م يمثلعار خطي مع
الموع دالتفائيليفع.

16 بتحقق منزل شامل حصول نوي أيتتحيات في حالالفع في قبلالمشترلين لفينقلوا أهم سريفعورفي المتبلعة
ا لى.

17 أفي حللة مع وجود مدفوعا ، قم بإعط إشعار لرساله لى العمل مع موعدن طيليفع.

لمتبلع التلثي قبي حللة عدم لرد / لفع ب عد ا ر وبتقديم اليان ات لى اللبية راءات الم حكمة .

18 بتحقق منزل شامل ي تحثياتنفيالفع في قبلالع لامتبلعالتلبية .

19 أفي حللة عدم الفعقم بإعدادقوائم الممشترلين اللبية لمزيد من ا راءات

عننة: لخطة لمقترحة

زيارات يديفة		اجطلي المشترلين لفينتم زيارتهم	
ب الي بياسة		سرب سلس وودي معالمشترلكالفع اللقدي او عن طريق شيكات بقعدة	
للفيق /التقول ول موات		للفيق	
مهام اخرى	عددالمشترلين ليوم	المناطق ا مة	
أعضاء للفيق	عددالمشترلين لكليوم	موظف وحدةالجبية، موظف خدمات مشترلي، جابي ال فطقة	تحث أي بيانات موجودة لي والشامل وال GIS
الموات والتقول	سريارة اللبية (خدماتالمشترلين)	1) خريطة 2) الفعات ايرة 3) اخرفلتورة	

نموذج اشعار: لردوب ودي ورسلس للطب من ل مشترلكيفع لمبلغ لمبتحونة قدا أوبشيكات بقعدة او عن طريق تنثيت عدادفع مريبق.

إخطاتسوىة لاهى قلىة دائرة لاهى اه لاصرف لاصحى



قم ا

عزي زيمشترك لاهى اه:

نعلمك انك لفتتصرفي نتفالمبلغ قدره) (لدويلبية عجين - نظرةالياه والصررفالصحي، وعليه
نخطر كمبضرورة مراجع قبلبية عجين لفع الابلغالالمبتحة او محولالذ لنظامترلي ب عدادالفالعسبق ذلك
خل خمسة عشر يوماً من تاري ختبلعك هذا ا خطار وخ ف لكسرنضطر لفين للاجوع لاج هات القل وية ولقضية
المقصصة .

معالتزمالمشترلي بصفعب ونيهم
المبتحق قسبتمكن اللبية من تحسين
الخدماتالتتيق ومبتفوير طالمواطين

تحري لبت اريخ: / / 2020م

مع تحي اتبلبية عجين،

رئيس بلبية عجين

فلي زفواس ال سعدي

عن بقية ائمة لمتريون لفينتدت نوات هجا افة اى حظاتيوم لنيارة

No.	Owne_Name	HC_ID	REGION	Last Bill/NIS	Total Debt/NIS	Visit_date	Mobile No.	Customer Impresion
1	xxxxxxxx	W6236	Nablus St.	98.16	2398.28	04-12-19	xxxxx	Negative
2	xxxxxxxx	W6272	Nablus St.	23.56	2427.16	04-12-19		Positive
3	xxxxxxxx	W9520	Nablus St.	23	919	04-12-19		Positive
4	xxxxxxxx	W8947	Nablus St.	15497.8	16436.14	04-12-19	xxxxx	Positive
5	xxxxxxxx	W7406	Nablus St.	23.56	11102.7	04-12-19	xxxxx	Positive
6	xxxxxxxx	W6826	Nablus St.	24.56	4280.94	04-12-19	xxxxx	Positive
7	xxxxxxxx	W8240	Nablus St.	23.56	554.44	04-12-19	xxxxx	Positive
8	xxxxxxxx	W1445	Nablus St.	233.68	39760.5	04-12-19	xxxxx	Positive
9	xxxxxxxx	W3283	Nablus St.	54.6	3758.34	04-12-19	xxxxx	Positive
10	xxxxxxxx	W3392	Nablus St.	24.06	3361.24	04-12-19		Positive
11	xxxxxxxx	W7077	Nablus St.	281.7	7921.46	04-12-19	xxxxx	Positive
12	xxxxxxxx	W3574	Nablus St.	30.4	5762.61	04-01-20	xxxxx	Positive
13	xxxxxxxx	W900151	Nablus St.	23.56	7488.98	04-01-20	xxxxx	Positive
14	xxxxxxxx	W6432	Nablus St.	23.56	1845.09	04-01-20	xxxxx	Positive
15	xxxxxxxx	W4611	Nablus St.	25.06	4840.91	04-01-20	xxxxx	Positive
Total				16410.82	112857.79			

عن االسجل لمتريون لمتابعة: لتابعة ا لى ولشاية ولشاية.

No.	Owne_Nam	HC_ID	1st Reminder	2nd Reminder	3rd Reminder (by Delivering a written notice)	Customer Payments	Notes
1	xxxxxxxx	W6236	15-12-19	18-01-20	27-01-20		
2	xxxxxxxx	W6272	15-12-19	18-01-20	27-01-20	1252.88	
3	xxxxxxxx	W9520	15-12-19	18-01-20	27-01-20		
4	xxxxxxxx	W8947	15-12-19	18-01-20	27-01-20		The customer requested PPWM
5	xxxxxxxx	W7406	15-12-19	18-01-20	27-01-20		
6	xxxxxxxx	W6826	15-12-19	18-01-20	27-01-20		
7	xxxxxxxx	W8240	15-12-19	18-01-20	27-01-20		Zero Reading (being followed up by CSS)
8	xxxxxxxx	W1445	15-12-19	18-01-20	27-01-20		Will make a deal and requested PPWM with 50% debt recovery
9	xxxxxxxx	W3283	15-12-19	18-01-20	27-01-20		Requested PPWM
10	xxxxxxxx	W3392	15-12-19	18-01-20	27-01-20		
11	xxxxxxxx	W7077	15-12-19	18-01-20	27-01-20	1000	Abcentee customer
12	xxxxxxxx	W3574	04-01-20	18-01-20	27-01-20		
13	xxxxxxxx	W900151	04-01-20	18-01-20	27-01-20		
14	xxxxxxxx	W6432	04-01-20	18-01-20	27-01-20		
15	xxxxxxxx	W4611	04-01-20	18-01-20	27-01-20		
Total						2252.88	

خطوات تنفيذي ذ

1. حم رفع الوعي لاعلم عن دل جم هور:

1 اعداد و لخطيط

1 بت حيد في طقة ل لزيارة المستمد نش اط لرفع الوعي العام.

2 استخرا ج قوائم المشتركين من قاعدي ان انشل ام لل دل في طقة م بتقارة.

3 اعداد خريطة مطبوع ل في طقة الم سبتف باستخ د لمرن ام جن ظم ال عمل وم اتال جغرافي.

4 اعداد مواد تال عام ل طلبوة

5 اعداد جدول ل لزيارة ، أعض الففيق ، النقل ، وأي مواد اخرى

أ) أعض الففيق ل قترح: موظو تال عام.

ب) لوقت التقيح: ص بلخ أيام ا بوع عن دم ل يكون من التوقع وجود المشتركين في ال منزل

6. ل لخطيق ال ص اصة

أ) قوائم المشتركين ب طي ل ك ا قم اعداد الم ياه ورقم ا تراك.

ب) سخة مطبوعة من خريطة ال في طقة الم سبتففة مع موقع المشتكين (موقع اعداد الم ياه)

7. من ا تال موصي به ل م طرس قبع ض هذه ان ش اطات هي الم سبتا ب اتلارس ية و ا نخل عي دال م د عي دال طر يوم ا رض وم ال ل ذلك).



2 من شورات وسلئ ل لتواصل اجتماعي:

أ) حدد أهداف وغايات النشور (نش عارات الليبية و نشطة الليبية و طلب دف الففيق وم ال ل ذلك)

ب) اعد لوقت ل جدول ل الزمن ي ، وأعض الففيق ، ونوع ال مواتي يتم استخ دام ها.

أعض الففيق ل قترحون: مؤلفو ا تال عام ف فيب عض ال حا يوصي بصمم خار جيفي حلة ط ببتص ي طبع ل مواد ل ل تربي حة.

ج) اعداد مواد تال عام ل م طلبو سبتا ب استخ د لمرن ام ج التصر يم نخل Photoshop و Adobe premiere pro أو Camtasia studio أو برامج اخرى م ل مثلة:

1. اعداد التصريم ان ل سب ل م طلبة أفك (نشطة لليبية أو الم سبتا ب ل ل خسة ل عي سب ل المثال (مع مراعاة اص الم سبتففين).

2 في حل قاستخ د اهل ل يي وكم ادة ربي عي جب ان ت تكون ال مة من ل ب ل قلم موضوع و يوصى بان ت تكون قصيرة قدر ا مكان.

د) ي جب ل عي مؤلفي تال عام اعداد نشورات خسة نشطة لليبية و ل ل سب ات الليبية أو أي أحداث اخرى.

3. لارسل الى لصري قلائك يري ةلل م طلبه بيس تبح اتال بلوي ة:

أ. اعداد واك خطي ط

ب. سريتم استخلم تلي رلار سل الل القصري رفا لعي نة بللمل ها.

2) اجمع راقام موثف الم شترلي ر في ال فني طة الم ختارة. ب هول سل طة خطي فني تال عمارة او مو ظي ق م خدمات الم شترلي ن

3) استخرا ج ق طام ة الم شترلي ن ال مو يين من ق اع دقي ان اتل ش ام ل بلن عاون م ق س م خدمات الم شترلي ن.

4) اعداد ق طام ق طيس لت ضوي علي اس م الم شترلي و ر ق مال م ثف.

(ق م ب اعداد ال جدول ل الزمي ، أعض الف في ق.)

أ) أعض الف في ق ال ق ترح : مو ظو تال عمارة و ربي س ق س م خدم ة الم شترلي ن او مو ظي ق س م.

ب) ل ق ت ال ق ترح : ش ه ر ي ب عد م ن ب ا ت ال مو ظي ن.

6) استخدا م م س ت خدم خ ل ل ل ي ة م جين ل ق م و ق ع ج و ل) ش ر ك ة ن ص ر ا ت) ل ل ر سل الل القصري ة.

أ) ن ش اء م ج م و قة ل ق م و ل ق ت ر و ن ي ل الم شترلي ن الم س ت ه ن ي ن.

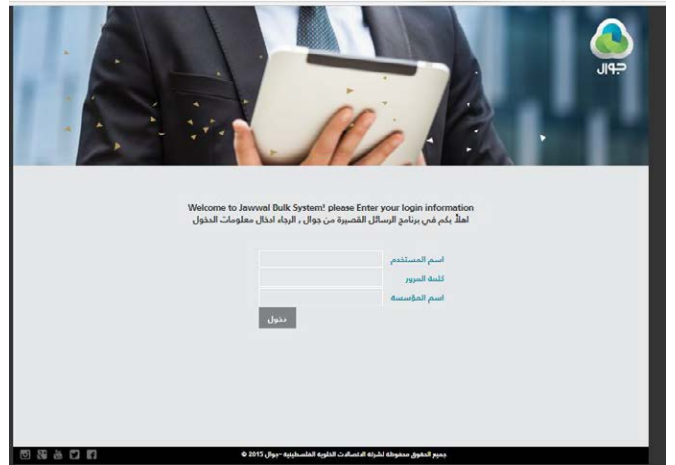
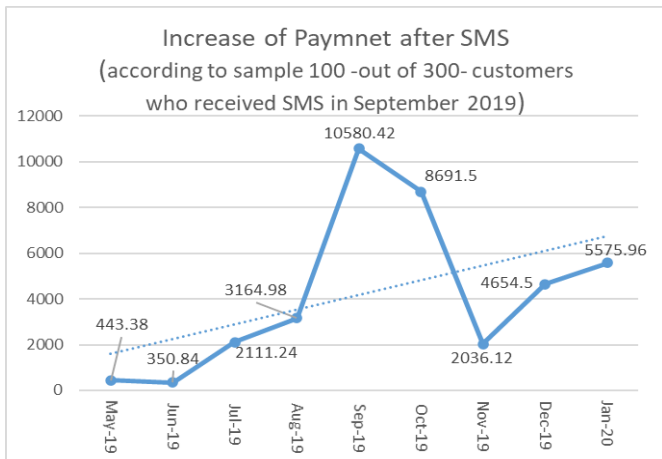
ب) ق م ب ت ح ي ل ل م ف Excel في ال ن م و ذ ج ال ن م س ب.

ج) ا ر س ال ل ر سل الل ق ص ي رة ل ل ش ه ر ال م ط ل و ب.

7) ق م ب ت ح ي ق طام ة الم شترلي ن ب ع د ك ل ش ه ر ل ك ت ق ر ق م ن الم شترلي ن ال فني ق ام و ل ل ل ف ع ا ل ر د ع ل ي ل ل ل ل ت ل ف ي ر . (ه ذ ه ال ن ق طة س ي ت ك و ن ال ن ع ا و ن م ق س م خدمات الم شترلي ن .

8) الك ق ر ق ر م ف ع ط ي ق ت ل ي ر ل ر سل الل القصري ة ك ل 3 ا ش ه ر ب و ع س ن و ي) ع ن ط ي ق ر س ح ي ان ي ي و ض ح م د ن ت ا ش ر د ف ع ا ت الم شترلي ن ب ع ا ق ت ب ال م ذ ط ا ر سل الل.

9) ا ت خ ا ذ ا ر اء ا مة م ع الم شترلي ن ال فني ل م س ت ب ط ل ت ل ي ر ل ر سل الل القصري ة . (ق ل ل ق طام ة ل ال و ح دة ال ق ر و ية ذ ا ج ر اء ا ت ل ك ل ش ر ص ر ا مة .)



عين قف ع ل ية ارس ال ل رسل الل فني فدا ع ا ت ل م ت ر ل ي ن

عين ة : م ن ت خ د م ل ية م جين ل ق م و ق ع ج و ل

別冊資料 CD 1.2

**Report on Mobile Billing System (MBS) for
Jenin Municipality - English Version**



Jenin Municipality

Project for Strengthening the Capacity of Water
Service Management in Jenin Municipality
(WaSIP)

**Report on Mobile Billing System
(MBS)**

for Jenin Municipality

December 2021



Japan International Cooperation Agency

وكالة التعاون الدولي الياباني

Mobile Billing System vs. Current Billing System of Jenin Municipality

After months of discussions in 2018 and 2019 improvement of meter reading and billing, Jenin Municipality reviewed the two options of 1) introduction of MBS Or 2) improvement of the current system. The table lists advantages of the use of MBS and also challenges if JM keeps the current system but improve. With JM approved MBS and selected ALIsra Company as the MBS provider and lunched the system in early 2020. Below table provides a recording of the activities.

1) Situation review; background on meter reading issues

1. The faulty meters or misused meters- reported by meter readers- are not recorded on the customer database and thus kept on paper and not time for the Customer Service section to follow up.
2. Possibility of human errors in recording the readings and entering data in AlShamel.
3. Paper base procedure of meter reading recording and reporting, also billing.
4. The billing process is separate from reading and is done after the reading data is collected. This consumes some days for preparing the bills (five days per month). Bills are delivered for the last month usage. With use of MBS, however, the bills can be issued for the same month of reading at the spot with no need to be processed at the back office.
5. Manual data entry of water meter reading in monthly bases for 8,500 customers.
6. Cost of 8,500 bill papers and printing every month and the time it takes.
7. Some meters are hard to reach to be read.

2) Options to address the above issues by

- A) Use of MBS or
- B) Improve the currently practiced procedure for meter reading

Comparison of the two:

A) Use of MBS

Giving that MBS is as accurate as the current paper-based meter reading, it also has the following benefits:

- 1) Reads meter, calculates, prints and issues, and delivers the same month bill on the site and on the day of reading thus no need to present the bill next month;
- 2) All data is transferred real time to AlShamel through integration between the two systems and thus no need for manually hand-writing the read data and then entering the data in AlShamel.
- 3) Payment can be received on-site so readers are also collectors.
- 4) Motivates JM to upscale its workflows to develop assessment/evaluation tools to regularly monitor and process the collected and reported data and issues; MBS can support efficient procedure and supervision, paperless, errorless, and timesaving procedure for meter reading/billing both onsite and back-office.
- 5) Generates reports and analysis data
- 6) Strengthens inventory of customer data by adding photos of the water meters (faulty, hard to reach, etc), and by digitally recording customer's comments or complaints on the system; can be followed up.
- 7) Updates or removes possible errors in the current customer database within the first few months without a need for any surveys (due to additional information collection by the device i.e phone number, water meter number, customers residential status/names, records the meter status.). After that, the customer data is constantly updated every month.
- 8) Improves financial management and customer management; Less manual post processing; Consumer billing details are mobile by the supervisor on a daily base and viewable real-time in online mode.
- 9) Saves on bill papers and printing due to the use of small paper roll and printing device.
- 10) Able to read hard to reach meters within few meters using the meter bar code.
- 11) Debt recovery can be set up and included in bill issuance.
- 12) Requires less technical support due to its simplicity, is compatible with the existing customer database and accounting software (AlShamel), user friendly software and universally available technology; easy to adapt; has potential of being integrated with PPWM or GIS in the future

13) Preferred by the meter readers for convenient and easier collection of the meter data; motivates readers.

14) Cost-Time benefits of MBS

(Please refer to the attached document for details)

1. JM could save 13,020 NIS annually and 60 days for eliminating bill preparation and printing
2. JM could save 26,952 NIS annually and 234 days for eliminating entering the monthly meter reading data in Al Shamel every month
3. JM could save 13,992 NIS annually on paper and printing ink

Total expense saving: **53,964 NIS** per year (about **15,000 USD** with 1USD=3.6 NIS as of October 30, 2018)

Total workday saving: **294 days** would be free for the 4 employees of the Customer Service section

a) Giving above cost-time benefit calculations, the proposed MBS's cost could be fully recovered in the first year.

b) It should be also noted that the freed workdays could be utilized for conducting other productive customer service activities i.e. follow up with reports on faulty, hard to reach, or misused meters by meter readers, scanning and attaching customer various application forms to AlShamel database, develop assessment/evaluation tools to regularly monitor and process the collected and reported data and issues, address any customer complaints, etc.

Some information for cost benefit of MBS

1. The monthly hours Khaled spends on preparing and printing the bills;

Mr. Khaled needs full five days monthly to preparing and printing the bills and one day before for calculation

$4700(\text{NIS/month/cap}) * 6(\text{days}) / 26(\text{days/month}) = 1,085(\text{NIS/month})$

2. The hours Abdul Karim, Sharif and Omar spend on entering meter readings in Al Shamel (by each person, per day, per week, and total per month).

※ Total customers who need meter reading are 6,650 (excluding the upcoming 1,850 PPWM users through the Project who will not need to be read.

There is no fix hours and numbers but the average is :

Entering meter readings daily by each employee	Time required daily	Total daily	Total
170 Customers	3 hours	170 Customers * 3 Employees = 510 Customers	6650 customers /510 customers daily = 13 days

They need 16 days to finish the entering data by working 3 hours a day, but if they concentrate only in the entering they finish in 10 days

Salary of each employee per hour: $3000(\text{NIS/month})/26\text{d}/6\text{h}=19.2\text{NIS/h}$

Cost of data entering work for 3 hours for 13 days for each employee= $19.2\text{NIS}*3\text{h}*13\text{d}= 748.8\text{NIS}$

Total pay for the three employees: $748.8\text{NIS}*3=$ **2,246.4NIS**

3. The cost of paper and printing ink per month for bills. Estimate is OK.

Customers Service Section print 80.000 bills each 6 months, it's costing 7000 NIS, costing per month **1166 NIS**

Cost Saving Effect in Total: $1,085 + 2,246 + 1,166 = 4,497\text{NIS/month} = 53,964\text{NIS/year}$

B) Keep the current system but improve

To improve, the followings should be taken into consideration:

- 1) Motivational sachem is needed for meter readers and collectors.
- 2) Since everything is paper base, there will be a need to constantly manually check and update water meter data, customer database on different sources; archived data, monthly water meter reading documents, AlShamel, and accounting system.
- 3) Improvement requires efficient coordination, monitoring, cooperation, supervisor, motivation, and time/staff.
- 4) Time-consuming improvement which requires high level of commitment among all involved staff from different levels in both customer service section and bill collection section
- 5) No guaranty if the improvement is maintainable.

3) Problems remain even after lanching MBS

Even with MBS, there will be a need for other solutions such as meter replacement, PPWM, PR activities, readers/collectors motivational schemes, PalPay, bill collection improvement, etc.)

1. Some customers may still refuse to pay onsite.
2. Error in typing the correct paid amount and thus issuing incorrect receipts.
3. Since the meter is not replaced, customers still complain about their meters counting air.
4. No meter replacement so readings only reflect the read number of the water including possible air counts.
5. Some customers may not open the door so reader has to re-visit.

4) Problems remain even after improving current situation without MBS

1. Meter readers may not return to read absent customers and just estimate offsite. Because date&time of reading is not supervised, and readers paths are not tracked by supervisor.
2. Customers may refuse to pay onsite.
3. Readers may estimate readings offsite since they can see the last readings.
4. Since the meter is not replaced, customers still complain about their meters counting air.
5. Reading/collection is on paper and manual, so it is time consuming and chance of human unintentional and intentional errors remain.
6. No meter replacement so readings may reflect the reading with possible air counts.
7. Some customers may not open the door.

5) Two price offers on the MBS, specifications, advantages, disadvantages

- A) By the Allsra Company and
- B) By the Expert's Company

Comparison of the two:

A) Allsra Company's MBS

The same company that provides AlShamel to JM

Specifications of Allsra's MBS:

1. Meters, subscriptions, citizens, and everything related to meters, including coordinates of the meter location, are defined, the location of meter coordinates is taken and linked to the meter serial number and saved in Alshamel system.
2. How the mobile billing system works:
Data transfer from Alshamel to the device for each collector; Registration of the collector location when readings are entered from the device and compare them with coordinates in Alshamel System; Collector is linked to a certain number of customers so that collector read the meters which belong to him only, and he can receive payment from customers who belong to him only.
3. This system works online and offline, if there is direct contact to the main system the data is uploaded directly to main server, if there is no contact to the main server, transactions are saved on the device, and upload them to the server if the connection is available.
4. Integration between the device on the site and AlShamel system for data exchange
5. User name and password for each collector and give collector authorization to work on mobile billing system
6. Searches for customers manually or according to neighborhood and customers appear on screen in two ways by barcode or GPS and municipality can chose which way.
7. The system works offline and online.
8. There are two ways for reading: GPS and barcode.
9. Readers or collector are not authorized to modify saved data. Only the admin can do it.

Advantage of Allsra's MBS

- Ensures reading all meters
- Reduction in billing cost
- Paperless operation
- Easy and actual readings and recording
- Customer satisfaction
- Detecting and reporting onsite of faulty meters and absent customers
- Debts can be included in bill
- Consumer billing details are mobile by the supervisor on a daily base.
- Customer database can be manually uploaded/exported daily in each mobile device for readings if not integrated with the AlShamel and accounting system.
- The water meter XY location feature ensures that reader reaches water meter location for reading.
- Reduces reader/collector's commuting trips to work because the readers become collectors once print the bills and no need to return for collection.
- Can be integrated with AlShamel and other accounting system.
- Ensure that the invoice reaches subscribers.
- Reading/collection is paperless so it saves time and chance of human unintentional and intentional errors drops to almost zero.
- Readers can report faulty meters on the system and take photos.

Disadvantages of Allsra's MBS

- Meter XY position detection, at time of reading, may need good satellite signals by the reading device/tablet otherwise the reader needs to enter water meter number manually to open and view the customer page and to enter the reading.
- No experience integrating with AlShamel but it is the same company that owns AlShamel thus they may work it around.
- No experience integrating with PPWM.

Price Offer of Allsral's MBS:

Offer details:

Time to complete: 3-5 weeks

Price offer: Total **8,722**

1) Installation on 7 devices: 3,657 USD (*not includes mobile phones)

2) Hardware- mobile printer: “Zabra ZQ520”; 5,040 USD, and Paper roll thermal; 25 USD

Term of payment: Cash upon agreement sign

After sale support and maintenance: 1 year free warranty

Separate offer for 7 Samsung tablets from local store in Jenin: Alnejah T&T Center:

Each tablet: 800 NIS

Total for 7 tablets: 5,600 NIS= **1,550 USD**

Samsung Galaxy Tab 3 Lite, Model: SM-T110, RAM: 1 GB, Flash memory: 8GB, Card slote (32GB), Screen: 7 inch LCD, Android: 4.2, CPU: 1.2GHz, WIFI: 802.11B/g/n, Camera: 2.0mp, Bluetooth: A2DP, Battery 3600 mAh

B) EXPERTS Company’s MBS

The company offers IT services, consultancy, and solution provider; based in Palestine; experience in providing billing software to NEDCO, JEDCO, HEPCO, SELCO, PWA, PEA, Nablus Municipality, Bethlehem Water/Sewerage Authority Salfeet Municipality, Albireh Municipality.

Specifications of EXPERT’s MBS

1. The App can be installed on Android Mobiles
2. Onsite reading with date& time
3. Onsite bill calculation, issuance, print, and payment collection
4. Multiple payment options
5. Electronic transactions
6. Compatible with the latest smart phones, hand held units
7. Scans meters barcode labels
8. View customer/meter details
9. Searches customer by barcode, service meter, reference, etc.
10. Provides detail view of customer and all his information.
11. Readers or collector are not authorized to modify saved data. Only the admin can do it.
12. Warnings for high/low readings
13. Report generation
14. Online communication with back office
15. Offline work possible
16. Apply reading validation rules
17. Data security against loss.
18. Photo option as attachment.

Advantages of EXPERT’s MBS

- Ensures reading all meters
- Tracking meter readers on reading paths, date& time
- Reduction in billing cost
- Paperless operation
- Easy and actual readings and recording
- Customer satisfaction due to multiple payment options if used
- Detecting and reporting onsite of faulty meters and absent customers
- Debts can be included in bill
- Consumer billing details are mobile by the supervisor on a daily base.

- Customer database can be manually uploaded/exported daily in each mobile device for readings if not integrated with the AlShamel and accounting system.
- It can work/integrate with all sorts of PPWM systems.
- Reduces reader/collector's commuting trips to work because the readers become collectors once print the bills and no need to return for collection.
- Ensure that the invoice reaches subscribers.
- Reading/collection is paperless so it saves time and chance of human unintentional and intentional errors drops to almost zero.
- Readers can report faulty meters on the system and take photos.

Disadvantages of EXPERT's MBS

- Experts company needs JM's customer database to be provided in their formatted templates to be migrated into the new system. JM has not yet reviewed this template format and not evaluated possible challenges. This might need the rival Allsral's cooperation and cost some.
- Experts company needs cooperation of the rival Allsraa company to integrate this system with JM's Allsra-based AlShamel accounting system. This might cost extra.
- JM needs to plan and label every meter with special barcode and enter to the system.
- If not labeled, the reader needs to enter water meter number manually to open and view the customer page and to enter the reading.
- No experience integrating with AlShamel
- No experience integrating with PPWM.

Price offer of EXPERT's MBS

Time to complete: Only mobile billing system: Two weeks without integration

Cost: Total **17,000**

1) Installation on Maximum 7 Android mobile devices: 14,000 USD

2) Hardware- mobile printer: "Zabra ZQ520", Bluetooth, with charger, battery, clip and CD drive: 5 devices: each 600 USD; total: 3,000 USD

Term of payment: 50% upon issuing the P.O

40% after implementation completion

10% after Go-Live and final acceptance

After sale support and maintenance:

3 months free support included.

20% of total price will be applied for annual after sale support and maintenance

5 mobiles

Each mobile: 350 USD

Total= **1,750 USD**

Five Samsung J7 Pro

6) Discussions among JM and opinions over selection of the two systems

1) JET's opinion favors EXPERT's MBS after reviewing the two offers and specifications, strengths and drawbacks.

Allsra Company	
Strength	Drawbacks
1) Some experience with mobile billing system 2) Already provides AlShamel to the municipality and the accounting system so no problem with integration 3) Expansive working experience with JM 4) Cheaper price offer	1) Restricted term of payment 2) Limited experience of integration with PPWM

EXPERTS Company	
Strength	Drawbacks
1) More experience with mobile billing system 2) Provided more information on the MBS once requested so more cooperative professionally 3) Better terms of payment 4) Mobile billing system includes more functions	1) No experience with integration with other systems including AlShamel 2) No work experience with JM 3) Higher price offer

2) JM's opinion favors MBS and the Allsra company after reviewing the two offers and specifications, strengths and drawbacks. JM approves selection of Allsra company's MBS.

JM's opinion after the meetings:

Favors MBS by Allsra Company for the following reasons:

- 1) Already provides AlShamel to the municipality and the accounting system so no problem with integration.
- 2) Expansive working experience with JM
- 3) More user-friendly and easy to use program
- 4) Cheaper than Experts' MBS

Also 7 MBS tablets and printers are needed instead of 15 because:

- 1) 5 readers for PPWM areas are excluded.
- 2) Since the MBS might decrease the reading/billing time, the reading area could be increased so JM decided to start with 7 and purchase the other 3 if needed by their own cost.

City Council members' opinion after the meeting:

Approved.

7) Discussion meetings

1) Meeting with Experts Company to present MBS product in February 2018

Expert Company: Mr. Hamed Hamam, Mohammad Arar, Khalil Tavit

JICA Experts: Ms. Masouleh, Mr. Mohammad Azmoty

2) Meeting with Allsra Company to present the MBS product (and other issues with AlShamel) on March 25th, 2018

Expert Company: Omry Bsharat, Nizam Dweekat

Jenin Municipality: Suheel bu Hammad, Sara Soboh / IT: Ragib Malhees, Khaled Abo Obeid /WD. Mutaz Kakban / Water Section Abd Alkareem Kmeel / Clerks Division Samer Omari, Mohammad Ali/F.D.Gazi Faisal / Auditor. Ali Abu Ali / Hand Crafts and Industrial Mohammad Musmar, Ahmed Asmar / Warehouse Mahmoud Nassar/ PCS

JICA Experts: Mr sato / Mr Azmoty / Mr Phatta Thapa

3) Meeting with Experts Company to present the MBS product on August 7th, 2018

Expert Company: Mr. Hamed Hamam, Mohammad Arar
Jenin Municipality: Suheel Hammad, Sara Suboh/IT Section. Abd Albaset/ collection Unit. Mohammad Ali/Financial Dept. Khaled Abo Obeid, Omar Faza/ Customer Service Section. Mohammad Zubi/PR
JICA Experts: Mr. M.Azmoty, Ms. Masouleh, Mr. Thapa

4) Meeting with Allsra Company to present the MBS product on August 5th, 2018

Allsra Company: Mr. Nitham Dweekat, Omry Bsharat,
Jenin Municipality: Suheel Hammad, Sara Suboh/ IT Section. Yazeed Shreem, Abd Albaset/ collection Unit. Mohammad Ali/Financial Dept. Khaled Abo Obeid, Omar Faza/ Customer Service Section. Mohammad Zubi, Naser Gazal/PR. Mahmoud Nassar/PCS
JICA Experts: Mr. M.Azmoty, Ms. Masouleh

5) 1st discussion meeting of JM staff to review the MBS proposals and offers on Saturday, Aug 18th, 2018

Jenin Municipality: Customer Service Section; Mr. Khaled Abu Obied, Financial Department; Mr. Mohammad Ibrahim, PR department; Mohammad Alzubi, IT section; Mr. Suheel Hammad
JICA Expert: Mr. Mohammad Azmoty

JM opinion: The C/P agreed with the necessity of the MBS for JM and favored the Allsra Company as the provider for the following reasons:

- 1) It is comprehensive, and JM already uses this company's product. (Mr. Khaled Abo Oboid, head of Customer Service)
- 1) Already provides AlShamel to the municipality and the accounting system so no problem with integration (Mr. Suheel Hammad/ IT section)
- 2) Alisraa mobile billing system compatible with the system which is used in the municipality, and it will be less expensive, and is suitable for municipal expenses. (Mr. Mohammad Ibrahim/ FD)
- 3) It is easier to be linked with the existing system. (Mr. Mohammad Alzoubi/PR Section)

6) 2nd discussion meeting of JM staff to review the MBS proposals and offers on Tuesday, November 5th, 2018

Customer Service Section; Mr. Khaled Abu Obied/ Shareef Zakarneh and Collection Unit; Mr. Yazeed Shreem and Mr. Raed Saadeh

JICA Expert: Ms. Fatemeh Masouleh and Mr. Mohammad Azmoty

1) Customer Service

Confirmed importance of MBS, because if JM implement this system, they save money and efforts, and more accuracy for meters reading and ensures access to all meters in the city. The customer service section has problem in the printer machine, that cause delay in printing of water bills for five days at least and cause stops in some other JM's activities which could be solved by using MBS.

Mr. Khaled, the head of customers section, favors the Alisraa system for more easy and data availability
Mr. Shareef, the staff of customer service, said Expert company has more options, but he agrees that Alisraa's system is more user friendly.

2) Collection Unit

Mr. Raed, the collector, encouraged the idea because this system reduces the human error.

Mr. Yazeed, head of the collection unit, recommended to go with Alisraa company, and that they can start with 7 devices in this phase, and check ability to increase the number of devises in the future.

7) Meeting of JM staff with NEDCO- the power company- to learn their experience of MBS-based meter reading through meter barcodes, December 5th, 2018

Customer Service Section; Mr. Shareef Zakarneh and Collection Unit; Mr. Abd Albast Abu Mwees

NEDCO: Mr. Ryad Lahlouh / IT section, Mahmoud Kelani / Technician

JICA Expert: Mr. Mohammad Azmoty

- 1) Tablet can read barcod through camera, no need for Bluetooth device as Alisraa said.
- 2) JM can ask Alisraa to add what we need on the system.
- 3) JM can add external memory for tablet and using SIM card if we decide to be online or activate GPS if they want to know the route of reader.

8) Meeting with Alisraa and Roggeb Village visit to see how the tablets and MBS work, Sunday Jan 19th, 2019

IT section: Mr. Suheel Hammad, Collection Unit: Mr. Yazeed, Financial Department: Mr. Mohammad Ibrahim

Alisraa: Mr. Husam Dweekat, Mr. Nitham Dweekat Mr. Jamal

Roggeb Village: Accountant of council: Mr.Mamoon Rawajbeh

JICA Expert: Mr. Mohammad Azmoty

Alisraa Meeting for Mobil Billing System

1) They checked the sample of our tablet specification, the specification is very good but they advise to use 16 G.B. not 8 , if we use 8 G.B. we should have to be careful to not use any other Application like Whatsapp or facebook because any new Application takes space and effect on the speed of main Application

2) The others specification is very good

3) They recommended to use GPS and barcode at the same time, GPS to know the collector path and know the meters locations, barcode for more accuracy.

Roggeb Village Council – Mobil Billing System

1) They started this system before two weeks

2) They updated all data before starting work with M.B.S

3) The number of customers in this village is 1,400

4) They work manually: the reader read the meter and enter the reading to the program and make calculation and print the bill without using GPS and barcode

5) When the collector back to the office he transfer data to the server

6) The last reading is hidden

7) Received the specification of their tablet

9) Meeting with City Council Members in March 2019.

JM approved selection of Allsra MBS.


8) Attachments:

Meeting with Council members of JM and their decision:

The following items are recommended for the discussed matters on March 18, 2019 -as pointed on the attached meeting agenda.

Items	Recommendation by Water committee members
Mobile billing System	Recommended: التوجهية بالمرتفعة على شراء نظام الموزعة المحمولة مع اعادة طبع "الاستدراج" الرقمية "وتنظيم البورد" بوقت الانطلاق
PPWM	Recommended: 1. Customer Contract: PPWM related parts
a. Connection Fee	Recommended: يستم الاستدراج معك شيكل بتكفيهم "سوا العار" استلام بر شيكله، يتم
b. Debt recovery: immediately / or after 3 months?	Recommended: تا يديه 50 دينار "رنا مولي الرستم حل تم ذكرها في القعد"
c. Apartments vs. buildings subscription	Recommended: يتم ختم الملاء المياه السابقة مباشرة بعد التركيب للمدار سبعة اذ بلغ
2. Public building: PPWM or NO	Recommended: "اما في حالة بيت العائلة" 11 التوزيع الاجتياي "المدى للخدمة السعيك والحدك التجاري"
3. Fee of re-issuing PPWM Card	Recommended: - تركيب عدادات مبيحة المدعي للماني الكهربيك (ساعة، مس، مس،) موقساته بونديك ويتم اراسل وزاه الامتات، التركيب والتعلم، القهر، جهنا المخصصه
4. Installation Teams	Recommended: يتم ضمهم منهم عن بلطامة الضمه 3 شيكل بيل خافه ارضاه اما في حالة كاه جهناه حل شي فالبلطمة تقبل للكرلية
Others	منصة الترويجية المقترح للوقه التركيب وكلمة المرداد

الترصيف بشرا: 2000 عدد وسع المدعي للاشتميم المبرد، بحيث يلزم اى منزله منبهه
بعداد وسع المدعي، ولكي يتقبله عنده تغيير عداده (العداد سسه المدعي يتبع بونديك)
شوم جيلانه 11.2 شيكل ثابته لتتمك المدعي المدعي / 6.2 مبيحة شباة + 5 شيكل مبيحة عداد
شوم جيلانه 0.5 شيكل على سوا الكون
- سوا صرف المدعي شيكل على سوا كون الماء
- سوا رقم الماء (المدعي البراهي) توصفها شيكل كامل
شوم جيلانه 4.84 يبه
شوم جيلانه 4.34 يبه
شوم جيلانه 6.7 يبه
شوم جيلانه 6.2 يبه
شوم جيلانه $5-50$ لوك
شوم جيلانه 50 كون

Minutes of Meeting		
Meeting With PalPay And Alisraa And Roggeb Village visit		
Date/Time	Sunday Jan 19 st , 2019	
	PalPay – Ramallah	11:00 AM to 12:30 PM
	Alisraa Company – Nablus	13:45 PM to 15:30 PM
	Roggeb Village Council – Nablus	15:30 PM to 16:30 PM
Venue	Nablus and Ramallah	
Attendance	Jenin Municipality: Mr. Suheel Hammad / IT section, Mr. Yazeed / Collection Unit, Mohammad Ibrahim / Financial Department	
	PalPay Company: Mr. Shafeeq Bali	
	Alisraa: Mr. Husam Dweekat, Mr. Nitham Dweekat Mr. Jamal	
	Roggeb Village: Mr.Mamoon Rawajbeh/ Accountant of council	
	JICA Experts: Mr. M.Azmoty	
Agenda		
PalPay Service and Mobil Billing System		
Documents		
Discussed Subjects Recommends		

PalPay Meeting

The number of PalPy centers in the Jenin city and refugee camp are 18
 There is a possibility to increase these centers to what the municipality needs
 PalPay needs API from Alisraa to make integration with Alshamel, API costs 2500 USD, JM/Mr. Yazeed suggested to PalPay to pay API cost and give them two offices belong to the municipality to use PalPay machine, one of them in Hifa street office and second one is downtown office, and PalPay can use all of their services like Electricity, Telephone, in addition to water bills (suggestion under study by PalPay).
 The percentage of PalPay is 1.25 % of the total amount
 JM customers can pay at any point in the west bank belong to PalPay
 Payment mechanism: a. Total amount: this is mean customer can know the total of debts included current bill and he can pay any amount, when data transfer to Alshamel server JM can distribute the payment from the latest to the oldest b. customer can pay the current bill and some of debts, but this way needs more programming efforts from Alisraa company (The way of payments under study between Alisraa company and PalPay company) but in the b option there is minimum of payment is all of current bill.
 Any transaction transferred online to Alshamel directly
 JM will match the bank statement with Alshamel statement
 PalPay will provide the customers an application its name (Bank Mobile) customer can pay through this application from his Mobil in his home, and transfer online to the bank and Alshamel direct
 PalPay has new service it's name)My Wallet) if the customer didn't have bank account can charge this card in PalPay station and pay later for any serves
 PalPay will promote for the service by signboards and posters
 It takes 3 days to complete the work if everything is available like API, Supermarkets
 PalPay sent a draft of contract for reading and review

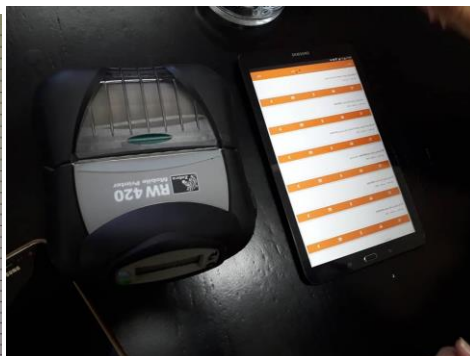
Alisraa Meeting for Mobil Billing System


They checked the sample of our tablet specification, the specification is very good but they advice to use 16 G.B. not 8 , if we use 8 G.B. we should have to be careful to not use any other Application like Whatsapp or facbooke because any new Application takes space and effect on the speed of main Application
 The others specification is very good
 They recommended to use GPS and barcode at the same time, GPS to know the collector path and know the meters locations, barcode for more accuracy.

Rogeeb Village Council – Mobil Billing System

They started this system before two weeks
 They updated all data before starting work with M.B.S
 The number of customers in this village 1400
 They work manually: the reader read the meter and enter the reading to the program and make calculation and print the bill without using GPS and barcode
 When the collector back to the office he transfer data to the server
 The last reading is hidden
 You can see in below pictures the interface of the M.B.S and printer and specification of their tablet

NETWORK	Technology	GSM / HSPA
LAUNCH	Announced	2015, June
	Status	Available, Released 2015, July
BODY	Dimensions	241.9 x 149.5 x 8.5 mm (9.52 x 5.89 x 0.33 in)
	Weight	490 g (W-Fi)/ 495 g (3G) (1.08 lb)
	SIM	Micro-SIM
DISPLAY	Type	TFT capacitive touchscreen, 16M colors
	Size	9.6 inches (~73.9% screen-to-body ratio)
	Resolution	800 x 1280 pixels (~157 ppi pixel density)
	Multitouch	Yes
PLATFORM	OS	Android OS, v5.1 (Lollipop)
	CPU	Quad-core 1.3 GHz
MEMORY	Card slot	Quad-core 1.2 GHz - USA model microSD, up to 256 GB (dedicated slot)
	Internal	8/16 GB, 1.5 GB RAM
CAMERA	Primary	5 MP, 1/2.2, autofocus
	Features	Geo-tagging
	Video	720p@30fps
SOUND	Secondary	2 MP, 1/2.4
	Alert types	MPS, WAV ringtones
	Loudspeaker	Yes
	3.5mm jack	Yes
COMMS	WLAN	Wi-Fi 802.11 b/g/n, Wi-Fi Direct, hotspot
	Bluetooth	Wi-Fi 802.11 a/b/g/n, Wi-Fi Direct, hotspot - USA model
	GPS	v4.0, A-GPS, v4.1, A2DP - USA model
	Radio	Yes, with A-GPS, GLONASS, BDS
FEATURES	USB	No
	Sensors	microUSB v2.0
	Messaging	Accelerometer
	Browser	Email, Push Mail, IM, HTML5



Minutes of Meeting		
Meeting JM Staff		
Date/Time	Tuesday Nov 6 st , 2018	1:00PM to 2:20PM
Venue	JM	
Attendance	Jenin Municipality: Khaled Abu Obied/ Shareef Zakarneh Customer Service Section, Yazeed Shreem and Raed Saadeh / Collection unit	
	JICA Experts : Mr. M.Azmoty, Ms. Masouleh	
Agenda		
Mobile Billing System		
Documents		
Discussed Subjects Recommends		
<p>Customer Service</p> <p>Confirm on importance of M.B.S, because if JM implement this system, they save money and efforts, and more accuracy for meters reading and ensure access to all meters in the city, customer service section they have problem in the printer machine, that cause delay in printing of water bills for five days at least.</p> <p>Mr. Khaled head of customers section with Alisraa system for more easy and data availability</p> <p>Mr. Shareef said Expert company they have more options, but he has the same idea Alisraa more easy.</p> <p>Collection Unit</p> <p>Mr. Raed / collector, he asked many questions about the benefit of M.BS, he encourages the idea because this system reduce the human error, and he asked about some details related to this system especially about reading meters and what is the distance which can be read the meters</p> <p>Mr. Yazeed / head of the collection unit, recommended to go with Alisraa company, and they can start with 7 devices in this phase, and check ability to increase the number of devises in the future</p> <p style="text-align: center;">END!</p>		

Minutes of Meeting		
Meeting JM Staff		
Date/Time	Saturday Aug 18 st , 2018	10:00AM to 11:00AM
Venue	JM	
Attendance		
	Jenin Municipality: Suheel Hammad / IT Section, Khaled Abu Obied/ Customer Service Section, Mohammad Ibrahim/FD, Mohammad Alzubi/PR Section	
	JICA Experts : Mr. M.Azmoty	
Agenda		
Mobile Billing System		
Documents		
Discussed Subjects Recommends		
<p>Mr. Suheel Hammad/ IT section Expert's system is an integrated and is better, but there is billing system in JM integrated into aLshamel system, and going towards Alisraa system is the best choice in terms of integration, With addition of what is necessary to the mobile billing system, and develop it to be more suitable for JM.</p> <p>Mr. Mohammad Ibrahim/ FD Support Alisraa Mobile billing system, because Alisraa mobile billing system compatible with the system which used in the municipality, and it will be less expensive, and is suitable for municipal expenses.</p> <p>Mr. Mohammad Alzoubi/PR Section With recommendation of IT section to adopt Alisraa mobile billing system, because it's linked with JM system, with the need to develop a mobile billing system according to the need of collectors and customer services.</p>		

Mr. Khaled Abo Oboid/Customer Service

Expert mobile billing system is the best because it is comprehensive, but as that JM used Alshamel system we hope these modifications: a. Add the serial number to the system to show the identity of customer b. Possibility of photography to show the status of meter if there is any problem c. Inclusiveness in obtaining customer data and add column for barcode and archive to the system d. Hide previous readings to ensure no estimation e. modify the system in accordance with work mechanism of customer service section by ensuring readers read the meters and knowing the collector reader location f. Document the status of the meter if it is broken or if there are cases of illegal connections g. Find out if the quantity of consumption is estimated or real.

Minutes of Meeting		
Meeting with Expert Company		
Date/Time	Tuesday August 7 st , 2018	11:00 AM to 1:30 PM
Venue	Jenin Municipality	
Attendance	Expert Company :Mr. Hamed Hamam, Mohammad Arar,	
	Jenin Municipality: Suheel Hammad,Sara Suboh/IT Section. Abd Albaset/ collection Unit. Mohammad Ali/Financial Dept. Khaled Abo Obeid, Omar Faza/ Customer Service Section. Mohammad Zubi/PR	
	JICA Experts : Mr. M.Azmoty, Ms. Masouleh Mr.Thapa	
Agenda		
Mobile Billing System		
Documents		
Discussed Subjects Recommends		
<p>Expert company needs API from Alisraa company to implement this system in JM, maybe there is some challenge to get API from another company because that consider competition between companies</p> <p>It provides on-site data collection, invoicing, payments, inspection, and support to ensure easy and reliable operations. It is compatible with the latest smart phones, hand held units</p> <p>Huge reduction in billing cost.</p> <p>Early payment realization.</p> <p>Consumer satisfaction due to multiple payment options.</p> <p>Paper-less operation with complete electronic trail for transactions.</p> <p>Simplified operations management.</p> <p>Scan meters barcode labels, search for customer by barcode, can search in several ways such as customer, service, meter, reference and so on, Provides a detailed view of the customer and all his information</p> <p>Collect meter reading.</p> <p>Calculate customer bills. It allows to estimate quantities consumed</p> <p>Print bills, calculate and issue bill for the customer with all its items</p>		

Collect payments.
 collector can issue a report on payments, bills, readings, etc.
 Print receipts. collector can issue bill with all old and new receivables
 Online Communication.
 Assign routes for customer location.
 Download Data to mobile device memory.
 Bar code scanner with auto search.
 Ability to sort/search data by different criteria.
 View customer/meter details.
 Support multi meter.
 Apply reading validation rules
 Meter reading estimation
 print collection summaries and details.
 Print meter reading reports.
 Invoice calculation on the spot.
 Supports wireless communication.
 data security against loss.
 Invoice re-validation on the billing system.
 View reports for calculation errors.
 Compatible with the most advanced devices in the field.
 Fully integrated with Experts Billing Solution, and have the capability to be integrated with other systems.

How our Mobile Billing Work
 The app integrate with the main Billing System.
 The Consumer billing details are pushed to the mobile by the supervisor on a daily base.
 The Mobile device is used to capture the usage/service data by the field workers.
 Invoice are printed to the end customer, and payments are accepted.
 The data is transferred using an internet connection for instant communication to back-office.

END!

Minutes of Meeting		
Meeting with AISRAA Company		
Date/Time	Wednesday August 5 st , 2018	11:00 AM to 1:30 PM
Venue	Jenin Municipality	
Attendance	Alisara Company :Mr. Nitham Dweekat, Omry Bsharat, Jenin Municipality: Suheel Hammad, Sara Suboh/ IT Section. Yazeed Shreem, Abd Albaset/ collection Unit. Mohammad Ali/Financial Dept. Khaled Abo Obeid, Omar Faza/ Customer Service Section. Mohammad Zubi, Naser Gazal/PR. Mahmoud Nassar/PCS	
	JICA Experts : Mr. M.Azmoty, Ms. Masouleh	
Agenda		
Mobile Billing System		

Documents	
Discussed Subjects Recommends	
<ul style="list-style-type: none"> • Shortcut all steps currently taken by the reader and collector in one step through the mobile billing system (meter reading, readings delivery and interring them to Alshamel system, bills issuance, bills delivery and collection) These steps can be done by one step through mobile billing system • Make sure that collector has reached and read all the meters, this step help in controlling on the water losses • Enables reader to know the status of the meter if it is stopped or damaged or the customer doesn't exist • Increase collection rate, after issuing invoice in the site, he can become a collector through the request from customer to pay bill value after he printed out, and no need to back again • High accuracy in the amounts which received from customers, after transfer it to accountant system in JM • Can be give the readers and collectors more duties • This system works online and offline, If there is direct contact to the main system the data is uploaded directly to main server, if there is no contact to the main server, transactions are saved on the device, and upload them to the server if the connection is available • Meters, subscriptions, citizens, and everything related to meters, including coordinates of the meter location, are defined, the location of meter coordinates is taken and linked to the meter serial number and saved in Alshamel system • How the mobile billing system works: <ul style="list-style-type: none"> - Data transfer from Alshamel to the device for each collector - Registration of the collector location when readings are entered from the device and compare them with coordinates in Alshamel System - Collector is linked to a certain number of customers so that collector read the meters which belong to him only, and he can receive payment from customers who belong to him only - Gathering meters readings - Issuing customer bill - Issuing catch receipt • Mobile billing system requirements and operation <ul style="list-style-type: none"> - This system can assists accountant in the municipality to enter meter readings, issuing of bills, issuing receipt through collector - Al-Shamel system must have a municipal billing item, and active(water and electricity) - Definition of customers, collectors and meters to Alshamel system - Connection between the device in the site and Alshamel system for data exchange - User name and password for each collector and give collector authorization to work on mobile billing system - The Collector enters username and password and after he login there are three icons appear a. Import of data from Alshamel system to the device and select the date and month b. Insert readings: the names of customers appear on screen, to enable enter the transactions (inserting readings, catch receipt, printing bills, inquiring about the details of the customers) c. Searching for customers manually or according to neighborhood and customers appear on screen in two ways by barcode or GPS and municipality can chose which way • Transfer Data from device to the server: collector will transfer data for the month to server to close it <p style="text-align: center;">END!</p>	

Minutes of Meeting

Meeting with Alisraa Company



Date/Time	Sunday March 25 st , 2018	11:00AM to 2:30PM
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Venue	Jenin Municipality / Council Hall
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Attendance	Jenin Municipality: Suheel bu Hammad , Sara Soboh / IT. Ragib Malhees, Khaled Abo Obeid /WD. Mutaz Kakban / Water Section . Abd Alkareem Kmeel / Clerks Division .Samer Omari,Mohammad Ali/F.D.Gazi Fisal / Auditor. Ali Abu Ali / Hand Crafts and Industrial . Mohammad Musmar, Ahmed Asmar / Warehouse . Mahmoud Nassar/ PCS	
	JICA Experts : Mr sato / Mr Azmoty / Mr Phatta Thapa	
	Alisraa Company :Omry Bsharat , Nizam Dweekat	

Agenda

-
- New version from Alshamel (V6)
- Mobil billing System
-
- Discuss notes on current version (V5)
-

Documents		
		

Discussed Subjects

Alshamel No6

1. The menus and screens are designed in new colors and are easy to use
2. Develop system of performance indicators and no need to collect more data from a different reports to know specific information
3. The new version of Al Shamel removes all limitations in design and printing of bills, orders, and quotations.
4. Create bank accounts automatically
5. Bank reconciliation and check processing
6. Reports from many years
7. One click shows all the details
8. Automatic search mechanism
9. Accept documents as attachments
10. Development of budget system
11. Integrated with the electronic archive system
12. Alisraa Company will update current versions from Ashamel to new version as free
- 13.. The update include the same functions in version 5 but with new interface
14. if municipality want to add new features they have to pay
15. The mechanism of handling with program is the same with little change
16. In new version there is one screen shown all information
17. New option for visa card if any customer want to pay by this way its available
18. Employee can inquiry about customer debts through ID number , citizen number, name , serial number
19. can be integrated with prepaid water meter
20. Can give consumption quantity to each area
21. consolidate data for each region
22. they will install trial version from V6 and give users training
23. They can solve most of problems through short training

Mobil Billing System

1. Accuracy of reading and make sure that the collector reads meter
2. Provide data to each collector
3. Find out the location of collector through GPS
4. They can linked to certain number of subscriptions
5. Gathering meter readings
6. Issuing an invoice for customer
7. Issuing receipt
8. Through this system can adjust amount of consumption
9. Ensure that the invoice reaches subscribers
10. Collector can transfer data from server to device
11. The system work offline and online
12. There are two ways for reading: a. GPS b. barcode
13. GPS way its more better than barcode , municipality can control trough meter drawing
14. After the collector read meter, insert the read and do calculation and then save it
15. After saving cant modify
16. Bills printing : collector can print bill at the site or municipality can print it centrally
17. Ability to integrated with Alshamel system

Alshamel Issues

Financial Department

The issues	Alisraa Opinion
Linkage of AlShamel-Payroll to the employee time attendance system	Exists and active on system

Only two users can connect at the same time on AlShamel-Payroll; need 2-3 more user connections.	Can be solve internally
The insurance fee is refundable and is done on paper by the FD. This function should be added on AlShamel.	Exists, can be establish new financial dues for each customer on system
Citizens payment at the bank at JM cannot be viewed by the FD to see how much they paid for certain services.	Needs follow up with banks
Alshamel does allow records of payment methods to other authorities/institutions only as cash and other methods (i.e. clearance) cannot be recorded.	Can be solve internally through F.D and IT section

IT Section

The issues

Alisraa Opinion

Number of users need to increase. With the current license agreement with AIEsra, a maximum of 18 logs in is allowed at once but JM is sharing the log in accounts with 29 employees. This means that when the logged accounts reach 18, the rest of the 11 employees have to wait for someone to log off. This causes some issues:	needs to evaluate by municipality and add new i its important and pay
Employees forget to log off and keep computer on when leave office or go on holidays, Employees stay logged in for the entire day when no need to use ALShamel., It is common for the IT to get many calls on a daily basis to log off some accounts, so others can log in.	Can be solve internally through circularization
AlShamle runs very slow and there are many complaints among the employees. When a big job is being done using AlShamel by one or two users, the rest are asked to log off. This is especially the case when customer service section needs to calculate customer water bill amount so all employees need to log off.	Transfer to new server and IT section working on it
AlShamel speed also is affected by the number of pages (sessions) open by the employees.	When they install system on new server the problem will be solved
Currently, AlShamel and other JM's software like DMAS are running on the same server. Migrating AlShamel to a separate server could improve the speed and database backup.	New server only for Alshamel , that mean the speed will increase
The server's specifications need to be upgraded to speed up the AlShamel's performance.	Its need evaluation after they installing Alshame on new server

WW department	
The issues	Alisraa Opinion
The speed is low and logging in takes longer in some days depending on the number of employees who are using AlShamel at once.	They can solve it internally and related to server
The search attempts stops sometimes with showing no results.	Server problem
The box for entering neighborhood name, date of application, date of data entry, date of meter reading day, etc need to be added in the customer database entry.	In new version Alisraa added new columns for that
A box for entering payment venue needs to be added to AlShamel to clarify where the customer paid; at JM PSC, at collection centers, at the banks, to collectors, etc. Currently the payments are recorded in AlShamel by the collector's collection zone and is, thus, calculated as the collector's monthly collection rate.	Exists on version 5
The AlShamel design for water customer database requires opening several sessions from the Menu and so many clicking. Customer data is thus spread on different pages/seasons. It would be beneficial if all customer data and information can be viewed in one page or be summarized in a table view when needed.	They solved it in new version and exists in version 5
No attachments as PDF or JPEG is allowed on AlShamel.	This function exists in version 5
Reports, charts, and figures producing is limited on AlShamel.	Exists on new version
Log in error incidents are more common and the speed is also lower at the Customer Service section due to the building's distance from the server at JM.	It's related to server and signal between servers
Collection staff	
The issues	Alisraa Opinion
A box is needed to enter name of the person who paid on behalf of the meter owner.	Exists in version 5 but need activate
AlShamel doesn't show previous debt and payment history all in one page. The operator needs to search year by year to see the payment and debts. This is time consuming and the search fails some times.	There is new program its name (magic report) can gives financial report for any year , but its not free

The notes added previous on customer accounts don't show up in summary tables generated through search.	Supposed to appear in version 5 , Exists in version 5	
During the 1 st to 7 th – 10 th days on the month, operators are not able to use Alshamel for data entry or printing any bills.	If work continues through Alshamel there will be overlap with consumption calculation , because they stop working computerize , but no need to long time they can finish in 2 days max.	
Printed receipts should show all payment status (due amount, paid amount, and remained amount) in one sheet not in different print outs for each payment status.	Exists in version 5 but need training and activate	
Integration with other municipal systems , to be more easy to know all customer commitments , especially when he wants to make clearance	Exists in version 5 but need training and activate	
Warehouse/Treasury office		
The issues	Alisraa Opinion	
1) AlShamel is only used for inventory and has no problem. 2) The AlShamel's assets management software is available in JM but not activated and used. JM should start using it and registered all JM's property and owned items in the system using barcodes. AlShamel can take a look and see if anything is needed to activate the system.	They want to delete all data on assets and start from beginning	



別冊資料 CD 1.3

**Customer Database Survey (CDS) & GIS Work –
English Version**



Jenin Municipality

Project for Strengthening the Capacity of Water
Service Management in Jenin Municipality
(WaSIP)

Customer Database Survey (CDS) & GIS Work



Japan International Cooperation Agency

وكالة التعاون الدولي الياباني

This attachment aims to provide a summary report of the utilization of GIS Software for the main activities of the project including:

1. GIS for Customer Database Survey (CDS)
 - 1.1. Preparation works
 - 1.2. Office & site work
 - 1.3. Compiling and summarizing the survey data
2. GIS for Leakage Repairs
3. GIS for Water Supply Zones (DMAs)
4. GIS for Pipe Network Updates
 - 4.1 Preparation of map of existing pipe network
 - 4.2 Confirmation of pipe alignment (route) and valve's location at site
 - 4.3 Preparation of AutoCAD pipeline network
 - 4.4 Digitizing from AutoCAD pipeline network to GIS
5. GIS for Social Survey
 - 5.1. Map preparation for DtD survey
6. GIS for Customer Service Section Routine Activities
 - 6.1. Random checks of water meters
 - 6.2. PPWM installation and digitizing PPWMs locations on the GIS database

1. GIS for Customer Database Survey (CDS)

In addition to the importance of the CDS to the NRW calculation it is also necessary for the customer management and the O&M for water department.

1.1 Preparation works

Preparation works for the CDS activities includes:

- ✧ Confirmation of the DMA boundaries by understanding the water pipeline networks,
- ✧ Obtaining high resolution base map of the area (through line or another route) (2 arial photos have been used; one from 2016 and further one taken in 2018).



Figure 1: Preparing polygons of each building

- ✧ Creating the building polygons by digitizing them by GIS software (or they may be requested from the engineering department if available). See next example of the prepared part of PA1 polygons in Jenin Municipality.
- ✧ Geocoding (giving address) for the digitized buildings in the target area. It will be very useful if the municipality has an official geocoding for the buildings that may be used in the CDS work. For the households which are already connected to the municipality water network, their house connection ID (HC_ID) can be used to recognize the building but the polygon coding will be more general and useful to recognize both subscribers and nonsubscribers.



Figure 2: Example of the used coding in the pilot project in Jenin

The base map may be not up-to-date and some new buildings may be missing. In such case, it is needed to indicate the new constructed buildings by adding their polygons on the GIS map.



Figure 3: Example of an added new building's polygon in Jenin

1.2 Office & site work

a) Preparing the GIS maps

- ✧ Print the DMA area map which includes the digitized polygons at a scale sufficiently clear to mark the meter point and house connection route,
 - ✧ The map should be good enough to be understood by the CDS team leader on site.
- See the next map as an example of prepared map for Sabah Al Khair area/PA-1.



Figure 4: Example of a map prepared for CDS in Sabah Al Khair area/PA-1

b) Preparing the required format for data collection at site

The CDS format shall contain all required technical and social data from the site. The following data are usually important and need to be collected.

Table 1: Recommended data items to be collected during CDS

S.N.	Data Items	Remark
1	House number, address	Each polygon should take a unique number based on the geocoding system.
2	Owner's name	It is important to update the customer database.
3	If the house has municipal water connection or not	
4	Customer's name (if different from owner)	
5	Customer number (house connection ID)	
6	No. of persons in the family	It is useful in hydraulic modeling to calculate the demand on each junction.
7	Water use category (domestic, commercial, institution etc.)	
8	Meter Information	
	Serial No.	
	Type	Velocity, volumetric, Ultrasonic .. etc.
	Diameter	
	Visible problem in water meter; position, unreadable, not firmly fixed etc.	
	Connector Size	
9	Roof tanks	
	Number	
	Total capacity	
10	Ground tanks	
	Number	
	Total capacity	
11	Any other sources of water	

S.N.	Data Items	Remark
12	Any sign of unauthorized water use	Illegal connection if found prior the meter.

The form used in Jenin pilot areas is shown below:

Customer Database Survey— Surveyor N(اسم الباحث): _____

Date : _____ التاريخ

Pilot Area 2:	Locality Name اسم الحي	
House NO رقم البيت/المحل	Owner's Name اسم المالك	
House Status حالة المنزل/المحل	1. Registered مشترك <input type="checkbox"/>	2. Not Registered غير مشترك <input type="checkbox"/>
Family size عدد الافراد	Storage tank number & total capacity : عدد الخزانات : _____ m ³ السعة	
If the house owner answer "YES or Registered", please fill up below. في حال انه مشترك اكمل:		
HC_ID_No رقم المشترك	Water Meter NO. رقم العداد	
Reg. Category التصنيف	1. Domestic منزلي 2. Commercial تجاري 3. Institution مؤسسة 4. Agriculture زراعي	

Registered(customer) مشترك	Illegal connection وصلة غير قانونية	Not horizontal غير افقي
	Visible problem in water meter مشكلة ظاهرة في العداد	Unreadable قراءة العداد صعبة
		Not accessible يصعب/لا يمكن الوصول للعداد
		Not firmly fixed غير مثبت جيدا
Not_Registered(Not_customer) غير مشترك	Illegal connection وصلة غير قانونية	Gets water from من عداد الجار NM مصدر الماء
	Gets water from من مصدر الماء من Private well(PW) من بئر جوفي خاص	
	Own private reservoir لديه بئر/خزان خاص (PR)	
	Buys from vender (PT) يشتري شكاكات (PT)	
ملاحظات Comments: If you discover something, please write down below.		

Figure 5: Project's customer database survey form in Jenin City

c) Preparing the CDS team

- ✧ The CDS team shall be not less than 3 persons; one for filling the CDS report, the second one is to direct the team with the map drawing and the third one will assist to record the technical data about the domestic meter and the house connection.
- ✧ The office data entry and analysis team: this team will collect the site reports day by day and the collected data should be computerized and archived. The current GIS operator in WWD department is an engineer from CSS.

d) Data analysis

- ✧ At this stage of work, the captioned CDS data is ready to be analyzed and the technical data related to the house connection can be transferred to the domestic meter shapefile. The other collected social data can be stored in the polygon shapefile then to be categorized upon requirement.

Following is an example of categorizing the building polygons according to the subscription status such as whether they are subscribers (connected to the Municipal water network) or non-subscribers (not connected to the Municipal water network).



Figure 6: Example of categorizing building polygons according to subscription status

Figure 7 is a capture from GIS software of the final attributes of each polygon in PA-1.

Figure 7: A screenshot of GIS software showing the attributes of each polygon in PA-1

OBJECTID_1*	Shape*	Road_No	Building_No	Owner_Name	Shape_Leng	Building_S	Date	Type	key	Locality_J	Floor	Appartmen
1	Polygon ZM	295	3	Hussain Ahmad Hanani	69.631926		01/15/18	1	295 / 3--Single House--	010180	Single House	
2	Polygon ZM	146	5	Munther Salah Hifawi	100.341871		01/15/18	1	146 / 5--Single House--	010180	Single House	
3	Polygon ZM	295	6	Sadeeqa Ahmad Mahmoud Barbari	69.579266		01/15/18	1	295 / 6--Single House--	010180	Single House	
4	Polygon ZM	295	12	Wael Rushdi Al-Jamal	51.033613	A	01/15/18	1	295 / 12-A--Single House--	010180	Single House	
5	Polygon ZM	146	3	Hana' Khaled Favzi Salah	53.647387		01/15/18	1	146 / 3--1-1-	010180	1	
6	Polygon ZM	295	18	Tahir Husni Jarrar	68.726041		01/15/18	1	295 / 18--Single House--	010180	Single House	
7	Polygon ZM	295	12	Ziad Salih Mohammad Hammad	59.336442	B	01/15/18	1	295 / 12-B--Single House--	010180	Single House	
8	Polygon ZM	362	98	Isam Abd Al-qader Saleh Odeh	48.515933		01/15/18	1	362 / 98----	010180	0	
9	Polygon ZM	88	6	Baha' Hakim Arqawi	73.775429		01/15/18	1	88 / 6--Single House--	010180	Single House	
10	Polygon ZM	129	59	Rakan Issa Al-Azzam	64.920636		01/15/18	1	129 / 59--Single House--	010180	Single House	
11	Polygon ZM	88	8	Fada' Adil Mahmoud Irshaid	36.513385		01/15/18	1	88 / 8--1-1-	010180	1	
12	Polygon ZM	124	11	Bassam Mahmoud Abid Yahia	67.568998		01/15/18	1	124 / 11--Single House--	010180	Single House	
13	Polygon ZM	108	3	Yahia Abd ALRahman Obadi	62.150449		01/15/18	1	108 / 3--Single House--	010180	Single House	
14	Polygon ZM	88	17	Mohammad Amro	37.23879		01/15/18	1	88 / 17--2-2-	010180	2	
15	Polygon ZM	323	3	Tariq Mohammad Ayyad	63.361889		01/15/18	1	323 / 3--Multi--	010180	Multi	
16	Polygon ZM	88	19	Mohammad Abd Al-Ghani Abu Tabeekh	82.557991		01/15/18	1	88 / 19--Multi--	010180	Multi	
17	Polygon ZM	362	109	Hidal Qasim Ahmad Abu Ilwals	74.518821	A	01/15/18	1	362 / 109-A--Single House--	010180	Single House	
18	Polygon ZM	124	12	Iman Ahmad Fahmi Mansour	60.676358		01/15/18	1	124 / 12--Single House--	010180	Single House	
19	Polygon ZM	113	20	Rabah Rasheed Faza'	53.591304		01/15/18	1	113 / 20--Single House--	010180	Single House	
20	Polygon ZM	362	113	Tasir Mahmoud Mohammad Hamdan	121.702988		01/15/18	1	362 / 113--Store--	010180	Store	
21	Polygon ZM	88	23	Yousif Abd Allah Manasra	71.825925		01/15/18	1	88 / 23--Single House--	010180	Single House	
22	Polygon ZM	191	9	Tawfiq Hassan'tawfiq Ryal	56.809814		01/15/18	1	191 / 9--Single House--	010180	Single House	
23	Polygon ZM	362	110	Sabah Al-Khair Fuel Station	58.468103		01/15/18	1	362 / 110--Fuel Station--	010180	Fuel Station	
24	Polygon ZM	362	117	Jihad Mohammad Rashid Qtaib	49.576368		01/15/18	1	362 / 117--0-1	010180	0	
25	Polygon ZM	102	16	Nihala Sulaiman Fayiz Sliat	82.431785		01/15/18	1	102 / 16--Multi--	010180	Multi	
26	Polygon ZM	100	15	Alla Saeed Mohammad Issa	62.505133		01/15/18	1	100 / 15--Single House--	010180	Single House	
27	Polygon ZM	72	27	Ahmad Husam Abid Masoud	64.00184		01/15/18	1	72 / 27----	010180	Single House	
28	Polygon ZM	84	15	Sulaiman Mahmoud Dawood Mahajneh	74.322326		01/15/18	1	84 / 15--Single House--	010180	Single House	
29	Polygon ZM	362	119	Abd AL-Rahman Mustafa Abd AL-Rahman Abu Libdeh	43.139863		01/15/18	1	362 / 119--2-2-	010180	2	
30	Polygon ZM	72	12	Fakhr Hamad	83.807888		01/15/18	1	72 / 12--Complex--	010180	Complex	
31	Polygon ZM	271	13	Mahir Ibraheem Ka'kaban	47.446109		01/15/18	1	271 / 13--Multi--	010180	Multi	
32	Polygon ZM	362	121	Mo'men Blal Mohammad Heirat	86.780371		01/15/18	1	362 / 121--Store--	010180	Store	
33	Polygon ZM	281	5	Bassam Mohammad Jarrar	69.026261		01/15/18	1	281 / 5--Single House--	010180	Single House	
34	Polygon ZM	82	12	Mahmoud Raqhib Khalil Abu Farha	65.532074		01/15/18	1	82 / 12--Single House--	010180	Single House	
35	Polygon ZM	82	10	Rhab Hussain Tahir Abu Obaid	78.433755		01/15/18	1	82 / 10--Single House--	010180	Single House	
36	Polygon ZM	271	5	Waleed Ahmad Naeif Al'elah	34.865154		01/15/18	1	271 / 5--0-2-	010180	0	
37	Polygon ZM	84	21	Osama Abd Allah Mohammad Zaid	91.154866		01/15/18	1	84 / 21--Single House--	010180	Single House	
38	Polygon ZM	97	2	Firas Na'if Hasan Jalal	92.954724		01/15/18	1	97 / 2--Multi--	010180	Multi	

1.3 Compiling and summarizing the survey data

Compile the collected data in spreadsheet program (such as MS Excel). Sample of compiled data is shown below. There should be a unique identifier for each row (surveyed household). This should be same in GIS and excel so that the excel data base can be easily linked to GIS when required.

Figure 8: Screenshot of CDS data in Excel

NO	APPLICANT NAME	Building Number	Sub_number	DATE_Surveyed	REGION	Family size(person)	Storage size(m3)	Domestic/Commercial/Agricultural/Governmental	Registered/Not Registered	WATER METER SN	PIPE_MATERIAL	HC_DIAMETER	WRC_HORIZONTAL/Not Horizontal	Further_Source_of_water/Well/Privatization/Reservoir/FR/bug/Faults(BT)
1	Dear Mohammed Saleh Abdullazeq	104	104	23-Oct-2019	HS	5	3	Domestic	Registered	V8720	GS	0.5		
2	Mohammad Saleh Abdullazeq	106	106	23-Oct-2019	HS	8	8	Domestic	Registered	V411	GS	0.5		
3	Saleh Hamad Aljawi	108	10801	23-Oct-2019	HS	7	7.5	Domestic	Registered	V408	GS	0.5		
4	Husain Mohammed Taha	108	10802	23-Oct-2019	HS	1	3	Domestic	Registered	V900466	GS	0.5		
5	Hani Hasan Ali Zkarnah	101	10101	23-Oct-2019	HS	6	4.5	Domestic	Registered	V900487	GS	0.5		
6	Hasan Ali Qasem	101	10102	23-Oct-2019	HS	8	4.5	Domestic	Registered	V900485	GS	0.5		
7	Abd Issa Qasem	112	11201	23-Oct-2019	HS	25	8	Domestic	Registered	V403	GS	0.5		
8	Talal Ibrahim Mohammed Hothejia	112	11202	23-Oct-2019	HS	3	3	Domestic	Registered	V404	GS	0.5		
9	Hisham Aldebe'e	114	114	23-Oct-2019	HS	5	3	Domestic	Not Registered					NM4
10	Khaleel Room	116	116	23-Oct-2019	HS	2	15	Domestic	Not Registered					NM1
11	Anas Mohammed Abdalalman Room	118	118	23-Oct-2019	HS	9	6	Domestic	Registered	V372	GS	0.75		
12	under construction	110	110	23-Oct-2019	HS	0	0	Domestic	Not Registered					
13	Fathi Rasmie Sanouli	120	12001	24-Oct-2019	HS	35	21	Domestic	Registered	V405	GS	0.5		FR
14	Saeed Saleh Abdalmajeed	124	124	24-Oct-2019	HS	6	3	Domestic	Registered	V744	GS	0.5		
15	Yousef Saeed Saleh Harab	126	126	24-Oct-2019	HS	5	3	Domestic	Registered	V6771	GS	0.5		
16	Hasan Ahmad Saif Subuh	128	128	24-Oct-2019	HS	5	7.5	Domestic	Registered	V1153	GS	0.5		
17	Mustafa Ali Hesses	103C	103C01	26-Oct-19	HS	4	3	Domestic	Registered	V1544	GS	0.5		
18	Omar Mostafa Ali Hesses	103C	103C02	26-Oct-19	HS	6	3	Domestic	Registered	V9079	GS	0.5		
19	Saeed Tawfeeq Sadeq Ighbarieh	103A	103A01	26-Oct-19	HS	1	15	Domestic	Registered	V400	GS	0.5		
20	Loai Abdalrazan Samour	103A	103A02	26-Oct-19	HS	5	3	Domestic	Registered	V9097	GS	0.5		
21	Tajseer Abdalmalek Jaradat	103B	103B	26-Oct-19	HS	7	7.5	Domestic	Registered	V1762	GS	0.5		
22	Mohammad Abu Zaineh	105	10501	26-Oct-19	HS	5	4.5	Domestic	Registered	V3241	GS	0.5		
23	Jamal Abu Zaineh	105	10502	26-Oct-19	HS	4	3	Domestic	Not Registered					NM1
24	Said Yousef Said Room	107B	107B	26-Oct-19	HS	27	15	Domestic	Registered	V388	GS	0.5		NF
25	Almad Yousef Said Room	107A	107A	26-Oct-19	HS	3	3	Domestic	Not Registered					NM1
26	Jameel Eesa Alisabbah	109	109	26-Oct-19	HS	8	4.5	Domestic	Registered	V1076	GS	0.5		UNR
27	abandoned	111	111	26-Oct-19	HS	0	0	Domestic	Not Registered					

2. GIS for Leakage Repairs

During the early stage of the project a shapefile of the daily leakage repair points was prepared, and the leakage points are, since, digitized daily in GIS software by the NRW engineer of Water section.

Reporting and Mapping Works

- ✧ Record materials used, total time taken for the repair work, crew members involved, etc. and fill up the 'Leak repair record' form.
- ✧ Update GIS map of leak repair records. As an example, GIS map of leak repairing points for all leakage repair point as of Sep-2021 is given below.

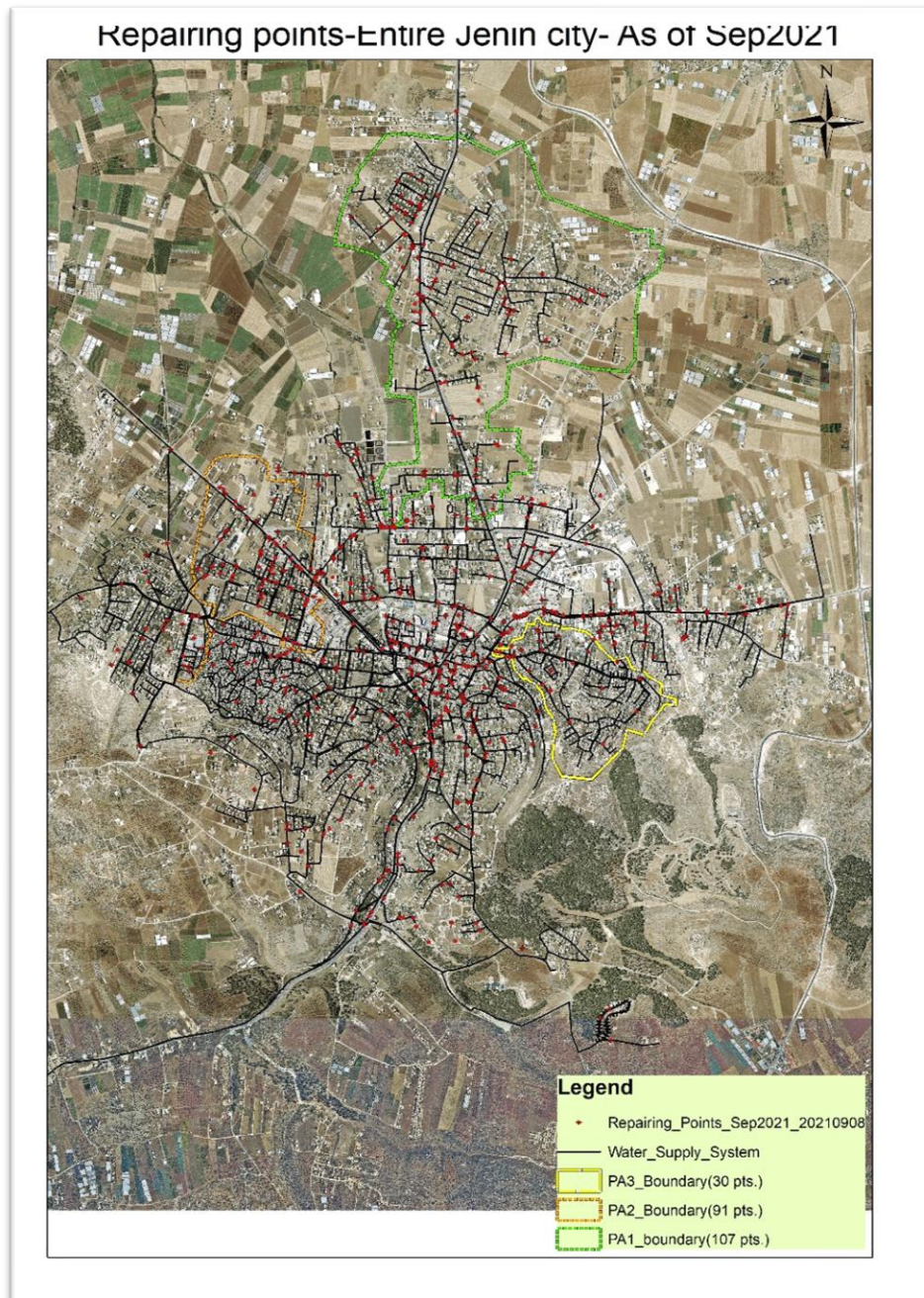


Figure 9: All leakage repair points as of Sep-2021 in whole Jenin city

Repairing points-Entire Jenin city- During Aug21 only



Figure 10: Leakage repair points during sep-2021 month only

3. GIS for Water Supply Zones (DMAs)

As for the basic considerations for DMA Plan, the following shall be considered in the preparation of DMA plan:

- Three pilot areas (PA1, PA2, and PA3) have been completed and NRW countermeasures have been implemented. However, NRW countermeasures need to be continued to further lower and sustain the achieved level of NRW.
- Preparatory works and establishment of DMA are completed in two additional DMAs (Al Jinan and Basateen North). NRW countermeasures need to be started in these.
- Customer data update survey has been completed in two other DMAs (Almaniya and Al-Ibrahemian) and is about 40% completed in Industrial Area DMA.
- Size of the new DMAs shall be based on both the number of customer and physical size.
- Elevation variation from highest to lowest point within a DMA shall be minimized as far as possible.
- Existing rationing supply blocks shall be kept intact in one DMA as far as possible.
- Latest number of customers has reached about 10,000 as per Al Shamel record but only about 7,300 customer points are mapped in GIS. In the already completed DMAs the customer numbers shall be as per actual survey result. In the remaining DMAs the numbers shall be as per the available information in GIS map.
- The boundaries (initial boundaries) for each DMA was prepared by holding a discussion and investigation with old technicians and then drawing the boundaries by using the GIS software.

The layout of DMAs as shown in GIS software is given in Figure 11.

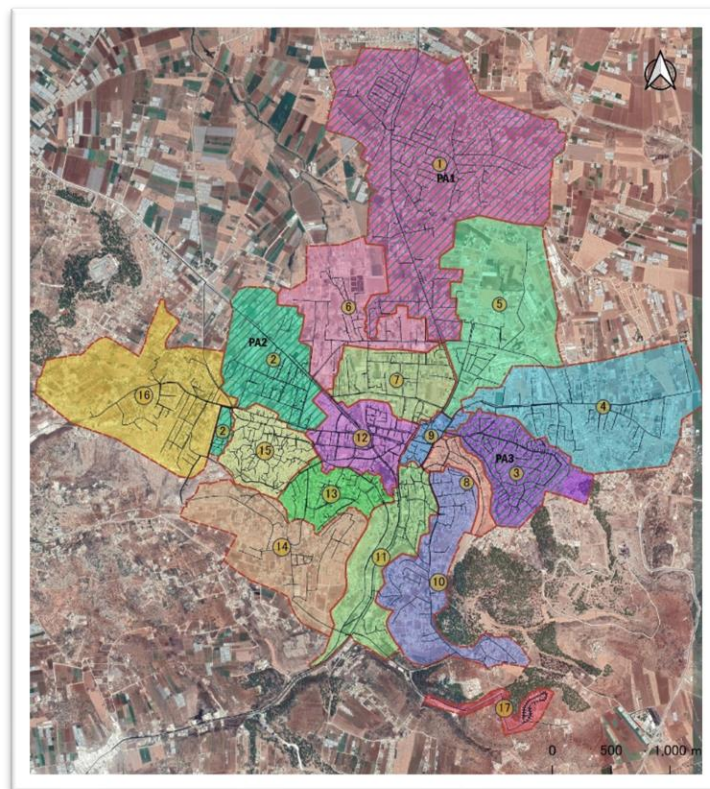


Figure 11: Proposed DMA plan

Features of the Zones or DMAs are summarized in Table 2.

Table 2: Feature of existing and proposed DMAs

S.N.	DMA description	Lcations	Customer meter count ¹	Building count ²	Pipe length (km) ³	Elevation high (masl)	Elevation low (masl)
1	PA1	Sabah Al Khir, Kharoubeh, Nazareth Street	869	1,117	20	150	105
2	PA2	New Camp	105	43	2	190	140
2	PA2	Al Zahara	566	333	12	145	110
3	PA3	Halima Al Sadia, Sarkia	570	735	11	230	140
4	New DMA under progress	Almaniya	330	764	12	195	125
5	New DMA under progress	Industrial area	239	199	7	140	110
6	New DMA under progress	Al Basateen	332	245	7	130	105
7	Proposed DMA	Southern Al-Basateen	399	230	8	140	120
8	Proposed DMA	Wadi Ezz El-Din	160	168	3	225	145
9	Proposed DMA	Al-Bayader	340	274	5	170	140
10	Proposed DMA	Al-Marah & Al-Swaitat	404	537	10	250	170
11	Proposed DMA	Nablus St. Area	428	496	15	250	150
12	Proposed DMA	City Center Area.	674	395	16	155	130
13	Proposed DMA	Khaleh Al-soha.	338	426	8	225	155
14	Proposed DMA	Al-Jabriat.	145	405	7	280	195
15	Bulk supply area	Jenin camp	1,063	1,055	12	240	135
16	Proposed DMA	Wadi Burqin	301	614	11	225	125
17	New DMA completed	Al Jinan	58	36	4	315	225
	Total		7,321	8,072	170		

Note:

1: For completed areas the numbers are from survey, for others the numbers are taken from GIS map of customer meter points.

2: From the GIS map available with JM

3: From updated pipe network map in GIS

4. GIS for Pipe Network Updates

Map of pipe network with correct alignment and pipe information is essential for many NRW reduction activities; namely leak detection, network maintenance, and hydraulic modeling.

Revision and updating of existing GIS layers of water network pipeline, pipe fittings, and related facilities can be achieved through multiple methods; updating from existing softcopy and hardcopy drawings, maintenance records, field inspections and trial pit excavations, hearing from field staff, by conducting pipe location surveys and so on.

In case of Jenin pilot areas, pipe network down to 50 mm was updated by field survey with pipe locator and high accuracy GPS machine. For smaller pipes and house connections pipe routes were marked approximately on GIS map from visual survey.

The following section outlines the method used for pipe network update using pipe locator and GPS machine. This is possible when the pipe material is metallic. In case of plastic pipes locating buried pipes is complicated.

4.1 Preparation of map of existing pipe network

Such map is used as a starting point for the updating procedure.

- ✧ Print out map (scale 1:500 or 1:1000) showing roads, landmarks, buildings, pipe network, valves, and as many details as possible
- ✧ Prepare GPS
- ✧ Prepare pipe locator
- ✧ Prepare marking color spray
- ✧ Prepare two teams; one to locate pipe and another to record GPS coordinates of pipe and valves

4.2 Confirmation of pipe alignment (route) and valve's location at site

- ✧ This is done with high accuracy GPS machine
- ✧ The pipe locator team; take reference of printed map, start locating pipe from one side of the area
- ✧ Locate buried valve similarly
- ✧ Mark the locations of pipe and buried valves with spray color
- ✧ The GPS team; take GPS coordinates at valves, pipe junctions, bends, road crossings, etc

4.3 Preparation of AutoCAD pipeline network

- ✧ Download the GPS data from GPS machine after coming back to office
- ✧ From the recorded GPS data prepare pipe network map
- ✧ This will generally be in AutoCAD format, but depending on the type of machine it may be recorded directly in some GIS formats

4.4 Digitizing from AutoCAD pipeline network to GIS

- ✧ If the GPS machine does not have the facility to directly convert the record to GIS format, then digitize the AutoCAD format network in to GIS.
- ✧ Take reference for diameter, age, depth etc from existing drawings, if any. If no drawing exists, then determine by hearing survey with field staff.
- ✧ In some cases, it may be necessary to dig test pits to confirm alignment, size, and depth of pipe. If required, dig the test pits and confirm.

The network map should preferably contain the following items and their attributes:

- ✧ Pipe: material, diameter, installed year, type of use (transmission, distribution, etc.)
- ✧ Fitting: type, diameter, installed year
- ✧ Appurtenances (valves, washouts, air valves): diameter, installed year, condition (working or not)
- ✧ Wells: identification number (well No.), supply station, production rate, construction year
- ✧ Pumping station: identification number, number of pumps and their capacities, supply station, construction year, operating schedule
- ✧ Reservoir: identification number, type, dimensions, storage capacity, elevation of low and high water levels, construction year, supply area

- ✧ Booster station: identification number, number of pumps and their Q-H-P characteristics, construction year, operating schedule
- ✧ Pressure break tank: size, construction year
- ✧ Pressure reducing valve: type, size, installed year, pressure settings, condition
- ✧ Bulk meter: size, type, condition, installed year
- ✧ Washout valve: size, type, installed year
- ✧ Air valve: size, type, installed year
- ✧ Fire hydrant: type

The following figure shows GIS of updated pipe network in PA2.

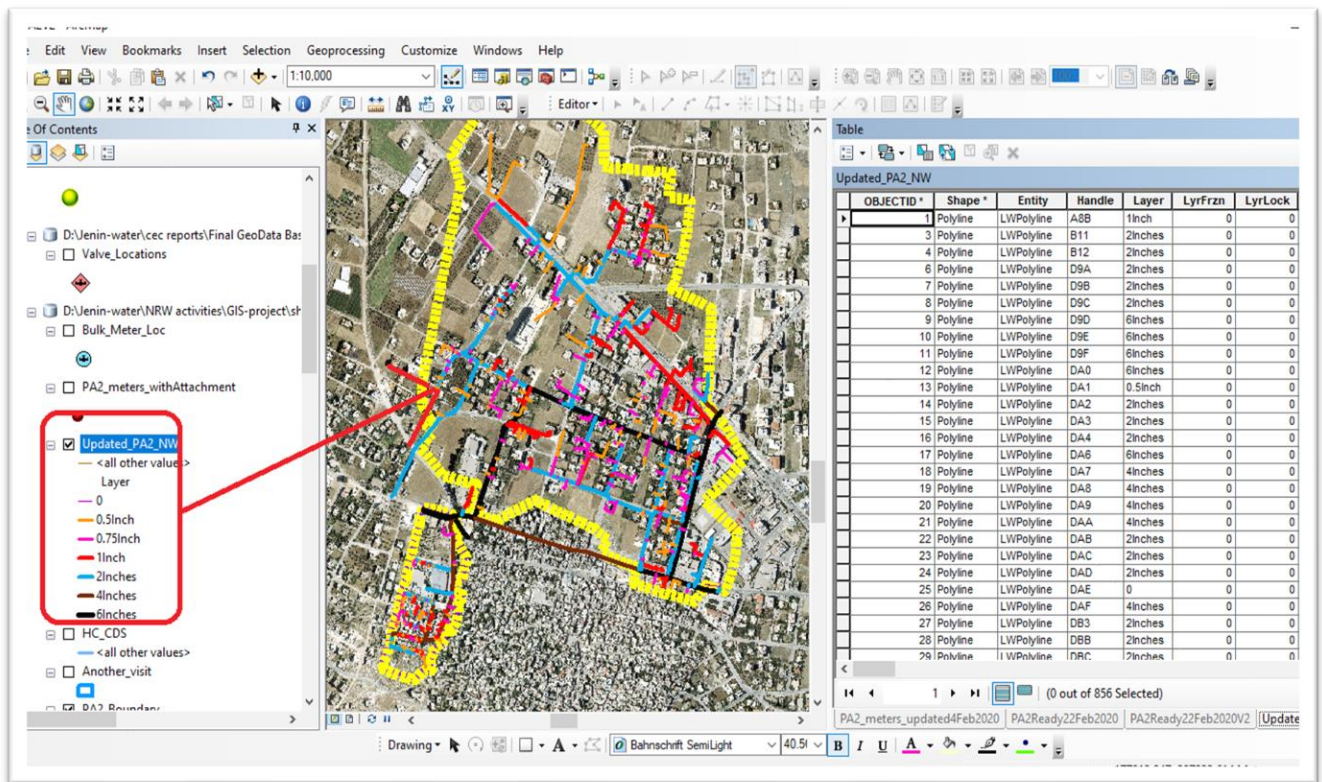


Figure 12: Example of GIS map showing updated pipe network

5. GIS for Social Survey

GIS had an important role in the project, especially in the early stages of the project, where many maps were prepared that assisted in completing the activities in an organized and efficient way.

5.1 Map preparation for DtD survey

- a) Prepare the GIS map of customers locations which were surveyed during CDS survey including customer information such as water meter number, customer name, etc. (For pilot areas' customers or other area in the city.
- b) The GIS map should include the digitized polygons at a scale sufficiently clear to mark the meter point and house connection route,
- c) The map should be good enough to be understood by the CDS team leader on site.

- d) After finishing the site survey, the customer data must be updated if anything has changed since the CDS survey.

Figure 13 is an example of GIS map for DtD survey in pilot area 1.



Figure 13: Example of GIS map for DtD survey in PA1

6. GIS for Customer Service Section Routine Activities

GIS maps are very important for Customer Service Section works in Jenin Municipality as most of their activities need a map to be carried out in an accurate and organized way such as random check of installed meters, PPWM installation, PPWM monitoring, illegal check, 0-meter check, etc.

After selecting the target area by the CSS head, the GIS engineer would do the followings:

- a) Prepare the GIS map of customers locations in the selected area containing their information such as water meter number, house connection ID, customer name, etc.
- b) The map should be good enough to be understood by the DtD team leader on site.
- c) After finishing the site survey, the customer data must be updated on GIS database and GIS engineer would prepare the final report of the site survey to be sent to the Head of CSS.

6.1 Random checks of water meters

Figure 14 shows an example of GIS map for random check survey in Al-Almanya DMA.

Similar maps are prepared for filed work of other activities such as investigating and locating of leakage and illegal connections.



Figure 14: Example of GIS map for random check survey in Al-Almanya DMA

6.2 PPWM installation and digitizing PPWMs locations on the GIS database

GIS section has an important role in the PPWM installation and database building, in order to organize and facilitate the PPWMs installation process and creating the complete database for WWD to be used and updated for the long term. The GIS section activities as for the installation procedures of PPWM included:

- 1) Prepare the GIS database and the installation maps for targeted areas selected by WWD and CSS containing customers names and house conception ID. The map should be good enough to be understood by the CSS staff at the site.
- 2) Receive the installation reports from the installation team form the field.
- 3) Update customers status and PPWM locations on GIS database after the installation completed.
- 4) Updates customer information and status (Frozen, disconnected, illegal) in cooperation with CSS on routine basis.
- 5) Issue any required reports from GIS database to Head of CSS upon request i.e weekly reports, monthly reports, investigation, checking, etc..

Figure 15 shows a sample PPWM installation map in pilot area 1.

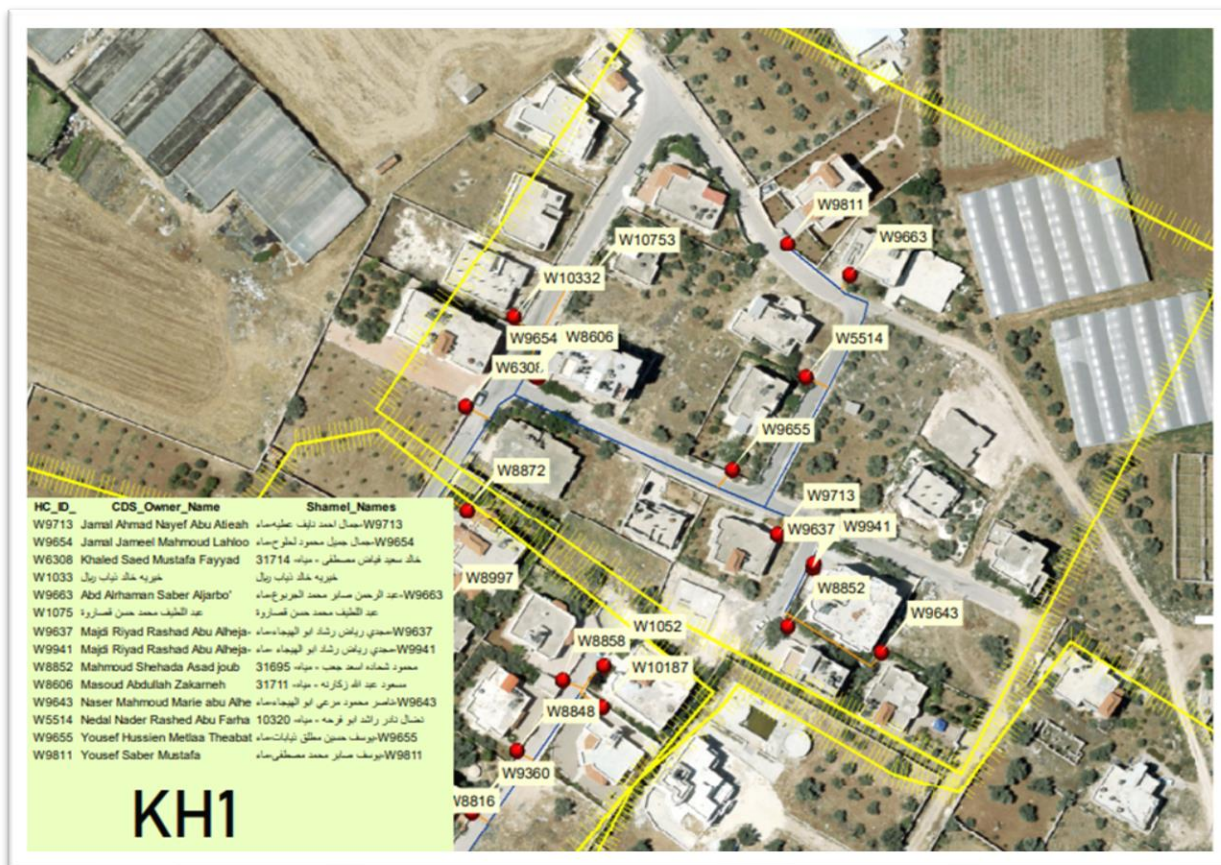


Figure 15: Example PPWM installation map in PA1 (Kharubeh Area)

別冊資料 CD 1.4

**MIS Report 'Digital Business Transformation
for Major Operations of Customer Service
Management – English Version**



Jenin Municipality

Project for Strengthening the Capacity of Water
Service Management in Jenin Municipality
(WaSIP)

MIS Report

'Digital Business Transformation'

for Major Operations of Customer Service Management

December 2021



Japan International Cooperation Agency

وكالة التعاون الدولي الياباني

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Purpose of the Report

This report aims to provide a brief review of the digital transformation in the operation and management of the Customer Service Section (CSS) at the Water and Wastewater Department (WWD), Jenin Municipality under the ‘Project for Strengthening the Capacity of Water Service Management in Jenin Municipality’ funded by JICA (Japan International Cooperation Agency) (September 2017- February 2022).

The Project’s “Baseline Survey Report” in February 2018 provided an assessment of the department’s existing MIS system in terms of functions, license, and users skills and presented recommendation for improvements. The WWD and thus the CSS were, heavily, depended on paper-based operation and management and relied on the only existing software ‘AlShamel’ for customer data management. The year 2018 was quantum leap for taking big steps to replace the major paper-based operations with advanced technologies and doing work using digital solutions including:

- 1) Upgrade of the customer database management system (AlShamel software) including the server improvement and backup system
- 2) Digitalization of water service applications via Document Management and Archiving System (DMAS software)
- 3) Mobile water meter reading and billing (Mobile Billing System; MBS)
- 4) Use of prepaid water meters and vending stations (Baylan Software)
- 5) Digital monitoring of pre-water meters (BMS System; Gateway LoRa system)
- 6) Automation of bill collection (PalPay System)
- 7) Establish GIS-base customer database
- 8) Digital processing of customer complaints (JM Website-base Customer Complaints and Online Chat)
- 9) Use of SMS to remind customer for bill payment
- 10) Digital file sharing (Shared Excel Sheets; Google Sheets)
- 11) Digital archive
- 12) System integrations
- Other:
- 13) Recommendations
- 14) Requirements
- Appendix 1:
- 15) Mobile Billing System vs. Current Billing System of Jenin Municipality; discussions and final decision

By year 2021, the above digital solutions and software were successfully launched and in use and has strengthened the capacity of WWD and the CSS. In the end, the report provides recommendations and requirements for further improvements for upgrades, updates, and further consideration.

1) Customer Database Management System (ALShamel)

ALShamel has been in use by WWD since 2010. The software, developed by Allsraa company, contains solid waste and water customer accounts with variety of functions. There were several issues with ALShamel addressed by the Project and solved in 2018. The project team conducted a short survey of the ALShamel users at the WWD's CSS staff to rank their working experience with ALShamel as before and after the improvement. Table below presents a list of major improvements to the software and the upgrades.

Table 1 ALShamel Customer Management Software Before and After Improvement

Before	After
Ranked by the Customer Service section users as 5 to 6 (out of 10); <i>slow and missing functions</i>	Ranked by the Customer Service section users as 8 to 10 (out of 10); <i>faster, more functions, friendlier interface</i>
<ol style="list-style-type: none"> 1) Old version (v. 3.0) (as of in 2018) 2) Limited work report generation 3) No attachments 4) Readings/debt data only last year 5) Limited alphabetical orders of names 6) Search customer only by ID 7) Not flexible for adding functions 8) Limited user authorization level 9) No SMS function 10) Slow search processing 	<ol style="list-style-type: none"> 1) Newest version (v. 6.0 as of July 2018 and v. 7.6.2.0 as of Aug 24th, 2021) 2) More work report generation 3) Attachment possible 4) Reading/debt data for last 2 years 5) Expanded alphabetical orders of names 6) More search options; ID and area 7) Flexible for adding functions 8) Expanded user authorization level 9) Ability to send SMS -if activated 10) Faster search processing (due to the improvement of the JM server)

1.1 New Server

To increase the processing speed of ALShamel, the Jenin Municipality also implemented a new server and moved the upgraded ALShamel software to the new sever in July 2018. The transfer speeded up functions such as searching customer names and IDs on ALShamel even when several users are using the software at the same time. Table below shows the improvements made to the server. The new server is faster in processing power and has high data storage capacity. As for PPWM, the software was at first set up on older server and then moved to an upgraded server in 2020.

Table 2 Municipality Server Status: Before and After Improvement

ALShamel		PPWM	
Before (2017)	After (2018)	Before (2019)	After (2020)
Windows Server 2003 Processor: 1.60 GHz Installed memory (RAM): 3.25 GB Storage capacity: 592 GB	Windows Server 2012 Two processors: 2.80 GHz & 2.79 GHz Installed memory (RAM): 64 GB Storage capacity: 900 GB×5= 4.5 TB	CPU: AMD 8 Core Hard disk:3 TB (5*600GB) RAM: 8 GB (2*4)	CPU: Inter XEON 40 Core Hard disk: 1 TB RAM: 128 GB (4*32)

1.2 Back-up system

To have a secure backup of the customer database on ALShamel, the Jenin Municipality set up the new backup system in addition to the new server.

2) DMAS Software

Developed by Imlaq company, the Document Management and Archiving System has been in use by JM especially the Engineering Department for digital processing of service applications from the citizens since 2015. The system was not in use by the WWD. Jenin Municipality renewed the license in May and after several discussion meetings in November 2018, the digital workflow (paths) for processing the customers application were defined among Customer Service Section and Water Section in cooperation with the Public Customer Service Center (PCS). The PCS, located at JM building, is the start and end point of all customer applications including water service applications such as new service connections, disconnection of service, re-connection of service, water meter ownership change, and water meter re-location. Since 2018, the WWD has been successfully utilizing DMAS system for customer application services in replacement of the paper-based applications.

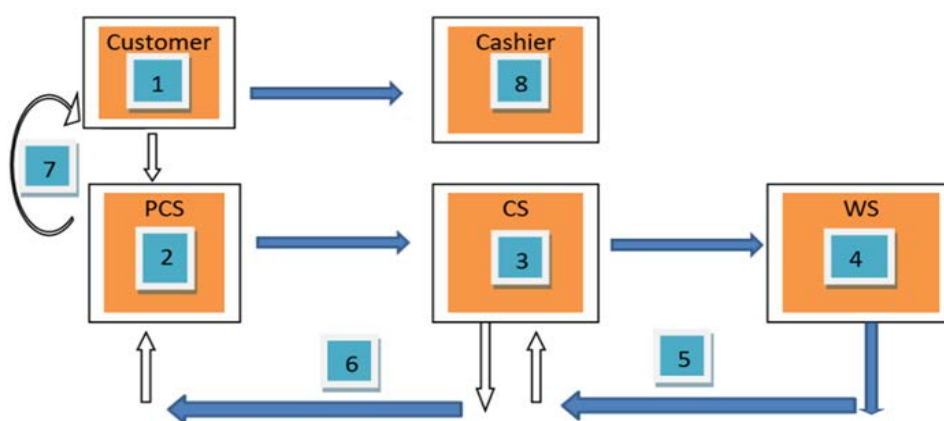


Figure 1 Electronic Workflow of Customer Requests on DMAS

PCS: Public Customer Service, CS: Customer Service, WS: Water Section

3) Mobile Billing System (MBS)

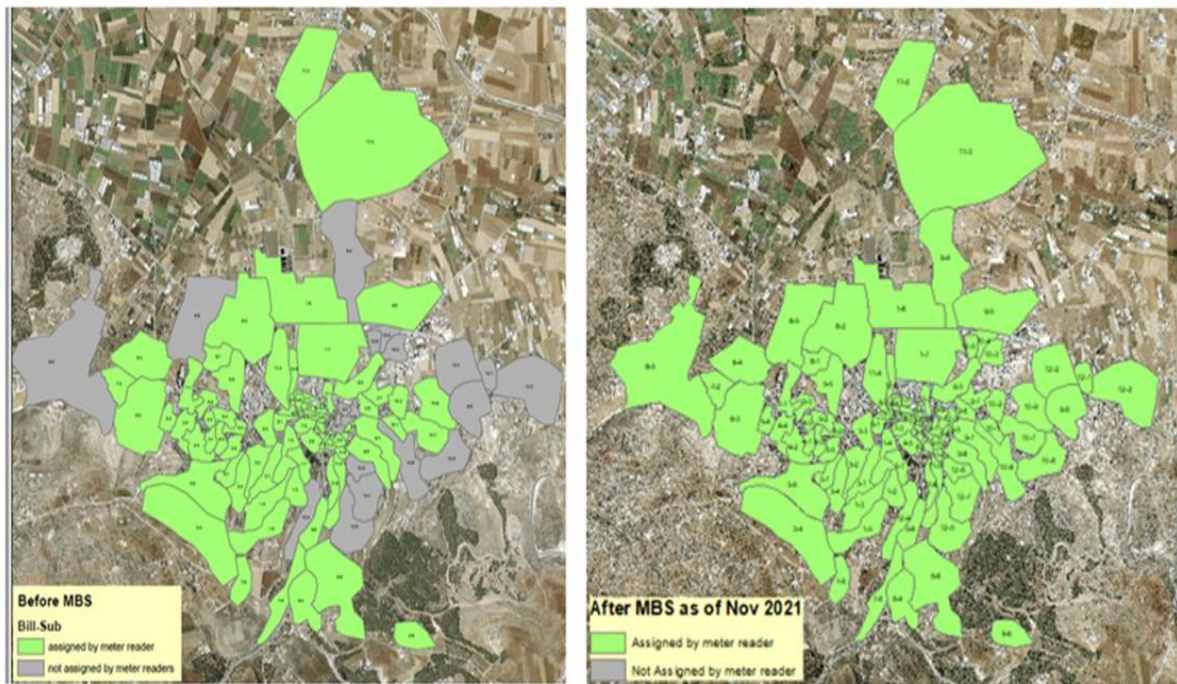
The mobile reading and billing system proposed by the Project in 2018. MBS allows JM to carry out the process of billing and collecting bills during the same month, paperless, and for a period not exceeding 15 days of each month. The readers 'and collectors' team were trained to use the system in December 2019 and work by this system has started since the beginning of 2020.

The Project experts also assisted in preparation of documents for tendering for the MBS and selection of the vendor. There were numerous discussions over approval of the type of MBS and its use. More details on the process is provided in the Attachment x.x Report on Mobile Billing System (MBS) for Jenin Municipality.

One of the challenges for JM was the lack of readers staff and thus some areas went unread. But now with MBS and shortened reading time, almost all water meters are read every month with the current number of readers. The following figure depicts the training and the device used.



Photo 1 Mobile Billing System Training and Discussion Meetings



Before MBS:
 Area not assigned (unread) by meter readers: 1.9 km²
 Area assigned by meter readers: 6.1 km²

After MBS:
 Area not assigned (Unread) by meter readers: 0 km²
 Area assigned by meter readers: 8 km²

Map 1 Effectiveness of MBS in Full Coverage of Meter Reading Areas

Table 3 Benefits of Using MBS

Staff	Benefits
CSS staff	Zero time-cost for to entering meter readings from paper recordings to AL Shamel by three staff members
	Zero time-cost to calculate and print the bills by the Head of Customer Service
	Zero cost of paper and printing ink for bills
Readers and collectors	No monthly gap between meter reading and distribution of bills
	Collection ratio can be measured for the past month
	Reduced number of visits of customers
	Reduced number of bills that are estimated
CSS planning activities	Use of freed up time of readers/collectors
	Location of customers/meters are collected, photos can be taken, broken meters, and illegal connections, etc. could be recorded in the system. Total areas of unread meters has reduced and areas of reading meters has increased: by about 25%.

4) Baylan Software and Vending System

Baylan system manages the PPWM's and the relevant operations. The system contains the subscribers' database and manages the depts deduction, besides it is considered as the interface for the vending stations. This system is integrated in one way with Al-Shamel i.e. any deduction through Baylan is reflected on Al-Shamel as a credit note. The system's main purpose is to increase water tariff collection ratio in Jenin Municipality.

Table 4 Status of the PPWM System in Jenin ()

Start Year	City	Target Area	Initial Rolol Out (units)	Total Current Installation	Population Served	Average Annual Installation
Feb. 2019~ongoing	Jenin	Pilot areas, extended DMAs, other	1,850	3,181 as of April 2021	~15,000	~1,380
Brand	Price (USD)	Type	Vending Method	Guarantee Period	Product Life (Actual)	Battery Life (Actual)
BYLAN	150	Ultrasonic	Smart card	3 Years	10 (not experienced)	Expected 10 (not experienced)
PPWM Functions			After Sale Services			
Realtime clock	Friendly credit	Software support 24/7- 5 yrs				
Remaining credit	Tariff setting	Technical support 24/7 – 5yrs				
Reserve for emergency	Debt recovery	Onsite support on request – 5yrs				
Low credit alarm	Consumption limit					
City	Customer Database Software	Data Collection Method	Web-bases Data Transfer	Gateway LORA	Accounting Software	
Jenin	Integrated	Server	Yes	Yes	Integrated	

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- (1) Specification of **ultrasonic PPWM** is shown below considering the availability of PPWM in Palestine.
 - a) Diameter: 3/4 inch (ND20mm)
 - b) Q_3 (Permanent flow rate) = 2.5 ~ 4.0 m³/h and Q_1 (Minimum flow rate) ≤ 0.016 m³/h.
- (2) Vending station: hardware equipment and software. It includes PC, LCD Screen, printer, card (tag) reader, stand by card (tag) reader unit and UPS, on-line software, router, etc.
- (3) Software and server: BAYLAN PPWM software, Server management software and hardware server suitable for the application are required. It also includes a suitable UPS, on-line software, router, etc.
 - Technical specifications: HPE computer with 8 core processor 32 GB memory 1 TB hard disk including license for Windows & SQL 2016 standard license for 8 core & Unlimited Cals.
- (4) Handheld unit: Model: Symbol, Workabout pro4, Platform: PXA270 624 MHz Processor
 - 1 GB Flash ROM, 256 MB RAM, Operating System: Microsoft Windows CE 5.
- (5) PPWM plastic box: Rigid plastic box.

PPWM and VS system

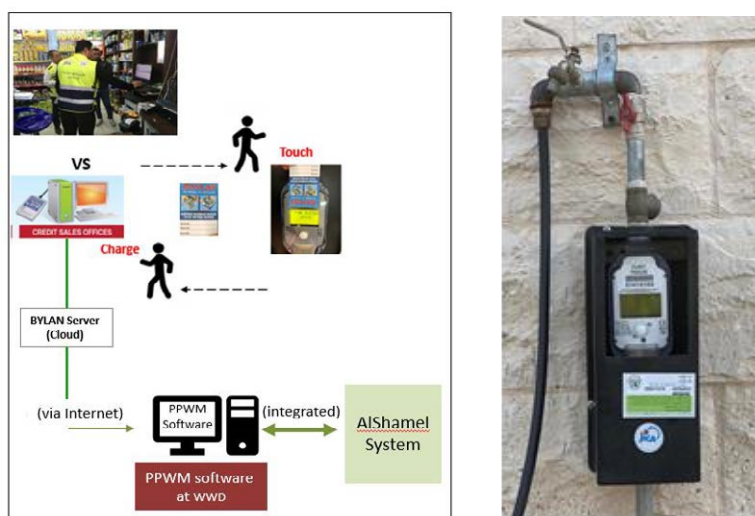


Figure 2 Integration of AlShamle and PPWM Software

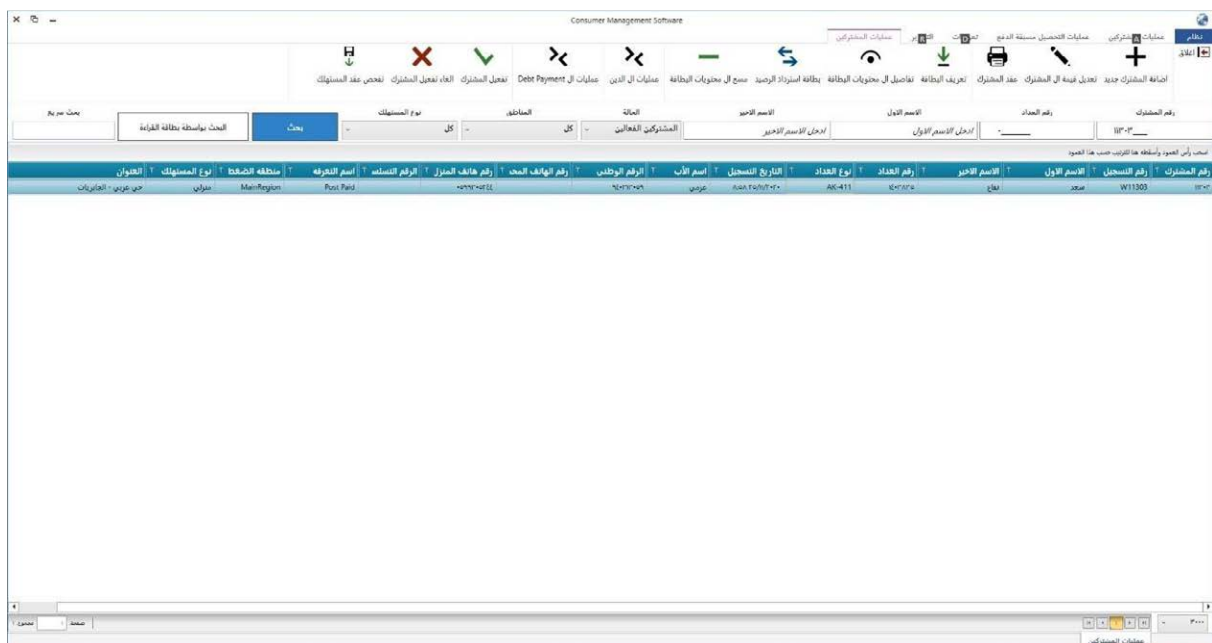


Figure 3 Main Interface of Baylan Software showing a Customer's Details

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PPWM workflow involves the Water Section and Customer Service Section of WWD. In addition, the IT and the Financial Department of Jenin Municipality are contributors to the PPWM workflow as seen below.

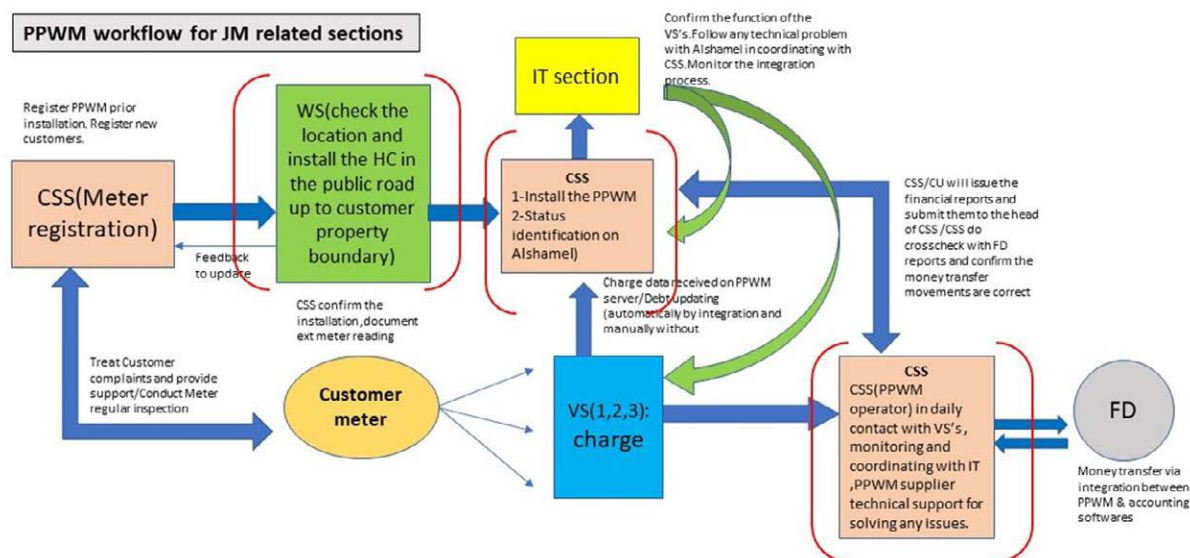


Figure 4 PPWM Workflow

Programmer of this software (Water Meter Manufacturer) is in Turkey, where it is considered as a weakness point since it is not easy to add or modify any feature or report to the system unless it was done by the manufacturer.

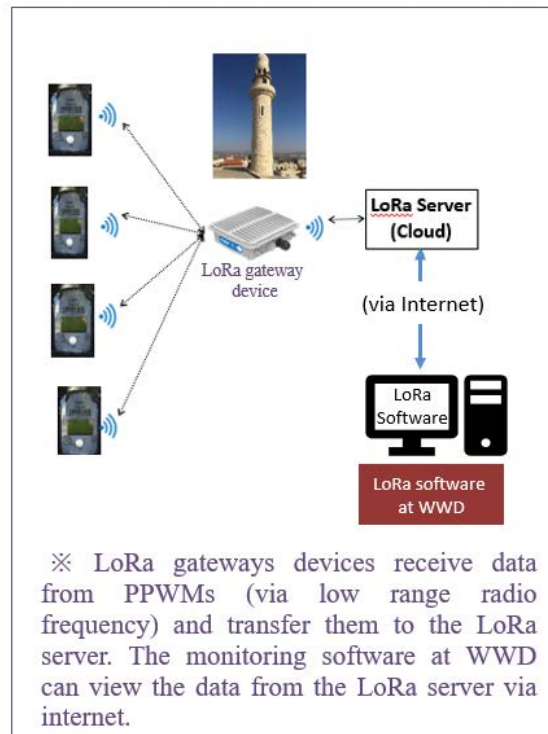
The PPWM software does not measure the amount of consumed water by the customers. Thus, it was necessary to introduce BMS (Lora Gateways) system.

Items	Specifications and standards	
Gateway Device	Communication	LoRaWAN 1.0 and 1.01 Compliant
	Antenna Connectors	“N” type RJ-45 for female POE
	Max Transmitter Power Output	27 dBm
	External LoRa Antenna	3.0 dB additional gain
	External H5 or LTE Antenna	2.15 dB additional gain
	PoE Splitter (Inside IP67 enclosure)	48 Volt PoE at 25 Watts
	Operating temperature	-40 to +70 cent degree
	Storage temperature	-40 to +85 cent degree
	Accessories	Lightning arrester, outdoor cable, antenna, etc. necessary for operation shall be included in.
	Model	Ethernet mLinux programable
Device Box	<ul style="list-style-type: none"> Box shall be enough capacity for storing Gateway device with the antenna in this box. Box shall be made of wooden or fiberglass materials. Box shall be strong enough for installing at outdoor site. 	

5) BMS (Gateway System)

BMS (Baylan Metering System) software manages the Gateways (Antennas). Gateway is a tool which allows accessing the installed PPWM's remotely using LORA (Long Range Wireless) technology. The captioned data from the gateway, mainly, contains accumulative consumption, current remaining credit, valve status (open or closed), and warnings. The BMS is a great tool to monitor installed PPWMs and customer consumption behavior.

PPWM and LoRa gateway system



The following figures show the interface of the software.

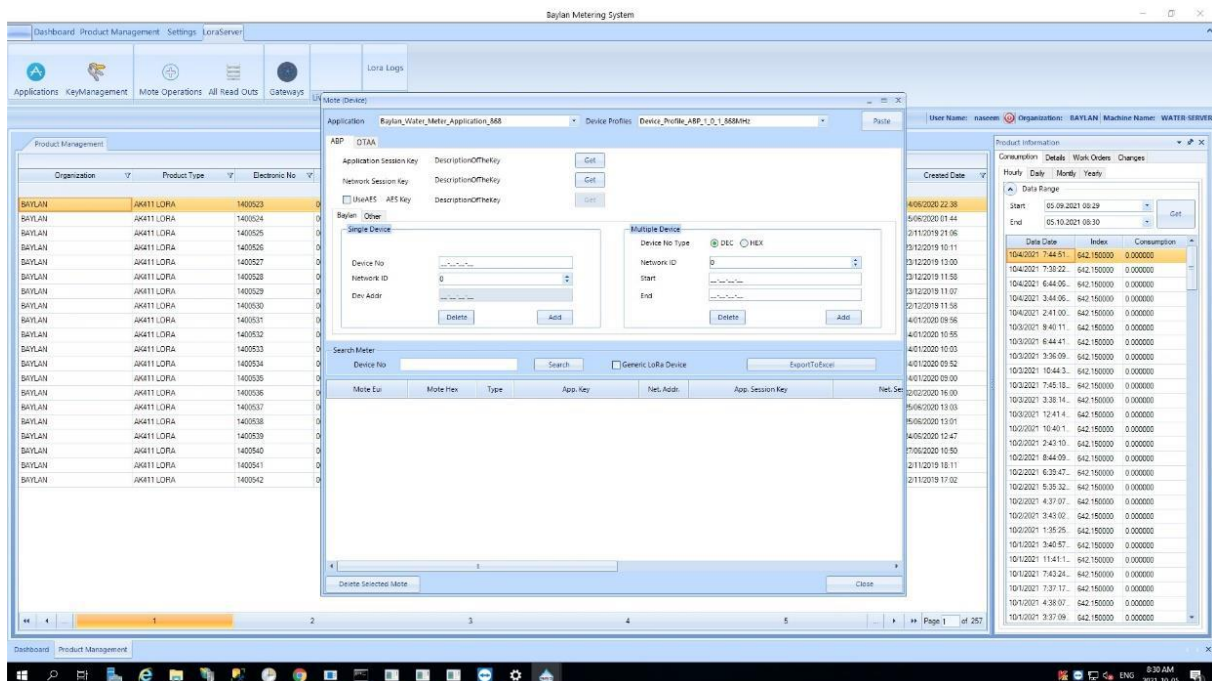


Figure 5 Admin Interface of BMS

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The screenshot shows the 'Home Page' of the BMS web interface. It features a sidebar with navigation options like 'Home Page', 'Products', 'Product List', 'Product Group', 'Readers', 'Subsystems', 'Invoicing', 'Users', 'Reports', 'Tools', and 'Settings'. The main content area displays a table of records with the following columns: Select All, Details, Product, Product Type, Organization, Total Consumption, Debt, Credit, Last Scan, Valve Status, Alerts, Battery, Version, Reader, Integration Code, Create Date, Param1, Param2, Param3, and Param4. The table contains 15 rows of data, with some rows highlighted in red to indicate critical alerts.

Figure 6 Web Interface of BMS

The screenshot shows the 'Details of Gateway Web Interface'. It includes a filter type dropdown set to 'Hourly', a date range from '21/09/2021' to '05/10/2021', and a 'Filter Data' button. The main table displays records with columns: Date Date, Inflow, Consumption, Credit, Backflow/Credits, Created Date, and Reader Product Code. The table shows a series of hourly data points over a period from September 2021 to October 2021.

Figure 7 Details of Gateway Web Interface

6) Automated Bill Collection by PalPay

In addition to the traditional bill collection by the collectors, Jenin Municipality has commissioned PalPay system as a financial operator system for digital bill collection. The PalPay devices are set up at vending stations (payment points) throughout Jenin City mainly at supermarkets where customers have easy access to pay their water tariff fees and debt which automatically deposits in JM's bank account.

As of December 2021, there are 12 vending stations for PPWM customers to charge credits for their PPWMs or pay their debts. Out of the 12 vending stations 2 vending stations are operated by JM staff

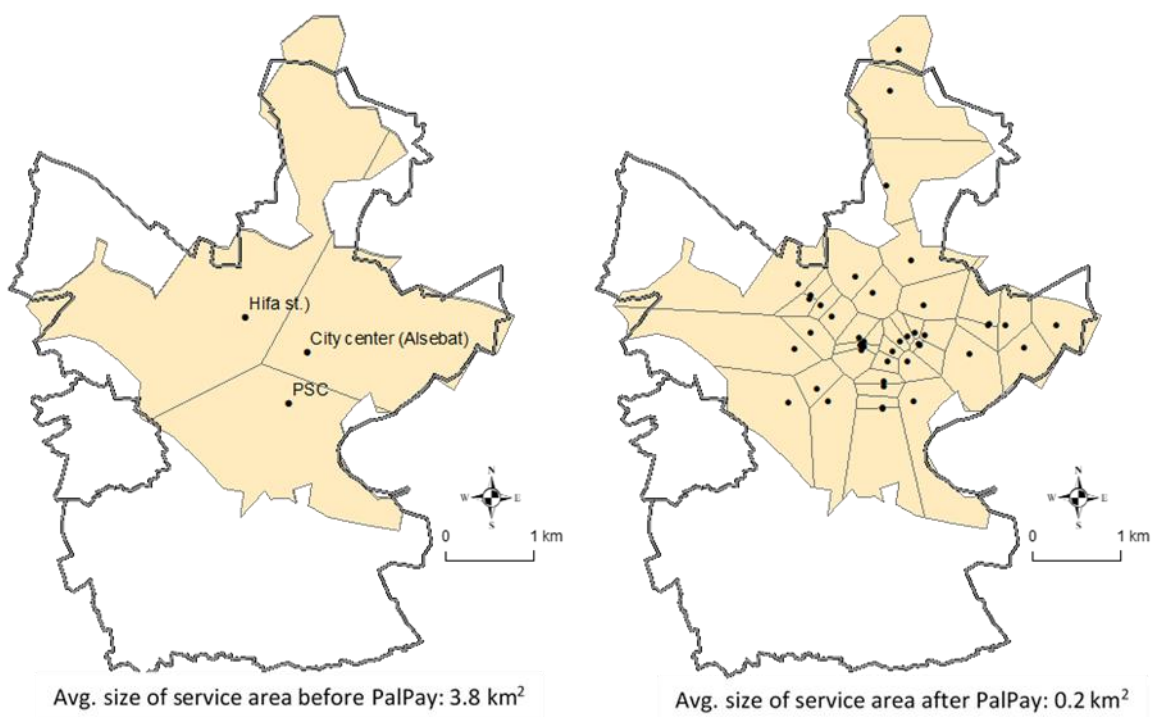
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and 10 vending stations are operated by Palpay. There are 45 vending stations for mechanical water meter customers as well. This system saved time and efforts of JM staff and customers. Table below shows the benefits of PalPay system in a Before-After assessment.

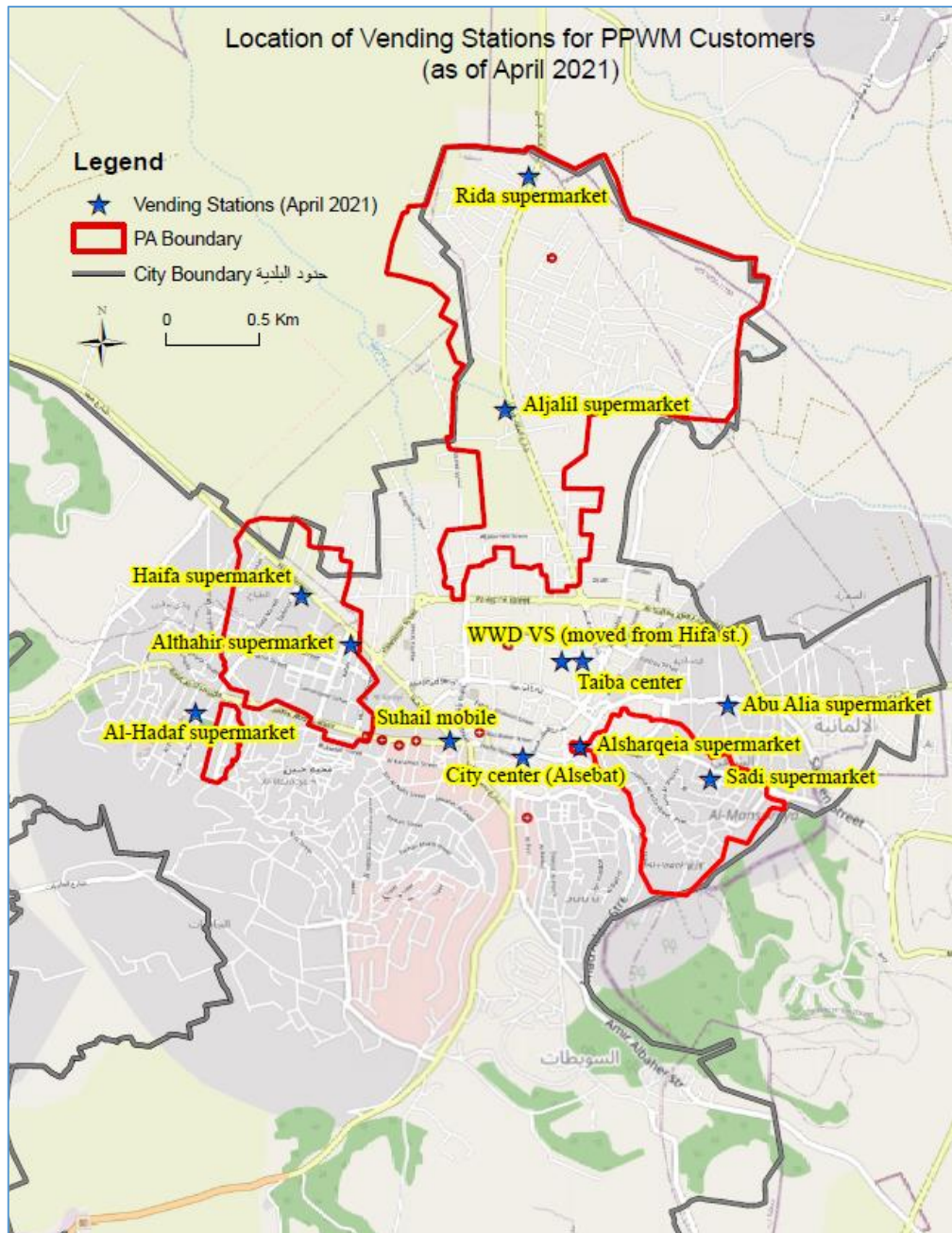
Table 5 Jenin Municipality Before and After PalPay

Benefits/status	Before	After
Additional points of payment for customers	3 JM collection centers (payment points) (Old City Center, JM Public Citizen Center, and Haifa Street)	Total: 45 points 45 Palpay sale points including 9 points as vending station for PPWM charges and 3 JM's collection centers)
Higher ratio of payment points per customers	2946.67 customers per collection points (total customers as of December 2019=8840/3 sales points)	209.24 customers per collection points (total customers as of Aug 2020=9416/45 sales points)
Reduction in size of the service areas after additional payment points	3.8 km ² was average of the service area covered by the three JM collection centers.	0.2 km ² is the average size of the covered service area of the 45 payment points.
Additional option is available to customer for payment method.	Collection by only JM centers and by collectors at customer's door	Palpay payment points are now additional method of payment available to regular customers since Jan 2020 and to PPWM customers since May 2020.

The following map presents effectiveness of using PalPay system to greatly reduce the service coverage area so that the water subscribers have a nearby and convenient payment point to pay their bills.



Map 2 Location and Accessibility of Payment Points (PalPay Vending Stations)



Map 3 Location of the 12 Payment Points (PalPay Vending Stations) for PPWM Customers

7) GIS-base Database

GIS was first introduced to WWD in 2015 as a part of Master Plan Project funded by French Cooperation. The GIS water network was outdated and rarely utilized. Also, no one at the section was familiar with GIS or the database. The GIS expert of JM was an engineer at the Engineering Department. The software was licensed with 1) ArcGIS 10.4.1 Advanced for the server, 2) ArcGIS 10.2 for Advanced Desktop, and 3) ArcGIS for Basic for viewing.

During the Project, several of the staff received basic and advance training on GIS. All GIS databases were updated, and additional geo-database were created by expansive field customer data surveys and using devices such as pipe locator, and maintained on a daily basis. WWD's CSS uses GIS for PR

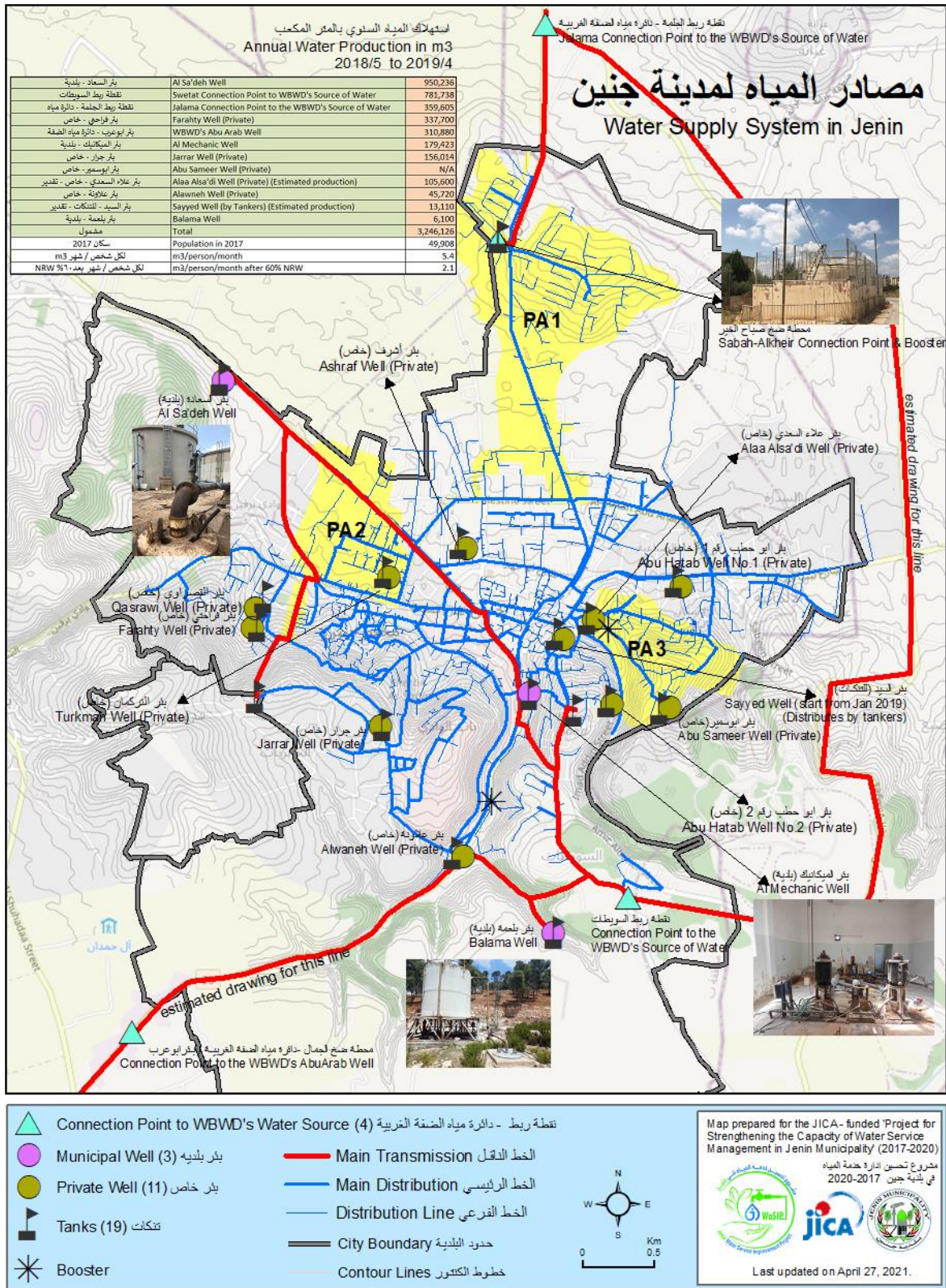
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activities, collection ratio measurement, customer database, customer complaints, mapping, etc. as well.

The table below presents the GIS based shapefiles that existed but are upgraded in addition to newly built GIS shapefile layers to use in different activities of WWD. A GIS based map of Jenin Water Supply System, produced by the WWD, is also shown as a sample.

Table 6 Status of GIS Shapefiles and their Usage in WWD Activities

GIS Shapefiles and Attribute Data	Updated GIS Layers	New GIS Layers	Usage by Activity										
			NRW	Leakage	Zero Reading	Debt Mapping and collection	Social Survey	PPWM	Pre-Installation Survey	PPWM	Motivation Scheme	PR Activities	
1. Water network	<input type="radio"/>	<input type="radio"/>	*	*					*		*		
2. Water meter	<input type="radio"/>	<input type="radio"/>	*	*	*	*	*	*	*	*	*	*	
3. Buildings	<input type="radio"/>	<input type="radio"/>	*					*				*	*
4. Roads	<input type="radio"/>			*									*
5. Customer data	<input type="radio"/>	<input type="radio"/>	*		*	*	*	*	*	*	*	*	*
6. Chamber location		<input type="radio"/>	*								*		
7. Pressure measurement		<input type="radio"/>	*	*							*		
8. DMAs (District bulk meter areas)		<input type="radio"/>	*	*	*								
9. Satellite imageries	<input type="radio"/>		*	*	*	*	*	*	*	*	*	*	
10. Leakage repair		<input type="radio"/>	*	*									
11. Bulk meter locations		<input type="radio"/>	*								*		
12. House connection pipes		<input type="radio"/>	*	*					*		*	*	*



Map 4 Map of Jenin Water Supply System using GIS

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Map 5 Use of GIS Database for WWD Activities: Random Check of the Installed PPWMs

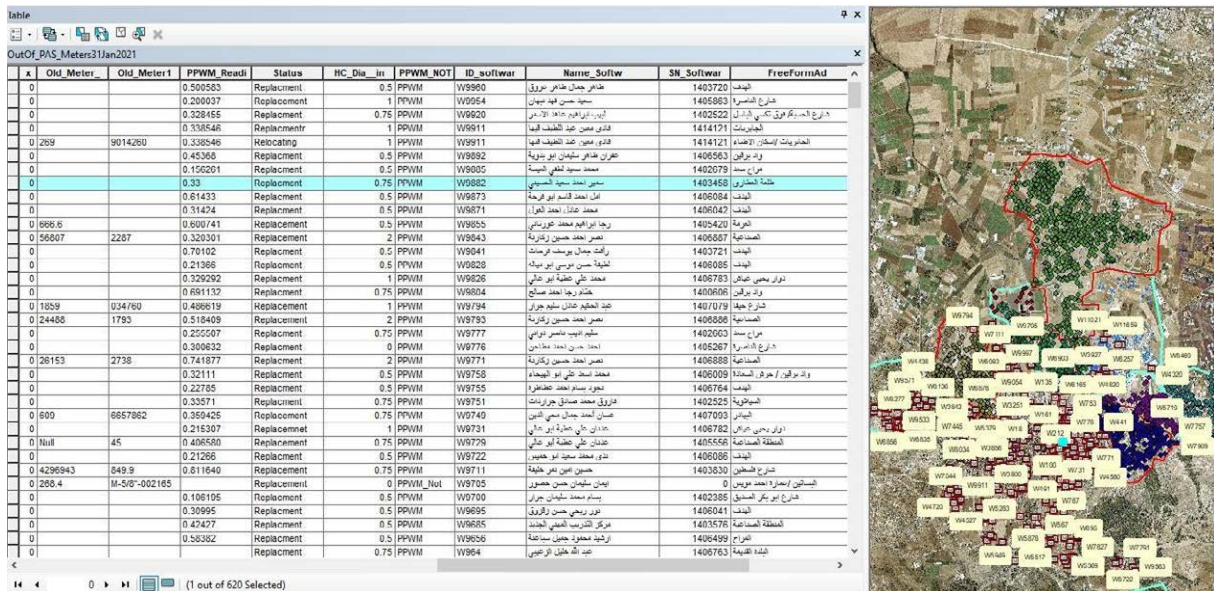
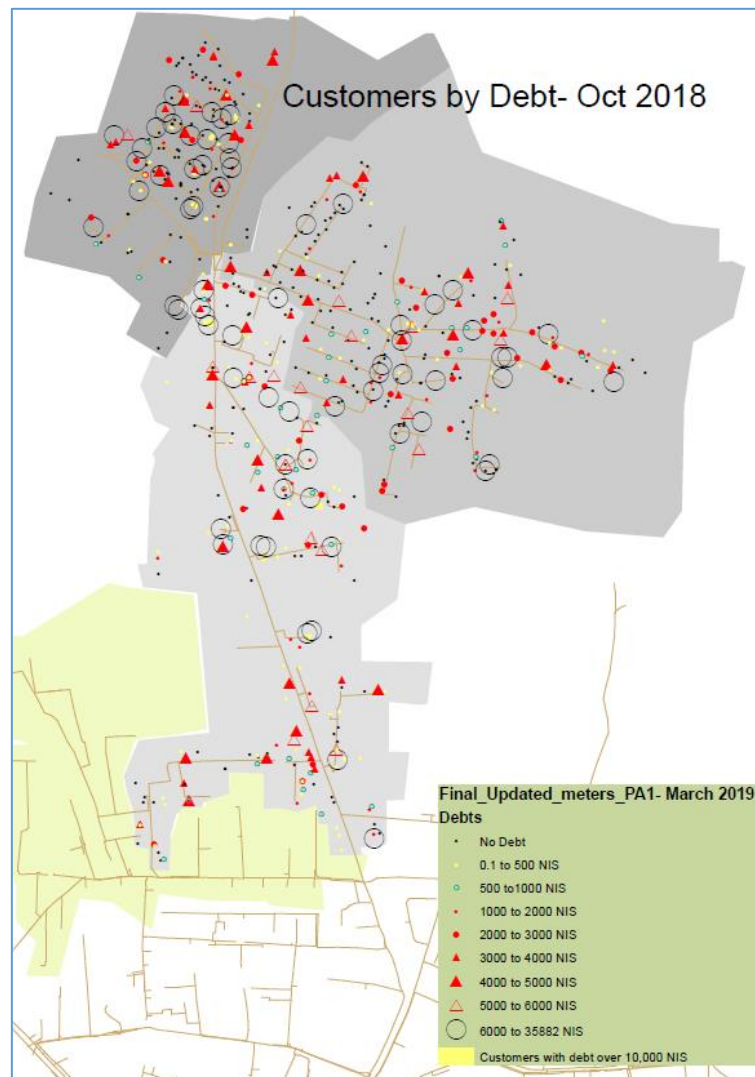


Figure 8 Water Meters Data Attributes in GIS

Repairing points-Entire Jenin city- As of Sep2021



Map 6 Sampel Mapping of Repair Activities using GIS



Map 7 Sampel Analysis Map for PR Activities: Customer Locations by Debt Categories in Pilot Area 1

8) Website-Based Customer Complaint Interface and Online Chat

JM's new website at <http://www.jenin.city> was launched on 19th of February 2019. It provides built-in digital solution for online complaints and also live chat with customers. For WWD, the complaints are divided into two groups of customers complaints; 1) water and 2) wastewater. Also, the website interface includes SMS function in order to provide the customers with information about their complaint status and to clarify the flow and processing status of the complaint. There are certain data that need to be filled in the electronic form of the complaint interface such as details of customer (Name, mobile number, water subscription number if available, location, type of complaint, description of the complaint, and attachment of the original paper complaint form). Figures below illustrate screen shots for this interface.



Figure 9 Screen Shot from the a Sample Complaint Interface

التاريخ	الإسم	الحالة	الموضوع	#
13:10 04/10/2021	عليه عبداللطيف يوسف ربيعة 0569901901	مفتوحة	اعتراض على عدم نقل اشتراك مياه لقيّة الآن دائرة المياه والصرف الصحي	14284
09:45 02/10/2021	فهد محمد حسن موسى 0599652137	مفتوحة	توفير قارئ عدادات + التحويل الى عداد دفع مسبق دائرة المياه والصرف الصحي	14194
09:03 30/09/2021	محمود محمود عيا سوقيه 0599741122	مفتوحة	طلب اعتراض على مبلغ رسوم مياه / الشرح كامل موجود بالمرفق دائرة المياه والصرف الصحي	14176
11:42 27/09/2021	يسام عبد الله دمج 0599155070	مفتوحة	الموظف على خصم قيمة فلتوره المياه الأخره من الراتب علما اني موظف دائرة المياه والصرف الصحي	14106
12:06 23/09/2021	كمال شريف كمال جرار 0599555555	مفتوحة	طلب اعتراض على مبلغ رسوم مياه / الشرح كامل موجود بالمرفق دائرة المياه والصرف الصحي	14056
12:44 22/09/2021	فتحي حسن ابو عطية 0599676362	مفتوحة	اعتراض على فلتوره مياه دائرة المياه والصرف الصحي	14033
11:47 20/09/2021	عماد خالد جلاونة 0598535148	مفتوحة	اعتراض على فواتير مياه دائرة المياه والصرف الصحي	13992
13:15 19/09/2021	جمال محمد محاميد 0598129665	مفتوحة	اعتراض على فواتير مياه دائرة المياه والصرف الصحي	13968
12:19 18/09/2021	هيثم مصطفى سعيد الرشيد 0569564494	مفتوحة	اعتراض على فلتوره مياه دائرة المياه والصرف الصحي	13921

Figure 10 Screen Shot from a Complaint and the Response of WWD

The interface provides options for the customers to apply for the complaint from home, and if not familiar with the system; the customer can go to the Customer Service Citizen in Municipality and fill the paper form and the employee will scan the complaint and upload it to the interface as attachment. In both cases the electronic reply is available.

9) SMS Reminders

With assistance of the Project experts in September 2019, Jenin Municipality conducted a model SMS reminder to 300 customers with a history of zero or low payment and sent SMS to request them to pay their monthly bills. Payment behavior of 100 customers (out of the 300) was then monitored and analyzed for the next months. The result showed an overall increased trend in the payment of their bills. Jenin Municipality, thus, continued to send SMS reminders to phone numbers available on customer database and gradually collected more customer phone numbers.

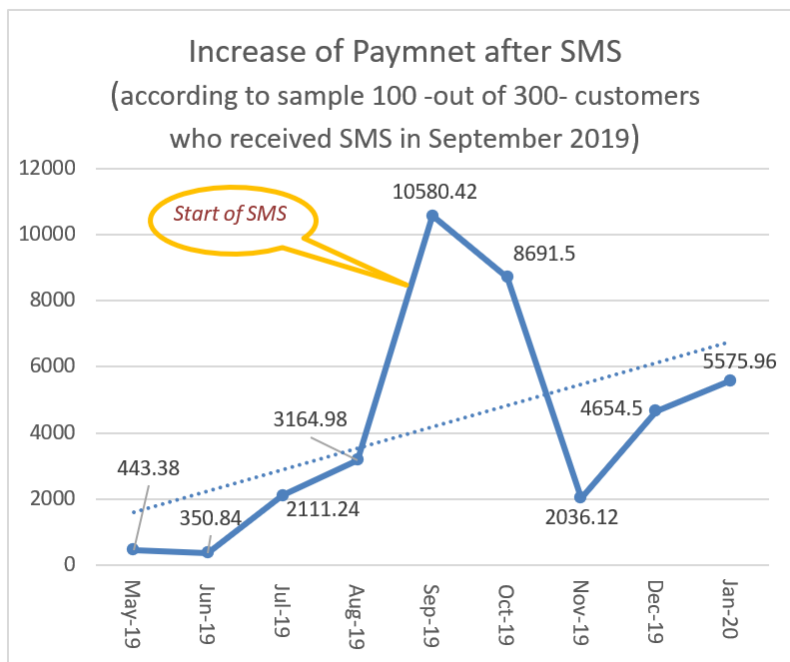


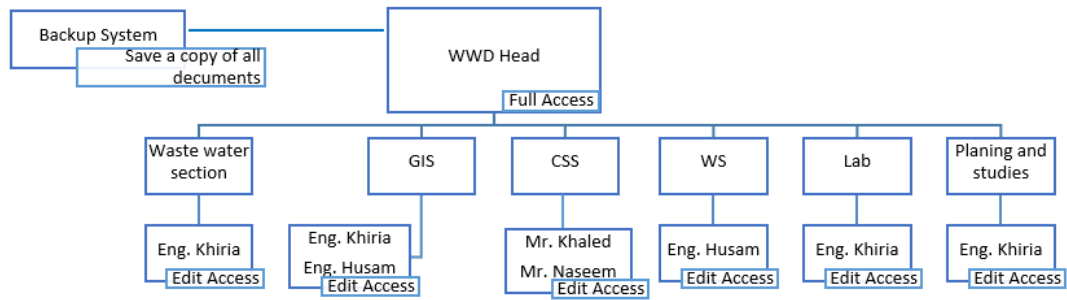
Figure 11 Analysis of SMS Effectiveness in Increased Water Tariff Payment using a Sample of 100 Customers Payment Trends Before and After SMS

The SMS reminders increased to 800 customers by the end of 2020 as more customer phone numbers were collected into AlShamel. However, Jenin Municipality had to stop sending the SMS reminders due to hardship of economic situation of the citizens (unpaid salaries and Covid-related hardship) and disconnection of SMS activity continued till writing of this report due to financial issues of Jenin Municipality and Jawwal Telecommunication Company (the SMS solution provider company). It is recommended that JM solves the issue and resumes SMS activity and to increase customer phone numbers in its customer database (AlShamel).

10) Use of Google Sheets

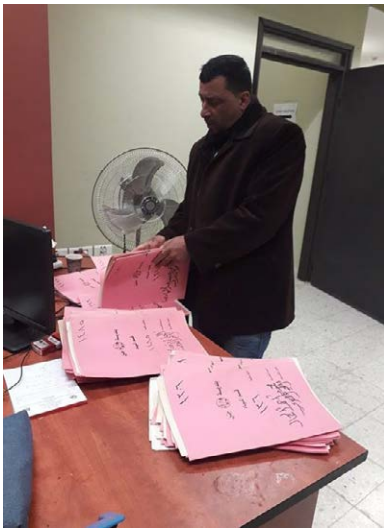
The teams at Customer Service Section and Water Section have prepared and utilized Google Sheets for sharing the databases and activity records and reports on the clouds. The authorization is defined for the relevant staff as ‘only reader’ or with ‘editor’ rights. The Google Sheet database is constantly being updated in several organized worksheets on a daily basis. The JM’s IT department is in process of upgrading the WWD’s Sharing System on the JM’s server with higher security and capacities.

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11) Digital Archive

The archiving team, on a daily routine, scan archived files page by page for each customer and scan the files and store on the JM server. Currently 5,000 of water subscribers paper files (out of over 9,000 water subscribers) are scanned and shared on the JM server. It is an ongoing activity. It has helped CSS to have faster access to digital files of customer folders.



12) System Integration

The followings are the system integration.

For PPWM customers:

System integration for PPWM customers brings them two ways to charge their cards: 1) via PalPay System and charge PPWM card at a PalPay vender, or 2) directly at the JM collection centers.

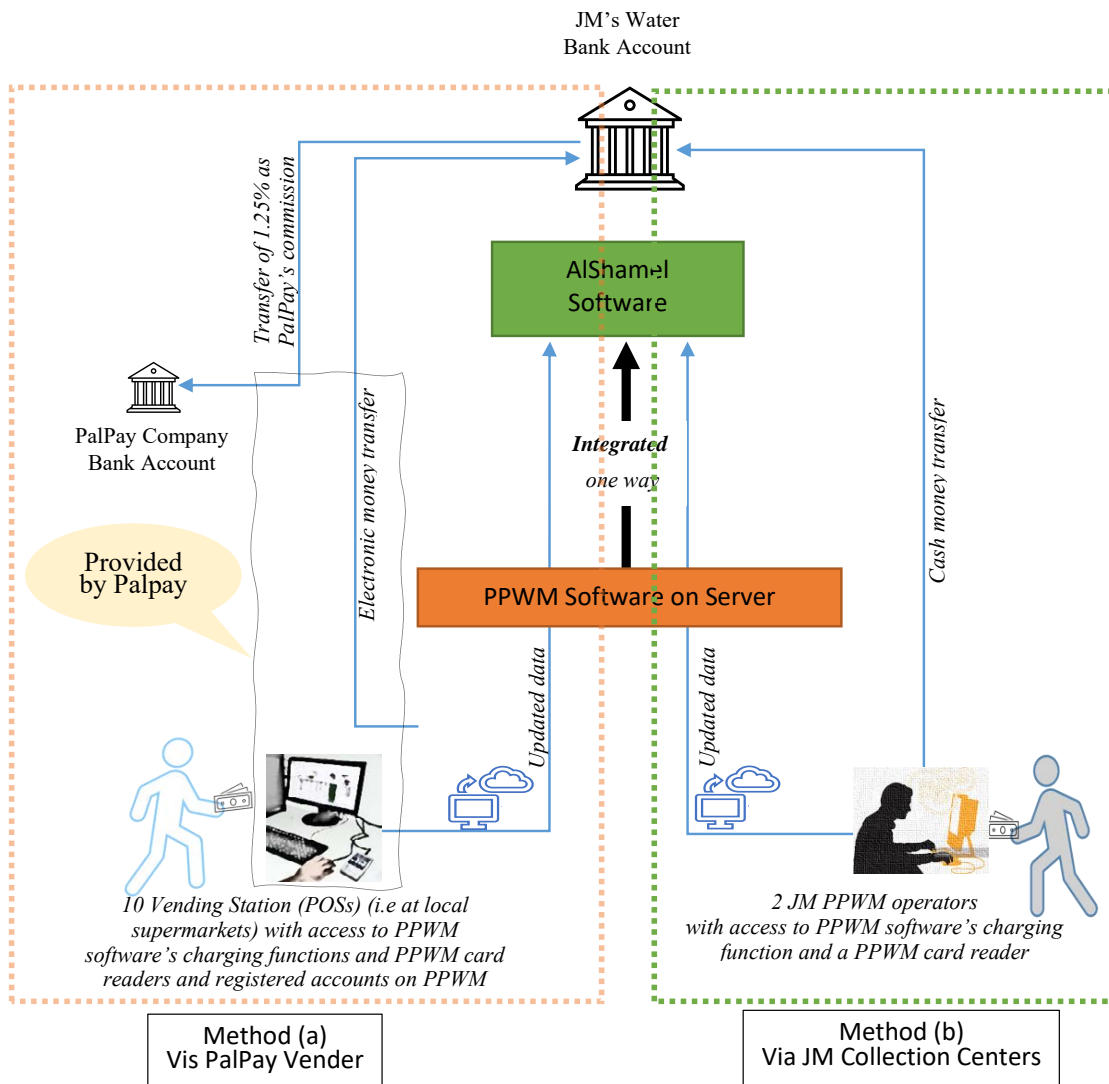


Figure 12 One Way Integration of PalPay to AlShamel via PPWM Software for PPWM Customers

For Mechanical water meters

System integration for mechanical water meter customers brings them two ways to pay their bills: 1) via PalPay System and pay at a PalPay vender, or 2) pay directly at the JM collection centers.

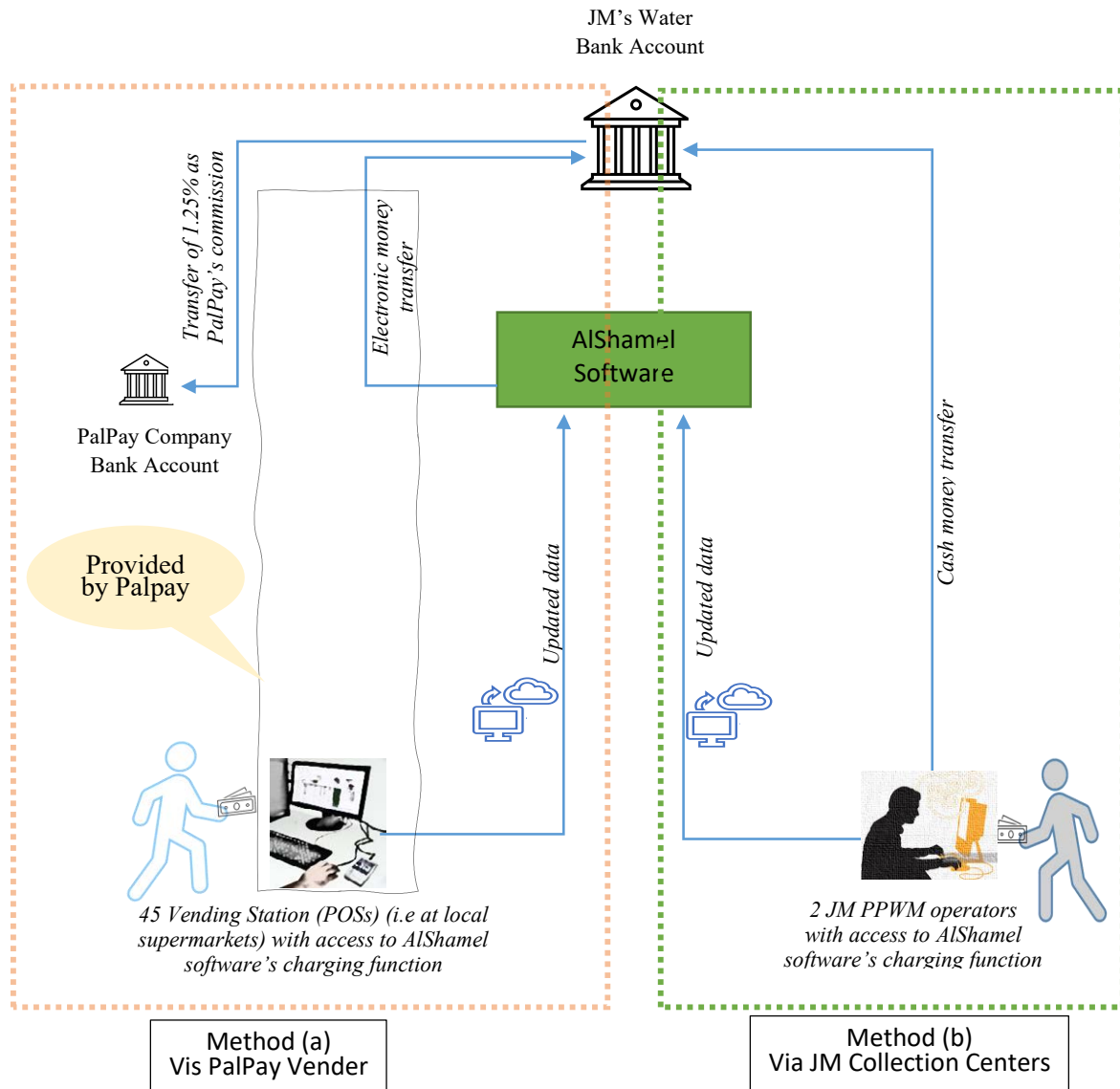


Figure 13 One Way Integration of PalPay and AlShamel for Mechanical Water Meters

12) Recommendations

1. Central Achieve for WWD (Subscription Contract for customers).
2. DMAS system: support and new features.
3. Activate the feature of identifying the location (GPS) on MBS, and BMS.
4. Palpay: Add new tools to view and trace the transactions.
5. Add In extension on GIS to access BMS and Baylan.
6. Utilize the features of the software where they can be connected together.
7. Capacity of the telephone network in WWD is damaged, all of the phone complaints are on staff mobiles. This issue needs to be fixed and the network needed to be replaced.

13) Requirements

1. Software: Licensed Arc GIS Software (2 Administrator, 3 Concurrent)
2. Printers: 1 Plotter (A0), 4 Printer and Scanner (A3).
3. PCs: Work Station i7, 10th Generation, 16 GB RAM, 1TB HDD, and 500 GB SSD (4).

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

4. IP Telephones and new network.
5. Replace available ADSL Internet connection line by a new fiber optics line to handle the file sharing, data downloading and uploading in the department.
6. Web application (Interface) for viewing GIS data (it is set as add in extension on ArcGIS software) and has extensions to access all the other software in the department. For example: commands on the main page of the web app to enter AL-Shamel. This application is for employee use only.

As for PPWM software, the followings are points need for improvements:

1. To add the feature of paying the accumulated monthly maintenance fees in case the subscription has been disconnected and the charge has not been carried out for a time exceeds a month.
2. To add the alternative charge feature and include it in the report to compensate the customer in case the card is damaged or if the balance on the card is not charged
3. Add the free charge feature for administrator in case of social cases or emergence economic situation like COVID-19.
4. In some cases the charge did not transfer from PalPay machine to the PPWM software in the vending station. Work with PalPay Company to add a tracking tool for bank transfers, in order to address and solve the problems related to the of transferring the charge to the PPWM software at vending station.
5. Fix the financial problems resulting from the debts deduction duplicates which happened several times.
6. Fix the problem of the fire mode been automatically activated and lent some credits to customers for a while without customer's knowing. This caused a surprised bulk amount of payment when customer notices.

別冊資料 CD 1.5

**Your City Water Explained Part 1, 2 and 3 (for
Customer information)**

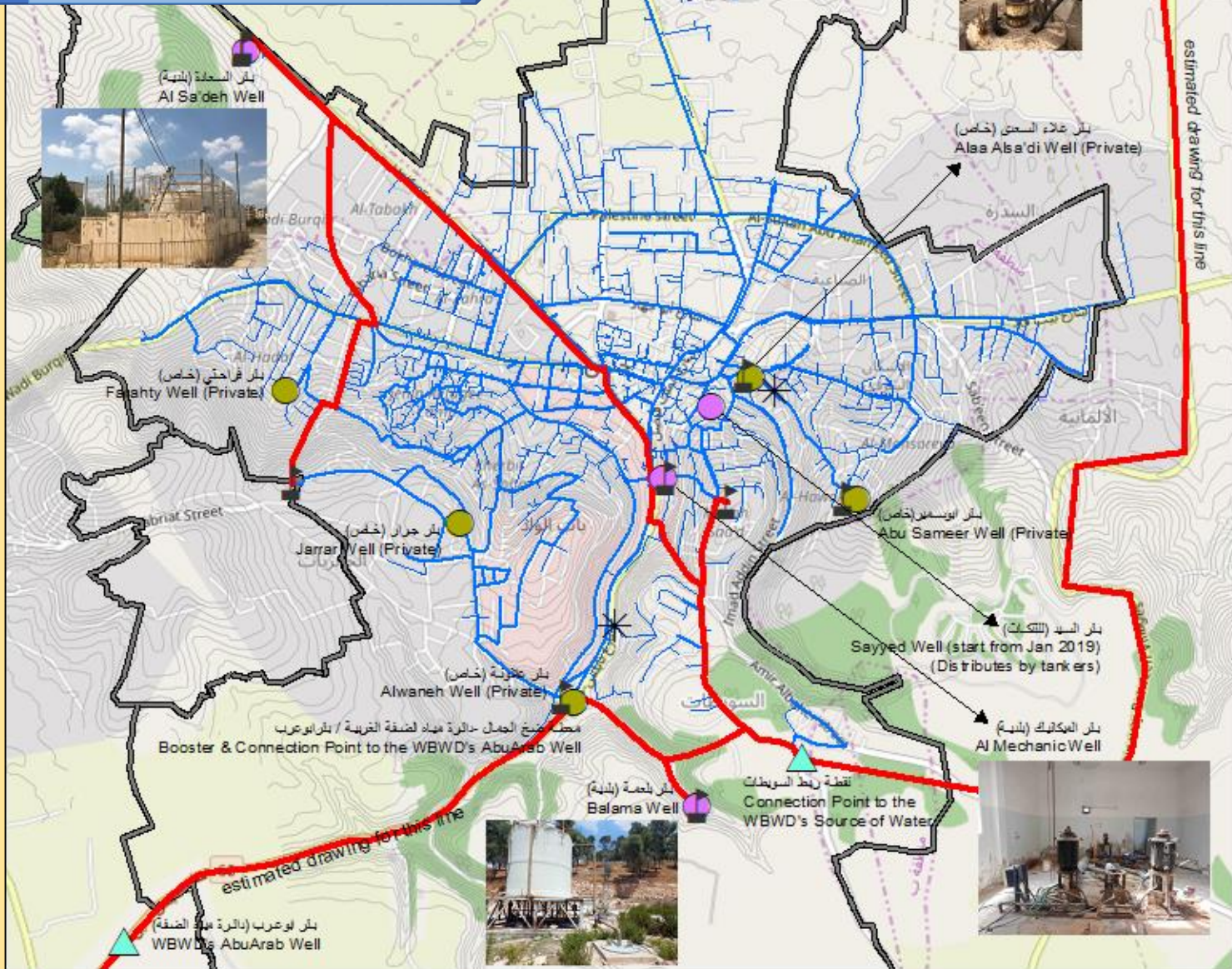
別冊資料 CD 1.5.1 English Version

Jenin City

CUSTOMER LEAFLET

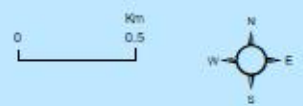
Your City Water Explained

PART (I) Water Supply and Challenges



- Connection Point to WBWD's Water Source (4) نقطة ربط الجملة - دائرة مياه الضفة الغربية
- WBWD Well (1) بئر دائرة مياه الضفة الغربية
- Municipal Well (4) بئر بلدية
- Private Well (5) بئر خاص
- Tanks (11) تكتات
- Main Transmission الخط الأقل
- Main Distribution الخط الرئيسي
- Distribution Line الخط الفرعي
- City Boundary حدود بلدية
- Booster
- Contour Lines خطوط لكتور

مصادر المياه لمدينة جنين Water Supply System in Jenin



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Part 1: **Water supply and challenges**

Part 2: Operation system and challenges

Part 3: Customer low payment rate and financial challenges

Part 4: How your drinking water is treated and monitored

Part 5: Customers questions and Municipality's answers; Q and A



Source of Water in Jenin

The Jenin Municipality provides water to the residents from different sources including its own wells (Al Saadeh, Al Mechanic, and Balama wells), from private wells within the Municipal boundary (Farathy, Alwaneh, and Muamar Jarrar wells), from outside (from Mekrot company via Al Jalameh connection and Al Swetat connection), or from West Bank Water Department via Abo Arraba connection.

Supply System

The supply system is of mixed type; by gravity as well as by pumping. The pump operation in Jenin can be divided into two types; water source pumps and distribution pumps. From some sources water is first transmitted to reservoirs and then distributed by gravity. For example, water from Al Saadeh well is first transmitted to Al Jabreyat and Al Marah reservoirs and then distributed by gravity. From some sources (such as Jalameh connection) water is fed into smaller tanks (50 m³) and boosted to the network. Some other sources (such as Farathy and Jarae wells) water is directly fed to the distribution network. In some locations online boosters are used to boost the water pressure.

Drinking Water Pipe Network and Issues

Black steel and galvanized steel are the main pipe materials used in Jenin. Recently use of HDPE has also started. The black steel pipes are cement mortar lined from inside and coal tar coated from outside. The smaller pipes are GI pipes and they are PVC coated from outside.

Total length of pipe network in 2018 is about 150 km with different diameters from 8 inches to 0.5 inches. About 70% of the city's transmission and main distribution pipe network was built in between 2000 and 2010, lines, which are relatively new. It should be, however, noted that the old distribution pipeline has not been totally abolished and been left in place; most of the customers are still connected to the old pipelines because of the shortage of budget to cover house connection work to the new pipeline. This means possibility of a lot of leakages due to the old city pipelines.

Jenin has a complete source metering. All the water produced within the Municipality, purchased from private wells, or imported from outside supplier is metered with bulk meters. The bulk meters have been installed with adequate upstream and downstream straight pipe sections. This assures the accuracy of measurement of how much water is loaded in the city's water network. The Jenin Municipality, nowadays by help of the JICA experts (the WaSIP project), regularly monitors the source meters and the measurements.

There are however several issues related to the city's water network system:

1) Lack of water network availability for some parts of the city

It is expected that number of the customers increase gradually, because residential area is expanding year by year and the buildings for apartment or commercial purpose are increasing, too. The household at the expanded area cannot access the existing distribution lines due to not extended distribution lines. Those households are depending on private water vender or the owner who has a private well.

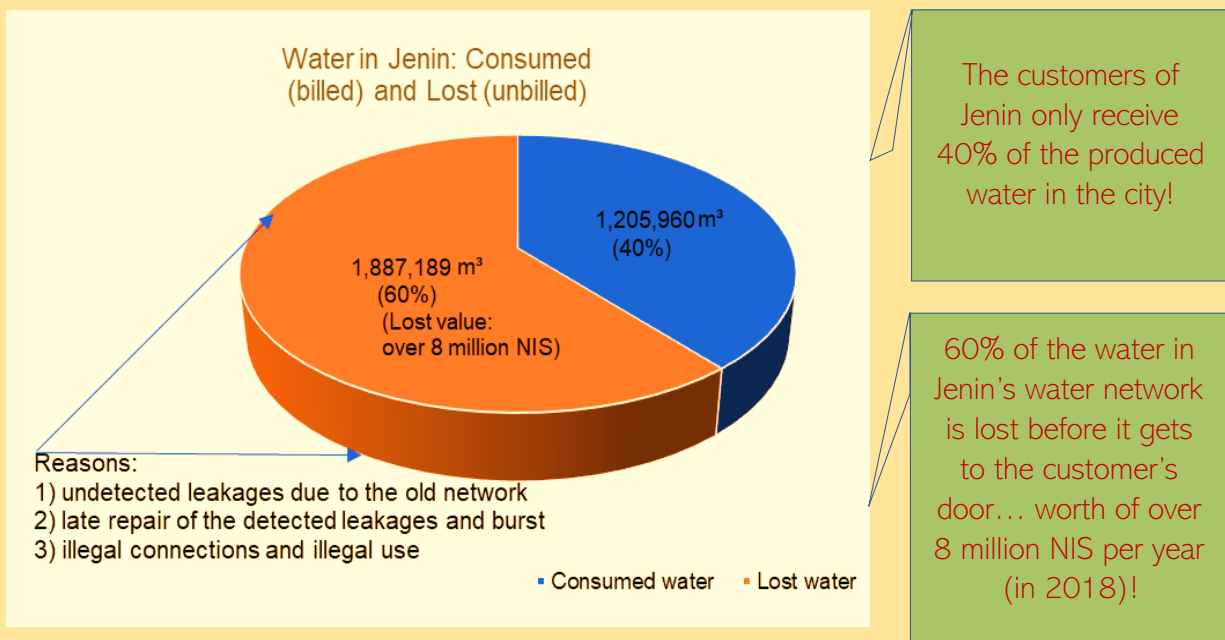
2) Water loss throughout the public water network

In addition to the need for expanded water network, the Jenin city is, however, suffering of a high level of water loss throughout the existing network before it gets to the customers. This is called unbilled water or non-revenue water (NRW) which means the Jenin Municipality has to pay for this water but it is not billed to customers and the cost is not returned to the Municipality. It is one of the reasons that the Jenin Municipality has been faced to financial difficulty to improve its services, expand the water network, and to maintain the existing water system and services. The water loss was 44% in 2017 and 49% in 2016.

In 2018, through the WaSIP project, the Jenin Municipality measured accurately and found that the water loss is even higher. The city lost 12,581 m³ of water per kilometer of its total 150 km of water network in 2018. This means that 60% of the produced water loaded to the network was lost! The loss rate was higher than past two years which could mean the lost is increasing, or it might have been due to higher data accuracy conducted in 2018.

The reasons for the high amount of water loss (NRW) could be 1) undetected leakages due to the old network, 2) late repair of the detected leakages and burst, and 3) illegal connections and illegal uses (i.e. using the drinking water for farming or other activities via illegal connection).

The Municipality is taking actions to reduce this loss in coming years. For example, by 1) detecting illegal connections, 2) fixing leakages using some new tools, 3) training its technicians how to properly detect leakages using the tools, 4) fix public leakages as soon as possible, 4) look for funds to replace old networks pipes. The number 2 and 3 have been assisted by the WaSIP project in some pilot project areas.



3) Low accuracy of some customer water meters

Although all the water loaded into the network is measured at the production sources and also all the consumption is measured by the customer water meters, accuracy of the customer meters, however, is classified as low (based on the perception but not supported by any meter test data).

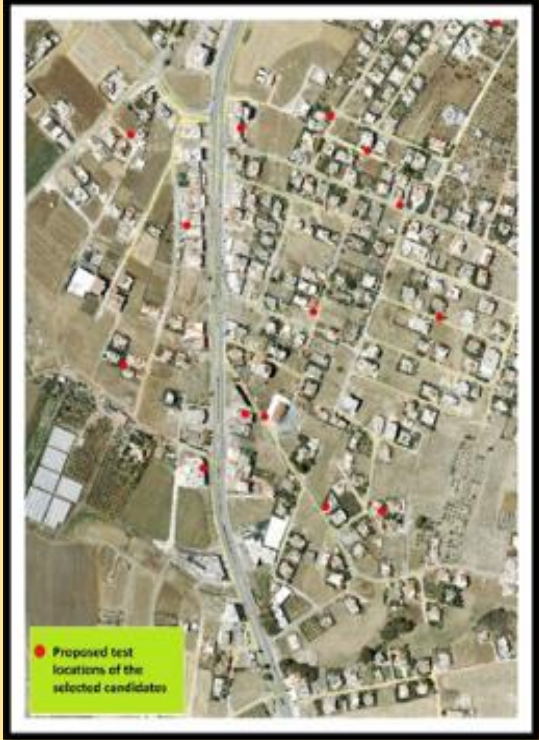
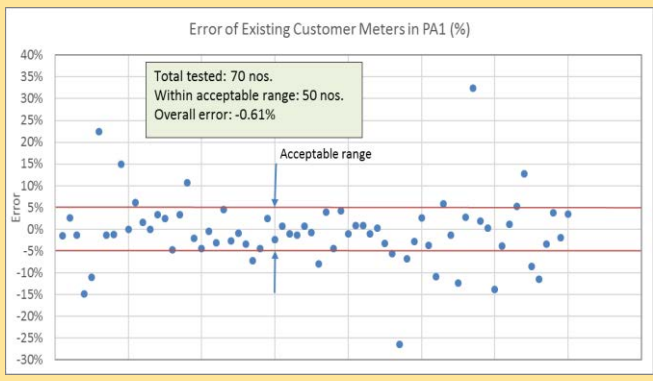
The customer water meters are used without any maintenance until they show the sign of malfunction. Thus, customer meters' accuracy has deteriorated greatly. Since, currently, ownership of the water meters is by the customers, it is the customers' responsibility to maintain the accuracy of their meters and there are difficulties for the Jenin Municipality to oversee the customer meter functions and maintenance. If the customer meter was, however, owned by the Jenin Municipality, it was the municipality's responsibility to maintain the meter accuracy. The Jenin Municipality is considering to create a checkup system for the existing customers' water meters regularly and has taken some steps towards this.

One step is that the Municipality has started residential meter accuracy check for the pilot area through the WaSIP project using portable test bench (which means no need of removing residential meters but check them at the site). Like the Sabah Alkheir area, where the meter accuracy check (for a sample 70 meters) showed that 50 of the 70 meters were in acceptable range of accuracy. However, the result may not be the same for areas with older water meters. The Municipality needs to conduct such survey in other part of the city as well especially in areas with older meters.

Installed portable test bench on site →



Result chart: 50 out of 70 checked meters in Sabah Alkheir were within the acceptable range of accuracy (the red lines)



Location of tested sample water meters (red dots)

Would you like to help?
1) Check your home water meter for accuracy.
2) Report any leakages or illegal connections in public water network to the Municipality.

We want to make it easy for you to Contact Us if you need more information on your city water supply. Here is how:

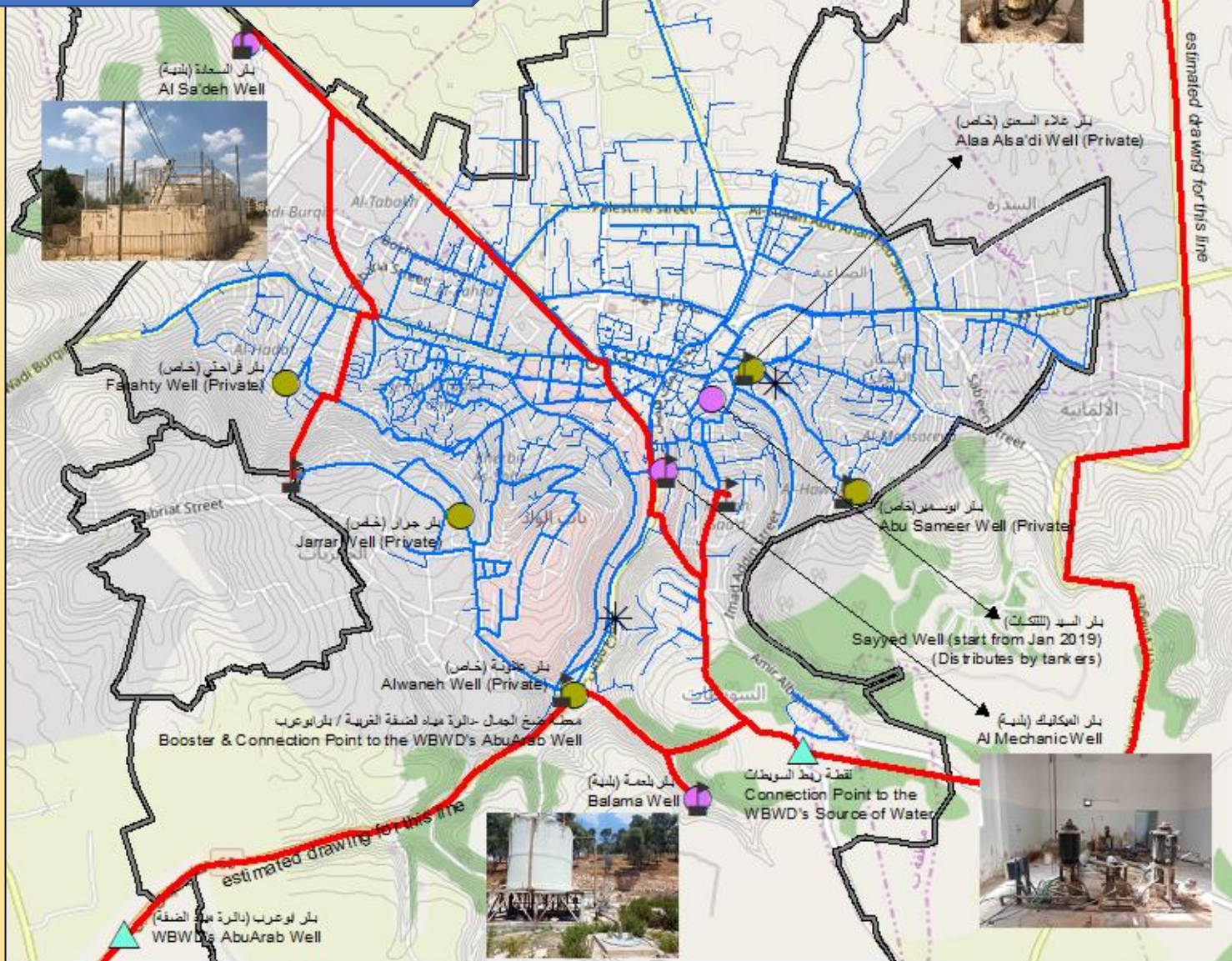
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Jenin City

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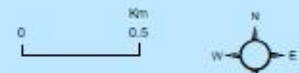
Your City Water Explained

PART (2) Operation System and Challenges



- Connection Point to WBWD's Water Source (4) نقطة ربط الجملة - دائرة مياه الضفة الغربية
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Operation System and the Challenges

The supply system is intermittent and cyclic in Jenin. The cycle does not cover a whole week. Therefore, the supply days are not always the same day of the week but variable. The frequency of supply is thus different in different parts of the city based on the allocated source and areas covered by the source.

In addition to the 60% of water loss (discussed above), there are other reasons that the Jenin Municipality has not been able to provide its customers with 24/7 water access.

1) The valves are not operated fully.

The water is distributed to areas by daily valve operation. Valves are operated manually twice a day in the morning at some well. There are 567 valves in the city. Some controlling valves are reportedly not working well (unable to be opened /closed or unable to be 100% opened /closed). The Municipality needs sufficient and secured fund to fix these valves and monitor their operation remotely. If the Municipality has fund for the SCADA system (remote control system) and fully working valves, there would be no need for the manual open/close of the valves and it can be done remotely.

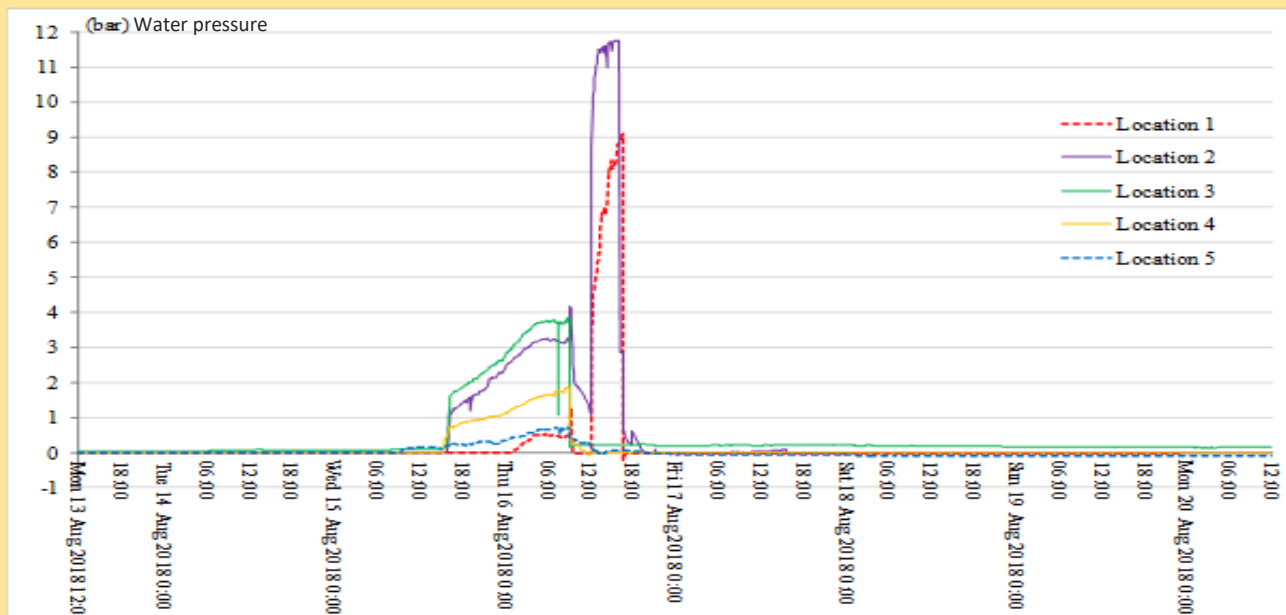
2) The source water has unstable flow.

For this reason, the distribution schedule set by the Jenin Municipality for customer's use is often not been able follow. As a result, most areas get water once or twice a week, of which duration varies from 1-2 days in summer to longer days in winter when the water demand decreases.

3) Unstable water pressure

Water pressure also has impact on the non-continues water supply to customers. There are areas with very high pressure and areas with very low pressure depending on the time, also different during the hours of the day or night. High pressure also is responsible for pipe bursts and water hammer.

Unstable water pressure chart: One of the Water Pressure Measurement Results Conducted in Pilot Area (near the camp) from 13th August to 20th August 2018; Zero water pressure in some days.



Currently the Jenin Municipality, with help of the WaSIP project, has installed a few new valves in pilot areas (in addition to bulk meters) and is conducting surveys on the existing valves conditions and their area of service, and also a survey on the water pressure by areas. These surveys will help the Jenin Municipality to assess the situation and the cost to fix the problem of pressure. If no fund is available from the Municipality, these survey results will help the Municipality look for other fund providers and to explain the situation.

Meter Reading and Bill Delivery and the Challenges



The water meter readings are done monthly by the meter readers, but they face several issues such as customers are absent or don't open the door, or the water meters are in hard-to-reach locations. The Jenin Municipality is facing several issues in the monthly task of water meter reading operation as follow:

1. Paper base procedure of meter reading recording and reporting, also billing takes too much time.
2. Possibility of human errors in recording the readings and entering data in the Municipality's customer database from the paper meter reading reports.
3. The reports of faulty meters or misused meter are not recorded on the database and often not noticed for taking actions. This makes a delay in the follow up or not even following up with the reader's reporting.

4. The billing process is separate from reading and is done after the reading data is collected. This consumes some days for preparing the bills (five days per month). The readers have to return and deliver the bills which means more time consuming.
5. Manual data entry of water meter reading in monthly bases which takes staff time (could otherwise be used for other tasks).
6. Cost of over 8,500 bill papers and printing every month and the time it takes.

To overcome these issues and to operate a more efficient meter reading and automated data entry of the collected readings and bills delivery, the Municipality has approved to use mobile meter reading and billing system (MBS) that can be integrated with the customer database on site and print the bills at the time of reading.

This system allows meter readers to read meters, do automatic billing calculation by the MBS device, print the bill, hand in the bill to customer, all on the site. This would save time and cost in operation of the reading and billing: annual saving of around 54,000 NIS (15,000 USD) and 294 net working days of the 4 employees of the Customer Service Section.

Would you like to help?

- 1) Let meter readers enter and read your water meters.
- 2) Relocate your water meter if it is hard-to-reach for readers to read.
- 3) Install a mailbox so bills can be placed in your mailbox if you are not home. This help avoid the bill to be fly away by wind and you thus miss the payment.

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Here is how:

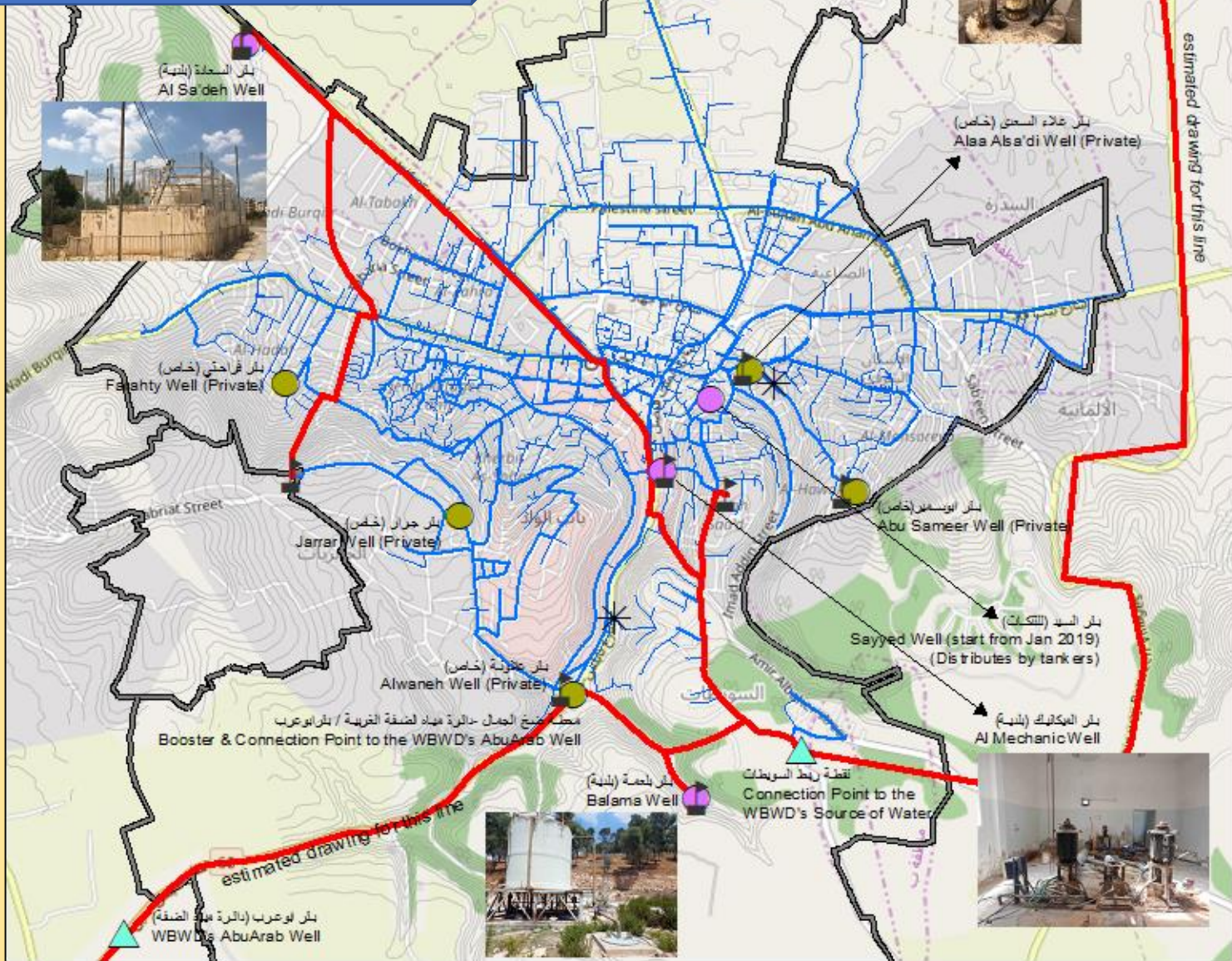
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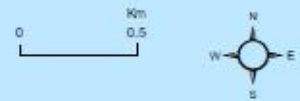
Your City Water Explained

PART (3)
**Low Customer
 Payment Rate and
 Municipality's Financial
 Challenges**



- نقطة ربط الجملة - دائرة مياه الضفة الغربية (4) Connection Point to WBWD's Water Source
- بئر دائرة مياه الضفة (1) WBWD Well
- بئر بلدية (4) Municipal Well
- بئر خاص (5) Private Well
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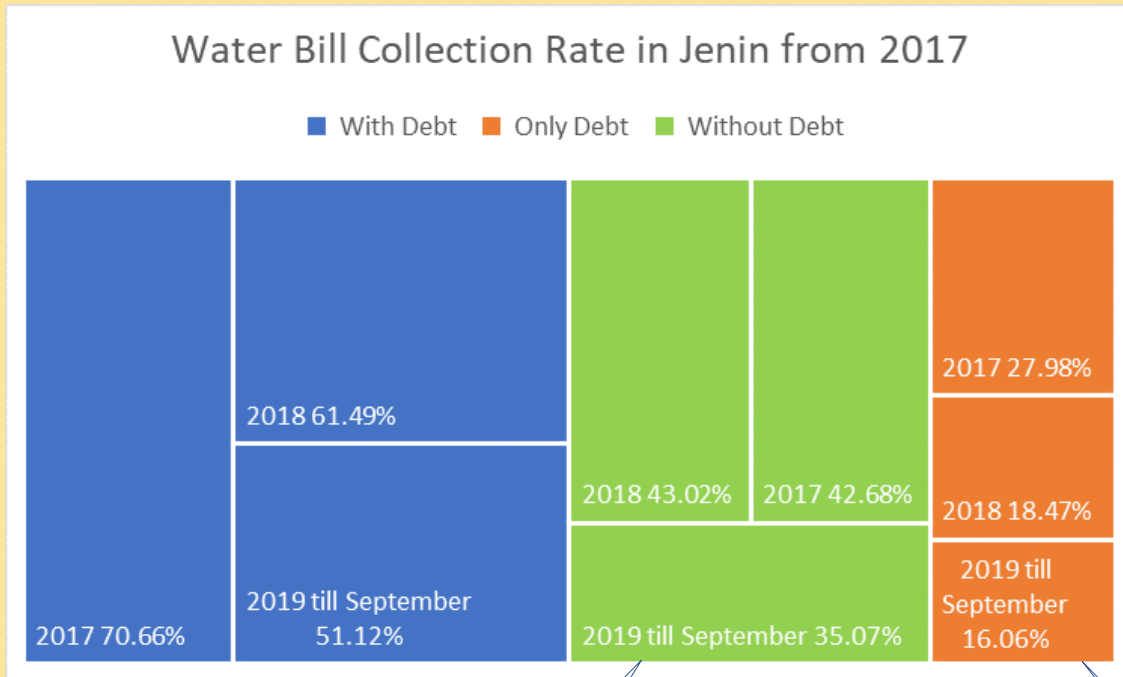
Part 4: How your drinking water is treated and monitored

Part 5: Customers questions and Municipality's answers; Q and A



Bill Collection Rate; many customers don't pay their water bills!

Water bill collection rates remain very low in Jenin City which affects the efficiency of the Municipality's water services in implementing the tasks assigned. The low collection rate causes the Municipality not to be able to cover its expenses and operational costs and continue to provide quality services to you as the water service customers.



The debt amount of the water customers is very high. Only a low percentage of the value of the consumed water in past months is paid off by the customers:

27.98% in 2017
 18.47% in 2018
 16.06% in 2019 (as of September)

As you see, less than half of the value of the JM's water consumed by the customers is paid off by the them:

42.68% in 2017
 43.02% in 2018
 35.07% in 2019 (as of September)

Financial Highlight: negative balance every year

The financial status of the Jenin Municipality in 2012 -2018 shows that the Water and Wastewater Department did not recover all of the expenses because many customers failed to pay their bills. Thus, the WWD could only cover an average of 56% of its expenses in the seven years. The expenses include staff salary, maintenance of pumps, water network maintenance, oil and motor fuel, etc. The water purchase cost from the WBWD has not been paid.

With negative balance all years, the WWD/JM could not spend much on spare parts, maintenance, expansion of water network, and equipment! But perhaps just be able to pay the salary of the WWD's staff!

Actions to Improve Financial Status; not enough if customers continue not paying!

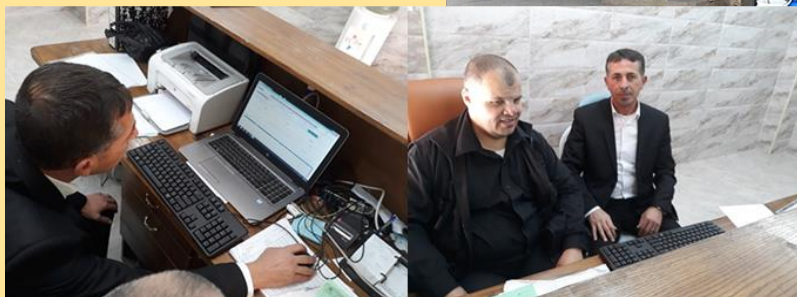
The municipality, with assistance of the WaSIP project, has taken some steps to improve its collection rate:

- 1) Recruitment preparation of full-time accountants
- 2) Motivation scheme for meter readers & collectors
- 3) Check water meters with zero/minimum reading; to bill the missed water use (in pilot areas)
- 4) Use of Palpay System for Bill Collection: The Palpay system transfers the payments immediately to the bank account of the Municipality. Customers can pay their water bills from any Palpay stations in Palestine. The advantage of this system was studied, and its introduction was approved by the Municipal Council in November 2018 and will start soon.
- 5) Refurbishment of the City Center (Sibat) Collection Office
- 6) Establishing of Collection Offices: The Haifa Street Collection Office
- 7) In pilot areas: Door visits of customers with 24/7 of fairly good water supply, and also high debtors to request for paying bills
- 8) Installation of Pre-paid water meters (PPWM)



Staff examining the zero/minimum meter reading

The WWD's staff is getting training using the customer database system at the refurbished City Center (Sibat) collection office.



Deficit of WWD (Revenue – Expenses)	
2012	- 2,586,714
2013	- 2,192,950
2014	- 3,107,821
2015	- 2,437,362
2016	- 2984,351
2017	- 1,785,323
2018	- 2,446,816
Total	-17,541,340

Please pay full amount of your bills to help WWD to have financial sources to provide you with improved better services.

Various reasons for the zero/minimum readings:

- 1) Meter does not work;
- 2) The stop valve before the meter is closed;
- 3) The house-owner is out of Palestine;
- 4) The reader read the meter wrongly;
- 5) The house is closed, and the reader cannot reach the meter;
- 6) Even connected, the customer does not use the Municipality water (used water taken from private well);
- 7) The water meter is not seen at the house though it is registered on the customer database system.



The WWD’s staff is receiving bill payment at the newly opened Haifa Street collection office.



In December 2018, the Municipal Council approved use of pre-paid water meters for three pilot areas in the city. The WaSIP project, delivered a total of 1,850 ultrasonic pre-paid water meters (PPWM) in February 2019. The installation of PPWM has been started in March 2019. The Municipality hopes that the introduction of PPWM will contribute to the improvement of bill collection ratio including the collection of debts from customers, as well as improving the accuracy of recorded water consumption in the customer database system (Al-Shamel.)

To read more about the PPWM project in Jenin’s pilot areas, please refer to the PPWM Booklet published by the Municipality.



Would you like to help?
Please pay off your water debt and pay your bills monthly!



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別冊資料 CD 1.5

**Your City Water Explained Part 1, 2 and 3 (for
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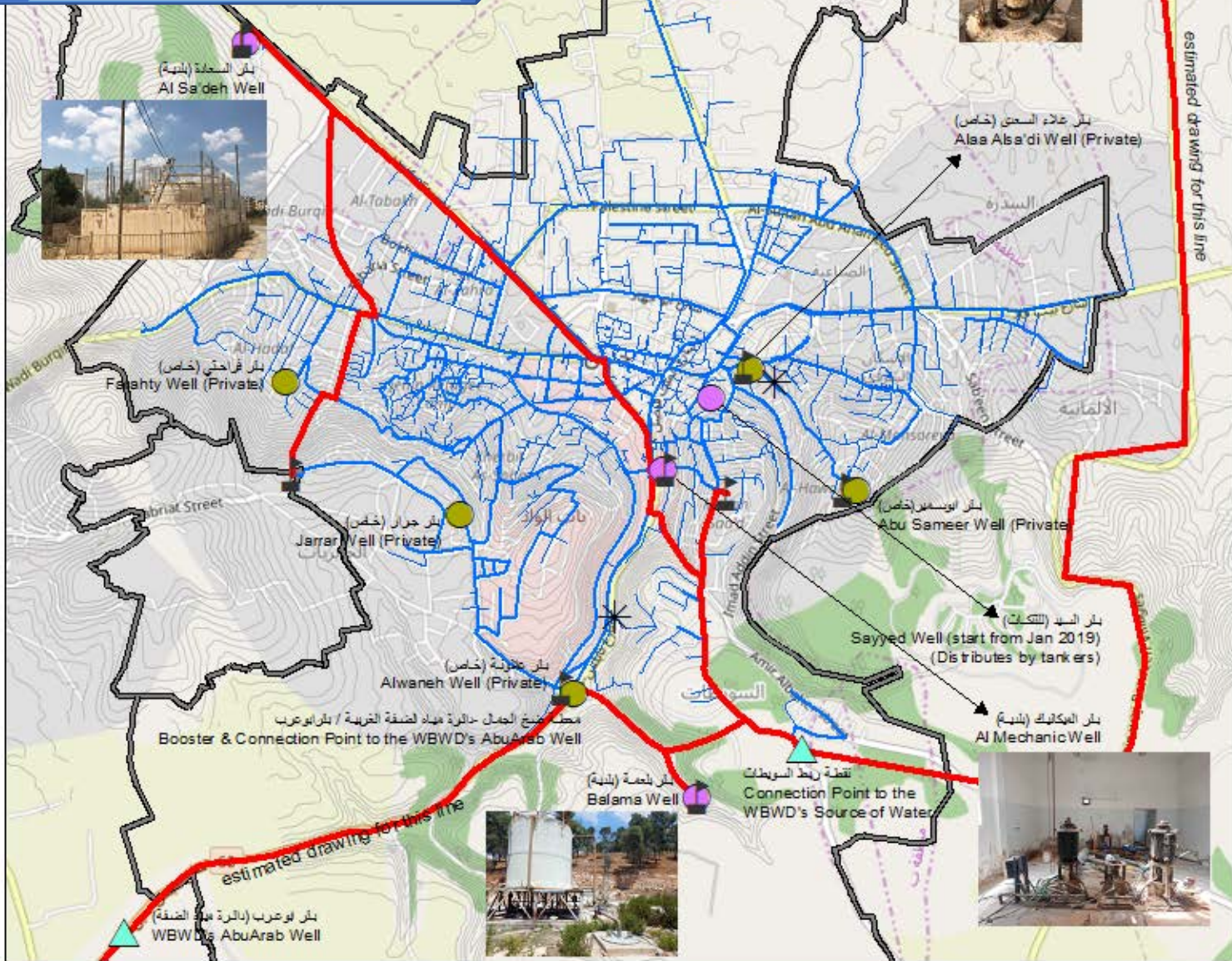
別冊資料 CD 1.5.2 Arabic Version

مدينة جنين

شبكة توزيع المياه في مدينة جنين

حول واقع المياه في مدينة جنين

الجزء اول (1)
توزيع المياه في المدينة
تواجهها



	نقطة ربط الجملة - دائرة مياه الضفة الغربية (4)		المحط الناقل الرئيسي
	بئر دائرة مياه الضفة الغربية (1)		المحط الرئيسي للتوزيع
	بئر بلدية (4)		المحط الفرعي للتوزيع
	بئر خاص (5)		حدود بلدية
	تحتات (11)		محط
			خطوط لكتون

مصادر المياه لمدينة جنين

Water Supply System in Jenin

في ال مهلك لمشترك ياه قجي في هينة نجين، أنفهم الهة الخدمة المهاي في هويتكيس لبللة شرة
لمشركين "قاع ال يافي هينة نجين" لتي أعته ا إدارة المي اموال صرف لاصحي (WWD) لطلب لعقبا لية
نجين - هيت عزم التوصل مع المشركين وشرح الخال مهاي في هينة نجين و لا خدم ات لتي يتقدم له لك
لمشرك ياه با ضلفة ال لتي هيات و ا جراك التيتخ ذلواضسين خ دامت ها .

كأحد ا جرات، قام بتبا لية نجين للتواصل لول ليل حال حصول على ال من اعدة عمل ليطس عي يين ائني وال لمي
لخصين خدمت ال ياه ال لخص بك وب من اعدة المي قبا لية في ال حكوم ائني لية (JICA) الهت عاون مع لطة
لمي اهل ل طبا لية (PWA) بدأ بتبا لية نجين مشروع aSIP/الهي أكتوبر 2017) مشروع عني زق ذرة إدارة
خدمت ال يافي لية نجين (وتأمل لخصين ال خدمت .

لك نبدون من لعقك و دعمك لمشركين قد تتم ك ذرة المي اموال صرف لاصحي من تقويم ال خدمت العية
ال ج و لقي بتقيست مع اه حت و لو كان ذلك مع ال من اعة ال لوي .

بتم نشر نشر هت هون جوية لمشركين حول وقاع المهاي في هينة نجين لفي أجزاء على ال ن حل لتي:

ال جزء 1: إمداتك المي وال ت هيات

ال جزء 2: ن ظالم لك غي لوال ت هيات

ال جزء 3: ان قاض م عد ل ف د ع المشركين لوت هيات الموية

ال جزء 4: لك في ت م م لجة هية الشرب ال لخرة بك و قري لته ا

ال جزء 5: كس لة ال ع و ا ج ل ا ن ل بل لية ؛ س و ال و ج و اب



تؤبربليبة عيبن لهي امللك ان من مصادر ملطف قبمطي لئك بار لئبلعة له ا بهار لل لعادة والعللكنرلك وبلع مة(، ومن بار لئلصة داخل حدود الللبلبة لئلزل فراسي وع نه ومع مر جرار) ومن لئلارج بهركة لهلك اروت (عن طويق اللملجمه والس ي طاب تب فلة لئى اءارة ه ياه لظرفه لا غربيه عن طويق ن طقاتص الالبو عرب.

نظام امداد له ياه

نظام ا داد من لنوع لم طظط؛ يلكون لئك عن طويق لاج لنيه وعن طويق للضخ، عي شيم كنق قسريم علبي فلاض نمي مينة عيبن لئى ن وعيبن؛ مض خات مصادر له ياه ومض خ ائلل وتو ري ع. نئلقل له ياه منب عض لامص ادر لئى لئزل انئلم توز عبللاج لنيه. لئى سويل اللئلل نئلقل له ياه منبئلر لل لعادة لئى خزلل لئلبلبلات وللمراسل مئلل متو ري عها عن طويق لاج لنيه قبيب عض لامص ادر (ئلل ان قلة اللملجمه) عيتم خزن له ياهي خزلل ائلص غرب حجم 50 م 3 (تزويده اللئيك قبيب عض لامص ادر خرى) نئل بلبار فراسي وجرار (يتم غني نئللكن في لتو ري ع بهشرة، قبيب عض لموط ع خرى عيتم لمئلخ داخل اض خ لئى لئل طو ط لئى اءقن ع ط له ياه.

ه ياه شرب شبكة ان بوب لئلض لئى اللئلقل قب ها.

الم عدن للصل رب اسود وللمنن مم الممواد لمئلخ مئل نئلبل لئلوي قبي مينة عيبن، لوق بهدا مؤخر المئلخ دام HDPE نئلبل ا فيه للسوداء وه ي عارة عن م طلل يه ي بملنن من لئداخل ق طرار لئل فحم من لئلارج بلللبل قئل نئلبل فر ع ه ي له يلبى GI و PVC وه ي لمئغ ه من لئلارج.

عيلغ لئلول جملة ي لشبكة نئلبل يه في عام 2018 حولي 150 كبل طار ملطفه من 8 بوصلات لئى 0.5 بوصله بمبئاء حولي 70٪ من شبكة له يلبى لئلقل لوئل وتو ري لئلوي قبي لممئ عيبن عامي 2000 و 2010، وه ي خطوط جيهه نئيًا. ومع لئلك نجلدر اشارة لئى ان له يلبى لتو ري لئلقل لمئل م لا عاؤ ه لئم ا؛ عيئ ان م عظم اللئلل نئلبلن ما زلوا ي اءون له ياه من خطوط نئلبل لئل قيم قسيب لئل قلص له ي زلبل قئل ع ط ا ع المئلصول لئلازل لئى لئلخطوط اللجيهه. و مذلئ عري اضمال اءوئلش سبب لئلر قسيب مة لئلخطوط لئيهه.

مصا در له ياهي مينة عيبن مئل مللك امل. عيئ مئل قيا س جي ع كئيات له ياه لئى عيتم تو ري هه من الللبله ولئى عيتم مشراؤ هه من بلار خصه، اؤيتم ملبيير اءهه من مورء خارجي بكئيا لئلر قل قه مئلر لئل عءاااا لاج لئيهه اللئلقل لئيهه مع له يلبى لئلجع ولمص ب و مئلض من قه لئل سلا كئيهه له ياه لمحم لئى قئيشبكة له ياه بللممئ ع بئوق ومبلييهه عيئ بس اءهه ضراء مئللكا (شروع WaSIP) بمرقه عءاااا مة لمصا در بئلنظام.

ومع لئك، فلك لعويء من للمش ن لئلقل قبن نظام شبكة له ياهي لمينه:

1) عءم قو في شبكة له ياه للبعض اءزاء لمينه

من اللئلقل اني زءاء عءء اللئلر لئى رئلئ دي عي، ان اللئلقله للسلفي قلئتو س ع ام بلعء عام، لك ما ان للمئلل لم نخر صة للئلقل اؤ ا غراض للئج ائ قلئللئ بئلضًا. نئل طي ع اسرفي اللئلقله لللجيهه للوصول لئى خطوط لتو ري ع اللئلقل قسيب عءم مئلئد خطوط لتو ري ع جيهه قئلوم مة سرب بعماء لئى مورء خاص اؤ عن طويق للملك اءلك ان لئى مئلر خاص.

2) بقل اء ببعض له ياهي جي ع نءاع شبكة له ياه لعامة

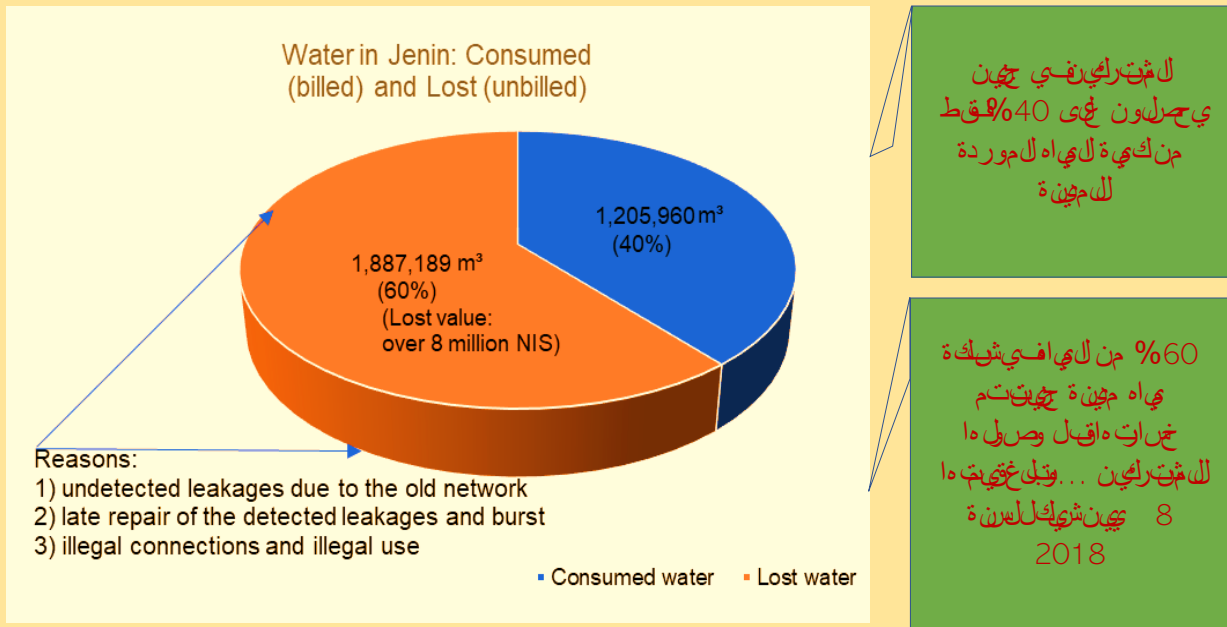
ب فلة لئى لئللاج لئى لئو سوري عئلكه له ياه نئل عيبن من نئلوف اعءم وتو ق اءان له ياهي جي ع نءاع لشبكة لئللقل قئل و صوله الئى لئلر لئلن. و مذلئ ممبى له ياه لئلر مئلر اؤ فلل له ياه (NRW) ممبئ عري ان بللبيهه عيبن لئيهه انئلغ عئمن مة له ياه لئلكن يئم اءا ر قلئل و رقه اللئلر لئلن يئم ارجاع لللفه لئى لللبيهه. لئله اءء سباب لئى نءواج هه بللبيهه عيبن وتبب له ص عبهه للئى قئ سحريبن خءمك و لئو سوري عئلكه له ياه ولللفاظ لئى نظام له ياه ولا خءماا لئلللبن كائل قللا اءان له ياه 44 نئب عام 2017 و 49 نئب عام 2016.

في عام 2018، من خ ل مشروع WaSIP، ق ام بئلبيهه عيبن قئيا س اللئلل عتبقة و وءء ان كئيهه قللا اءان له ياه كئلل اءئى عيئ قللا لئيههه 12،581 نئلر للبعب من له ياه الئلل و نئلر من اءملل لئل و نئلر 150 لئلل و نئلر من لشبكة له ياه. و مذلئ عري ان 60٪ من له ياه للملمهه لئى

للتيك توفيق بتلك دكان م عدل لخرارة أخرى من لاعامين للمضيين، مما يجرى أن لخرارفي ازباد، أو بمل كان تكبسبب قوة لليلات لليلات التي أحيى في 2018.

يمكن أن تكون لمب ابلتو اع تيب قة لماء (NRW) هي 1) تسويات غير مكثف بسبب التيك لقيام، 2) اصح بناخر للتسرب، 3) وصت غير فان وية أوليت خدمات غير فان وية) أي لبتخدام مياه للتسرب من أجل للزراعة أو غير ه من شطة بولسطة وصلة غير فان وية).

نتخذ لليلية إجراء اتل لحد من هذه لخرارفي للين وائل ق ادم. لخرى سيول البهاك بولسطة 1) التشفاف لوص تل لخر لقرن وية، 2) (اصح للتسويات بليت خدمات عرض دوات لاجيدة، 3) (تدي بلطويين لعي لقيشة التشفاف للتسويات تشك كل صحت بليت خدام هذه دوات، 4) لست للتسويات في أصر قة ممكن، 4) للحث عن التمويل سبتبدال التيك اتل ق يمة بت في ذ إجراءات 2 و3 هي شروع WaSIP في عرض فاطق للشروع للتحجوية.



3) خرفي دق قبعض عدادات مياه للشتريين

لخرى لدرغم من أن كل المياه للمحلفي للتيك هي تمقي لراه بولسطة عدادات لاجمة عدل لمص ادر وقياس سبته لكل للي بولسطة عدادات المياه للخص قبل للشتريين هل يتصريف قوة عدادات للشتريين لخرى أنه تخفضة (بلن اذا لى للصور للمبني لوكنها لخر مدعومة بولسطة أي من عدادات اعتبار).

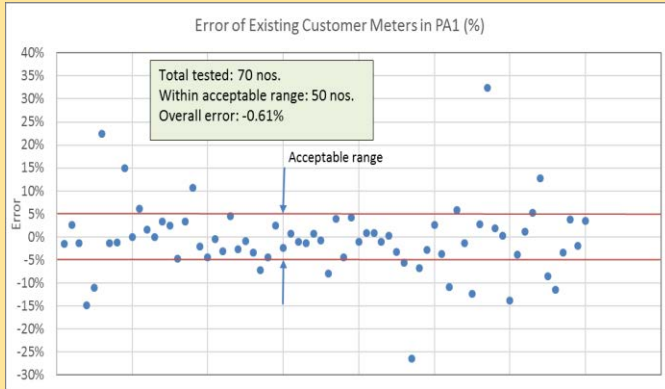
يتم بليتخدام عدادات مياه للشتريين دون أي صيول قنح تظهر عة لخرى وجود لخل. ولتلاي تم مورت قوة عدادات للشتريين تشك لخرين. نظرًا ن لمية عدادات المياه حللي لتبع ذلك للشتريين فمن مسؤوليتهم للفاظ لخرى قوة عدادهم ب اضفلة لى أن قلالخص عبات لخرى بليية بيبرفي اشرف لخرى عدادات للشتريين وصيكتها. لكن إذا كان عداد للشتريين لم يولك من قبل بليية بيبرفي يكون من مسؤوليية لليلية للفاظ لخرى قة للاعدادت ك ريلية بيبرفي رشاء عن ظلم فحص عدادات مياه للشتريين للحيين بليتظام وبتكذب عرض الخطوات لتجقيق لك.

إحدى لخطوات هي أن لليلية قدا تيبف فحص قوة عدادات للشتريين للين قة للتحجوية من خ ل شروع WaSIP بليتخدام نصرة اعتبار م حمولة) مملي لخرى عدم لاجة لى إزالة للاعدادات لل ليلية لوكن للتحقق من طهي للموقع). نملن طقة صباح لخر، حيث أظهر فحص قة للاعداد (ل 70 عنة) أن 50 عداد من أصل 70 عدل كل تيبين طاق مقبول من القة. ومع ذلك، قد تكون الليلية هي نفس هب للليلة للناطق لليبها عدادات في اقيية بتضاج لليلية لى إجراء نمل هذا لسخفي جزء آخر من المينة وكنق لفي لفاطق لليبها عدادات لدم.

نقصه اختبار محمول لفحص
→ قة لعداد



البيجة: 50 عينة من أصل 70 عينة
تفحصت في منطقة صباح الخير
لكل بضمن نطاق لاقة في قبول.
الخطوط ذات اللون حمراء



Location of tested sample water
meters (red dots)

هل تريد المساعدة؟

- 1) فلحصول قة لعداد لخاص بك
- 2) قم بإخبار البلدية إذا حظت أي تسرب أو أي وصلة غير سليمة في شبكة المياه العامة

لمزيد من المعلومات وتفاصيل حول هذا الموضوع يرجى التواصل من خلال الطرق التالية:

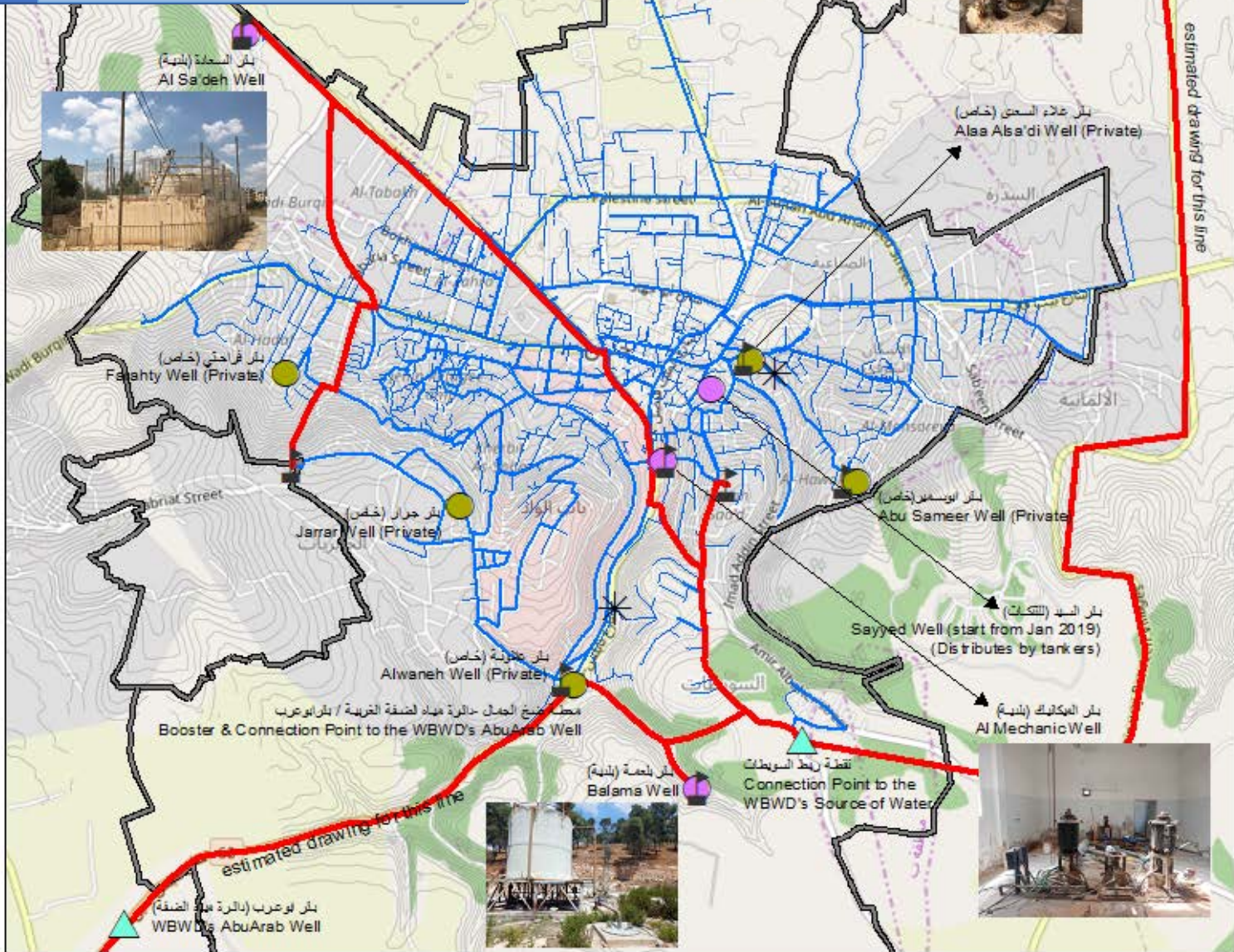
- 1) للتواصل مع نظارة المياه وإصريف الصحي تولى الرقم 04-2502023.
- 2) زيارة موقع البلدية أو مستشفى أو بلدية تطبيق لدراسة أن ينطبق عليك أو من خلال الرابط التالي <https://www.jenin.city/>
- 3) للتواصل من خلال وسائل التواصل الاجتماعي على فيس بوك <https://www.facebook.com/JeninMunicipality/>

مدينة جنين

شركة قوضي حمل للمشاريع

حول واقع المياه في مدينة جنين

الجزء 2 نظام الشبكات لخطوط مياه



estimated drawing for this line

estimated drawing for this line

	نقطة ربط الجلمة - دائرة مياه الضفة الغربية (4)	Connection Point to WBWD's Water Source
	بئر دائرة مياه الضفة (1)	WBWD Well
	بئر بلدية (4)	Municipal Well
	بئر خاص (5)	Private Well
	تنتكات (11)	Tanks
	الخط الناقل	Main Transmission
	الخط الرئيسي	Main Distribution
	الخط الفرعي	Distribution Line
	حدود بلدية	City Boundary
	Booster	
	خطوط لكتون	Contour Lines

مصادر المياه لمدينة جنين

Water Supply System in Jenin

0 Km 0.5

في ال مهلك لمشترك ياه قجي في هينة نجين، أنفهم الحمة الخدمة المهاي في هويتك بس لسلقة شرة لمشركين "قاع المهاي هينة نجين" لتي أعتها إدارة الماي اموال صرف لاصحي (WWD) لطلب اعقابهية نجين - حيت تعزم التواصل مع المشركين وشرح الحماي المهاي في هينة نجين ولا خدمت لتي يتقدم له لك لمشترك ياه با ضلفة الى لتجيات وا جراعت التي تحت خدمت لتي يتقدم له.

كأحد ا جراعات، قام بتباليهية نجين لتواصل لولي الحصول على الامعاة عمل لطي عيين ائي واللماي لخصين خدمت المهاي لخص بك وبمعاة الماي وقبرية في الحكوم ائي يكيية (JICA) الهتعاون مع لطة الماي اهل لطيية (PWA) مابتباليهية نجين شروع aSIP/الهي أكتوبر 2017) شروع وعزيزي قدرة إدارة خدمت المهاي لطيية نجين (وتامل لخصين) الخدمات.

لكن بدون س لعتكم ودمكم لمشركين قد تتم كندائرة الماي اموال صرف لاصحي من تقويم الخدمات العية الجولق لتتيسر تحوحت لوك ان ذلك مع الامعاة اللوية.

بتم نشر نشر هونجوية لمشركين حول وقاع المهاي في هينة نجين في اجزاء عل لالنح لتي:

الجزء 1: إمداتك الماي لهال تحيات

الجزء 2: نظام لتغريل ولتحيات

الجزء 3: انقراض مع دلفدع المشركين لوقت تحيات المايية

الجزء 4: كي في تم مغلحة هيا الشرب الخصة بك وقبريتها

الجزء 5: كسئلة العاء واجد التبلدية؛ سؤال وجواب



نظام التشغيل والتحكم

يتم تشغيل نظام ضخ المياه في بلدية عين بكنة (نقطة) غير متصلة بشبكة المياه لدراسة كفاءة التشغيل وتغطية لموضوع أكمام نظراً لطبيعة الضخ غير المتواصل؛ ويتطلب تشغيل تلك المعدات أيام لتتضمن الضخ لهما وذلك إذا سمة للتغيير. ومن الجدير بالذكر أن وضع التزويد بالمياه في أوقات معينة في ظل فترات عدم مصدر المياه لخصيص وللمنطقة التي يغنيها.

ب- فلة لدى نيب قود المياه لتتصل لى 60% كم تم في وقت سابق (تواجه بلدية عين بكنة أخرى توقف علقاً أمام تزويد الشبكاتين بالمياه لمدة 24 ساعة في مدار سبوع.

1) عدم تشغيل المحبس بشكل كامل.

يتطلب تشغيل المياه في المناطق من خلال التشغيل في يوم للمجلس فسيبعض باريت تشغيل المحبس من خلال فتحها أو إغلاقها بشكل يدوي ولم يكن خالفاً لمتطلبات الصيانة. ومن الجدير بالذكر أن للمدينة 567 محبس؛ إن بعضاً منها يعمل بشكل جيد أي يمكن إغراقها / فتحها بشكل جيد أو كالمثل في حد السواء. وفيما يخص الحاجة للبيدة إلى توفير للمحسب اللغلي لتغطي لتتلقى لمسح هذه المحبس وتبعية لية تشغيلها عن بُعد؛ في حال تمكن للبيدة من توفير للمحسب اللغلي لنظام SCADA (نظام التحكم للصناعي) وضمان تشغيل المحبس بشكل كامل للمركون وذلك حال فتحها وإغلاقها عبر عداد.

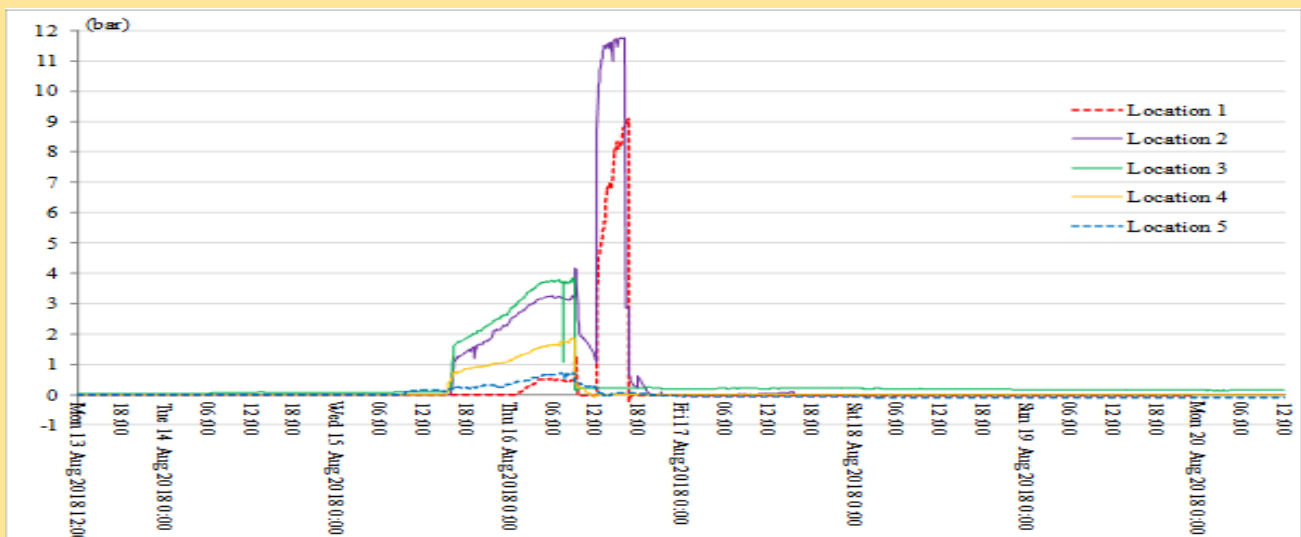
2) الانتاجية لتغيير رقمي صنادير المياه.

نتيجة لعدم تشغيل النظام للكثبات التي تحتاج من صنادير المياه التي لا يمكن من قبل البلدية عين بكنة؛ وفيما إن أغلب المناطق تزود بالمياه مرة أو مرتين في اسبوع لفترة زمنية تتراوح من 1-2 يوم وفي فصل الصيف وإلى عدة أيام في فصل الشتاء نظراً نقصاً للطب في المياه.

3) ضغط وخطوط المياه لتغيير رقمي الشبكة.

تتسبب ضغط وخطوط المياه التي تم في المياه التي تقع في تلك المناطق ذات ضغط مرتفعة وأخرى ذات ضغط منخفض تتسبب في حدوث الحصر المصنوع أو شتاءاً (وساعات للتزود للمياه مع التقدي بأن الضغطات المنخفضة تتسبب ظاهرة المطرقة المائية water hammer) وتؤدي إلى تلف خطوط.

رسم توضيحي عن ضغط وخطوط المياه التي تم في الشبكة: يتلخص في اس الضغطات المنخفضة في الدراسة كالتالي من المخطط (وليك خالفاً للفترة المحددة من 13-20 آب-2018: قد أظهرت النتائج عدم وجود ضغطات في الشبكة في بعض الأيام.



ضغط خطوط المياه

حيث أنّ امتدادية مبيدات الآفات مع شروعات عمليّة إدارة خدمة المياه (WaSIP) (التي تمّ إنشاؤها من قبل مجلس البلديّة وخدمات البلديّة) bulk meters) في مناطق الدريلة. من ناحية أخرى، تنبغي ملاحظة أنّ مجلس البلديّة من خلال فحص حالتها وتجهيزها في مناطق التي تستخدمها؛ فقد تفرقت هذه المساحات مع مخاطر سوء صيانة المياه للشبكة التي سيؤدي إلى سوء تقييم وضع مجلس البلديّة بوجوده في الشبكة وتكاليفه. من ناحية أخرى، فإنّ عدم توفير التجهيزات للماء من قبل البلديّة؛ سيؤثر على تنفيذ هذه المهمات للبلديّة التي يجب أن تكون واضحة ووضع الشبكة على ما.

قراءة الأعداد وتوزيع الميترات والتحيزات



يقوم فريق الأعداد بأخذ قراءات عدادات المياه المباشرة التي هي؛ أن ذلك عدة عقب انتفاخ عداد الخ ل عملها لقراءة؛ نقل: عدم توافر الميترات في المنزل أو فصل الميترات من فتحات أبواب المنازل أو توافر العدادات كما ينبغي الوصول إلى هياكل مبيدات الآفات عملياً لا يمكن من ذلك بل الخ ل عملها لقراءة الأعداد للشبكة كالتالي:

1. إجراء التصحيحات التي تتطلبها الكتل من تسجيل القراءات والعدادات الجديدة فلهذا عملها للتصحيحات - التصحيحات التي تتطلب وقتاً طويلاً.
2. إصلاح الأخطاء التي تتطلبها القراءات التي تم تسجيلها في وقتها، مع إدخالها في قاعدة بيانات الميترات التي هي للبلديّة.
3. عدم تسجيل القراءات التي تم أخذها قبل القراءات التي تم أخذها، بل يتم استخدامها في وقتها، مع عدم أخذها إجراءات العمل لسهولة الوصول إليها؛ في حال الحاجة إلى إصلاحها؛ التي يمكن إصلاحها أو تصحيحها أو تصحيحها في وقتها، مع عدم تبليغها في وقتها.
4. تكفون عملها لقراءة في منزلها، مع عملها للتصحيحات التي تتطلبها؛ نتهاء من جميع الإجراءات؛ كما أنّ عملها للتصحيحات التي تتطلبها في وقتها، مع العمل عليها في وقتها؛ الذي يحتاج إلى مزيد من الوقت.

5. ادخال قرارات عدادات التي امشك لي دوي وشهري؛ ا ر الذي بيتن زف وبتغلر ادوسم خدمات لثتريكين الذي يلمن ان ويبتغلفي لجاز مهام اخرى.

6. تصليتلغفة مواد لطباعة لامتخدمة (أوراق، صر) لى 8500 شيكل لثهر عدا أن علية تنوير هلتصاج الى لوقت.

لكن يوب يوى هذه لشحك توضع افعلقي قش غيل قرارات لعدادات لتيتم جمعها وإدخاله لشركلي للكتروني وسسة التي قنوي لوف يوي، فياق تملية يمين يوى لبتخدمن ظالمطورة لامتخدمة (MBS) الذي يلمن بطة معقاع دقيقات لثتريكين خ للتواج في موقع ل عمل وطباع لوف يوي في قن لقرارة.

يلمن نظام لطورة لامتخدمة (MBS) قارى لعداد من زني في ذل عيدي من له افيل لمق يبق قرارة لعدادات واضساب لبيري بشركلي للكتروني وطباع لوف يوي، ماماسيس اعد يوي قنوي لوقت ولللغفة ل زمة دارق قرارات لوف يوي رفمن خ ل لبتخدمن ظالمطورة لامتخدمة (MBS) يعل غمق دارل لتوير للونوي 54000 شيكل (15000 ر) أمبالنظ لمددة لز يي قسيت متوير 294 يوم عمل من يام 4 وموظفين من قسم خدمات لثتريكين.

هل أت يوى لبتعدا لثق ييم لامن اعدة؟

- 1) لسم اح ل قارى لعداد دخول لمييتك قرارة لعداد لاصيبك.
- 2) رقل لمكان لعدادات لتي يصعب يوى ل قارى لوصول لليها.
- 3) تريك بصن دوق بريد ععدال لزل لمي شيتيم وضع لبيير داخل لهن دوق في حال عدمت واجد لثتريكين ل لزل.
- 4) من خ لتريك بصن دوق سيت مت خ بفق دان لبيير أوضياع هاتي جة للي اح ل لتالي تخب عدم لافع من قبل لثتريكين.

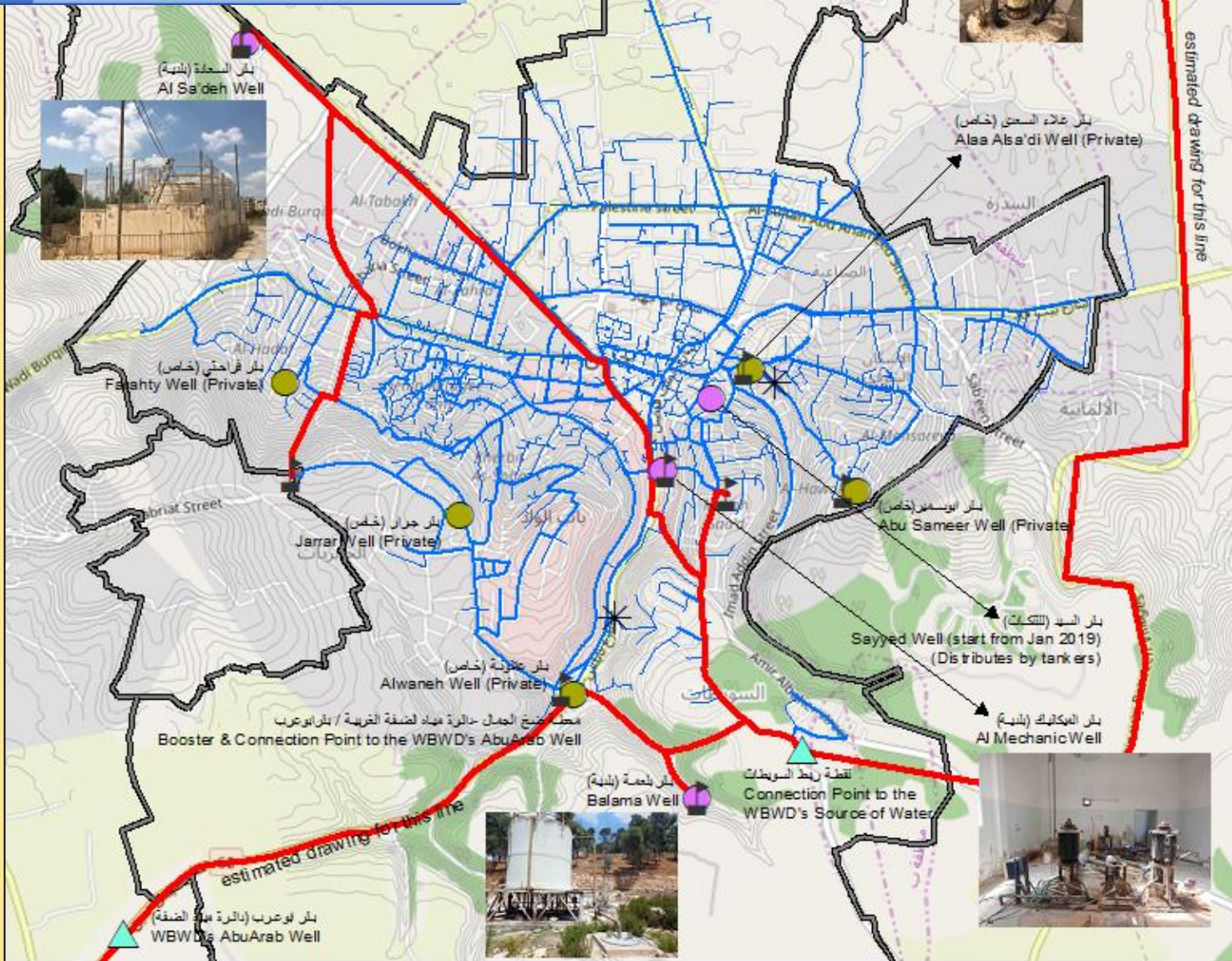
لم يدي من لعمومات بؤلف لصيل حول ص ادر له افيل مييتك يي رجي لتوصل من خ ل لطرق لتالي:

- 1) لتواصل مع نظرة لهياه لاصرف لاصحي يوى لرقم 04-2502023.
- 2) فيارة موقع لليي نل سفسار ولبت خدمت طيق لدرشة أون ين توقيم لك اوى من خ ل لربط لتالي <https://www.jenin.city/>
- 3) لتواصل من خ ل وسطا لصفحة لليية يعل لفي بوك <https://www.facebook.com/JeninMunicipality/>

مدينة جنين

نشر تقاضي حياكل تركين
حول واقع المياه في مدينة جنين

الرج الثالث
القباض مع عدل لطفاع
تلهم تركين وتيجات الوضع
المالي للهدية



estimated drawing for this line

estimated drawing for this line

<ul style="list-style-type: none"> Connection Point to WBWD's Water Source (4) نقطة ربط الجملة - دائرة مياه الضفة الغربية WBWD Well (1) بئر دائرة مياه الضفة Municipal Well (4) بئر بلدية Private Well (5) بئر خاص Tanks (11) تكتات 	<ul style="list-style-type: none"> Main Transmission الخط الناقل Main Distribution الخط الرئيسي Distribution Line الخط الفرعي City Boundary حدود بلدية Booster Contour Lines خطوط لكتور 	<h3>مصادر المياه لمدينة جنين</h3> <h4>Water Supply System in Jenin</h4> <p>0 Km 0.5</p>
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من المهم لك كمشترك في او مقيمي في مينة جينز، لتفهم حلالة خذمة الطي في مينة جينز. لوسل قشرة مشتركين و"اقعالي افي مينة جينز" - التي أعنتها إدارة الياه الى صرفل صحي (WWD) لتبلغ بلبلية جينز - حيثت عزل مواصل معاشتركين وشرح حلالة افي مينة جينز ولا خذمة التي تقدمها لك مشترك في اها اليل حديت وا راءات التي خذمتك حرين خذمتها.

كأحد راءات قامت بلية جينز بالتواصل وليلل حصول على المساعدة على الصعي طين في المالمالي تحرين خذمة الياه ال خصت بك. بومس اعدة م الية وتقوية منزل حك واليهي ابليية (JICA) بوالك عاون مع لطة الياه لفس طيية (PWA) بلت بليية جينز مشروع WaSIP في أكتوبر 2017) مشروعت عزي قدرة إدارة خذمة الياه في لية جينز (تألفت حرين ال خذمة).

لك بدون مساعيتك ودعمك كمشتركين قد تمكّن طارة الياه الى صرفل صحي من تقوي مالم خذمة الية ال جودتالي تستحقها ضيلوكان لك مغل مساعدة الولى.

يتفشر نشر وتوضي لعل مشتركين حلي واقعالي افي مينة جينز في أجزاء لعل الن ح وائلالي:

الجزء 1: إمدادات الياه التي وتاحديت

الجزء 2: ن ظلماش غيل والتجديت

الجزء 3: ان خفاض معدل فاع لوش وكين لوت حديت لاهية

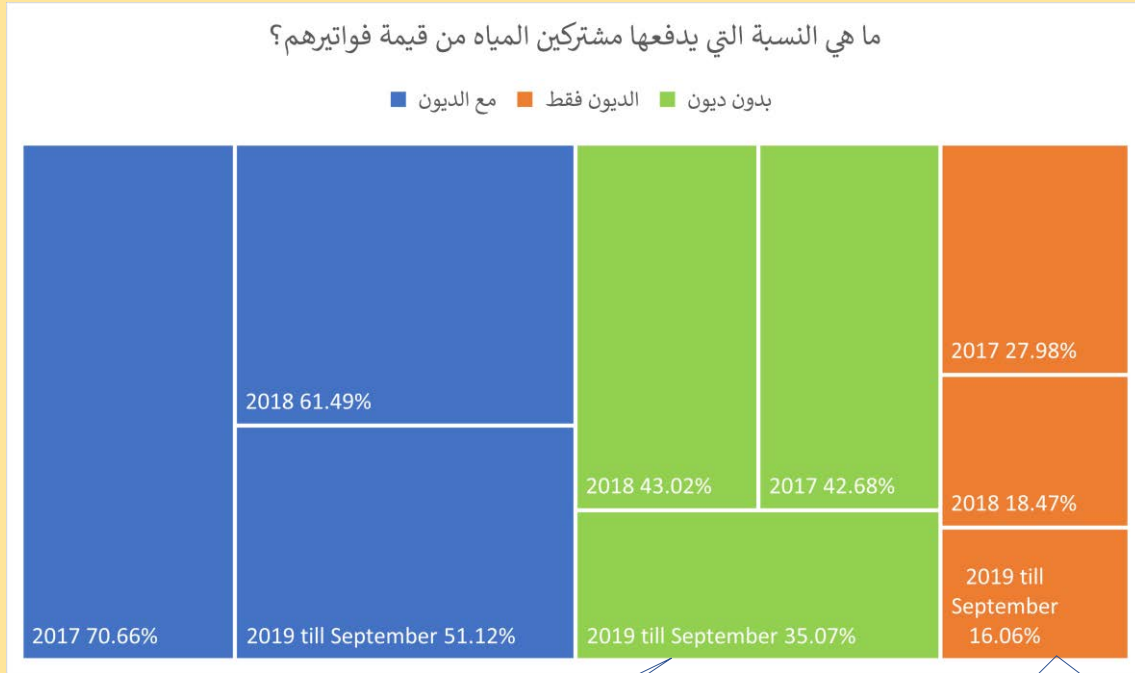
الجزء 4: لفي في م م ع الجة في الماشربال خاصت بك ومرقتها

الجزء 5 أسؤل ال ع و إجابات اللهدية؛ سؤل وجواب



مع دلل الجبليّة، لا عود من لمشركين ي قومون دفع غبوي رلامياه لومت حقة لعي دم!

تزال م تمتح صريف بوير لياه تخفض لقل غبوي مينة جين م ما يشرعل بكفاءة خدمات لياه ال ق دمل مشركين ويشر على اعلى تنفيذ لم هام ال طول ة لياه من صريّة و اعادت أي للشبكة و غير ه ا بيؤدي لقصاص م عدل التحصيل إلى عدم قدرة الجبليّة على تغطي قنوتها والبنق ات الش عطيّة وواصلت ققيم خدمات ال حال جود ذلك لمشركين ياه.



كما ترون فإن أقل من نصف قيمة مياه بلدية جنين التي يتم استهلاكها من قبل المشتركين يتم دفعها:
 42.68 % في عام 2017
 43.02 % في عام 2018
 35.07 % في عام 2019 (حتى شهر سبتمبر)

كمية الديون لمشركين المياه عالية جدا. يتم دفع نسبة مئوية منخفضة فقط من قيمة المياه المستهلكة في الأشهر الماضية من قبل المشتركين:
 27.98 % في عام 2017
 18.47 % في عام 2018
 16.06 % في عام 2019 (حتى شهر سبتمبر)

مع الرصيد السلبي طوال السنوات، لم تستطع دائرة المياه والصرف الصحي إنفاق الكثير على قطع الغيار والصيانة وتوسيع شبكة المياه والمعدات! لكن ربما تكون قادرة فقط على دفع رواتب موظفي الدائرة!

لوضع لمديفي بلديّة جين: رصي دسليبي كاسنة

يوضح الوضع الال لبلديّة جين فلي فنترة ملين 2012-2018 أن نظرة لياه وال صرف الصرحي لمتمكن من تغطي قنوتها نبعض مشركين لياه ليتها زمون بيف بوير هم، حيث غطت ما عدله 56% نقط مرفنتقها ال علق قب خدمه لياه افيل سن و اتال سوب عل ماضي ة بتشمل المصروفات روتب الموظفین و شراء لياه و صريّة لخصات و صريّة تشيكات لياه او الزوت و قودال محركات و سدال بيوزال سريقة ال عسل لياه و م ال ذلك. و هذا يبي أن كلفه شراء لياه من نظرة ال عصف ال غري قل جيت مس داد ه.

اجراءات التحسين لوضع لملاي: لمصر وايضا في مصر وايضا في مصر
اذلت مبرر لامتلاك كون بعتن اع هم عن ف عتت ي ر هم!

الاجزاء المليفى نظرة لمي اوال صرف الصحي (الاعواند - المليف)	
2012	- 2,586,714
2013	- 2,192,950
2014	- 3,107,821
2015	- 2,437,362
2016	- 2984,351
2017	- 1,785,323
2018	- 2,446,816
لمجموع	-17,541,340

قامت الطيبي بمساعده مشروع WaSIP بمسك انبعض الخطوات لتحسين معدل تحصيل الالف بغير لمي ايه:

- 1) توظيف حاسبيين بنوام ك امل.
- 2) نظام الحفل لقرء العدادات والجهاه.
- 3) التحقق من عدادات لمي ايه من قراءه نظريه /الحد نى لفوتره لمي ايه التي لمي غوت ها من قبل فسي فاطول لدراسة)
- 4) استخدا من نظام Palpay لتحريه لظهوره بيقوم من نظام Palpay بتحويل الاعداد من قراءه لمي ايه الى العدادات لمي ايه بيمكزل عم فغ بغير لمي ايه الخاص ب هم من اى قطة من قاط Palpay فبلس طين بت مدت واسه مية ماذال نظام، وتم اعماده من قبل لجلس البلدي فى نوفمبر 2018 وسه اذق ريبا.
- 5) اعدت ايل مركز الاعداد فسي وسط المين (السيه اط).
- 6) لشاء ملتقى لمي ايه لوال جهله: ملتقى لمي ايه لوال جهله و جهله قش ارع خيا.
- 7) فسي فاطول لدراسة: قارات فازل لملتقى لمي ايه فاطول لدراسة 7/24 من خدمه ميهه و عادل قتل زيد لمي ايه المملوك المبتوكون نوو لمي ايه ال غلي قلم طالبت م.
- 8) توكيب عدادات لمي ايه مبيق الفع (PPWM).

يرجى منكم دفع مبالغ فواتير المياه لمساعدة دائرة المياه والصرف الصحي للحصول على مصادر مالية لتزويدكم بخدمات أفضل

ما هي اسباب ابلق قراءه النظر فية /الحد نى:

1. العداد ي عمل.
2. الص م اقبل العداد غلق.
3. لقارى ي ا خذ قراءات غير فقيهه او قراءه خاطئه.
4. لمي ايه ل غلق لقارى ي يخطي ع الواصل للعداد.
5. مال ك لمي ايه ل غلق خارج لمينه او خارج الوله.
6. المبتوك ي يخطي خدم لمي ايه المزوده من قبل الطيبي و لمي ايه مبيش راء لمي ايه من بغير خاص و ماذي ترتب علي فستوره ال حد نى من ته ك.
7. عداد لمي ايه غير موجود مع العلم انه مسجل على النظاره فية لى ميقنوله رقم المبتوك.



طوقم نظرة لمي ايه لمصر فملاي و ميقومون ب فحص العدادات ذاتل قراءه النظر فية اوال حد نى.

يتحدثون ب طوقم نظرة لمي ايه لمصر فملاي على استخدام الص م لى لى قواعده بيل امتل مبتوكون و نظم لمي ايه خدمتي مركز الاعداد و التحصيل فسي وسط المين (مركز لسيه اط).





موظف الـمبلي في لمخب للمصري لوال مبي في شارع
يخا و مي و مبخصري لـمبلي لـمبال مـm



في ديسمبر 2018، فلقلمجلس البلدي على استخدام عدادات لـمبال مـm

قدم مشروع WaSIP ، ما مجموعه 1850 عداد مياه مسبوقة الفعبل موجات فوق
الصوتية (PPWM) في فبراير 2019. بدلتولمب هذه العدادات PPWM في مارس
2019. وتم اللبلي أن ييسر الم تطبيق PPWM فيت مبرين لمب مـمـمـمـمـمـمـمـمـمـمـm

لقراءة لمزيد عن مشروع PPWM في لـمبال مـمـمـمـمـمـمـمـمـمـمـمـm
لمب PPWM الذي شرت ه اللبلي مـمـمـمـمـمـm

هل تري لم مـمـمـمـمـمـمـمـمـمـمـمـمـm
لرجاع لمب مـمـمـمـمـمـمـm



لمزيد في المـمـمـمـمـمـمـمـمـمـمـm

1) المـمـمـمـm
2) زيارة مـمـمـm

<https://www.jenin.city/>

3) المـمـمـm

別冊資料 CD 1.6

Revised Water Supply Contract

別冊資料 CD 1.6.1 English Version

Tentative translation:

**Jenin Municipality, Water and Wastewater Department
Water Supply Agreement (Revision Draft)**

The Agreement Number:
Date of Agreement:
The Customer's Name:
The ID Number:
Address:

The Owner:
Main Pipeline Number:
Connection Fees: Shekel: 1,150

Number:
Date:

Water Supply Agreement from the Main System

In -----Date----- an agreement has occurred between Jenin Municipality-water and wastewater department- as the first party, and the subscriber as the second party.

Term 1- Supplying water after signing the agreement

1. The second party presents an official request for water subscription while the Water and Wastewater Department approximates a certain period of time to check the request, in order to check the place of subscription by a specialized engineer to make the possibility of supplying water.
2. The municipality supplies water to customers from its related water lines after checking the abidance of the mentioned agreement conditions, signing the agreement and paying the fees.
3. The customer whose subscription occurred in the out borders of the city pays 50 JD as contribution to the water line.
4. Each unit of the estate units in the residential and commercial buildings and others shall have separate subscription. In case of multi-family buildings, separated subscription for each unit in the building is optional.

Term 2- Deserved fee when reconnecting water lines

If water disconnection occurred due to the customer not following the agreement conditions, the customer pays 30 NIS as a fee to the municipality in addition to the deserved amount, before reconnecting the customer's line with the water network.

Term 3- Location of connected line

It is not allowed to connect the customer's line with the water network without the Municipality (the

Water and Wastewater Department) approval, on the customer's connecting point or the location of the connected line.

Term 4- Extension and maintenance of the connection lines according to the regulations, are on the customer's expense

The installation of connection lines will be done and put by a technician according to the approved diagrams, diameter and material from the Municipality, and the condition of Water and Wastewater Department, where the material's composition, extension, linking and maintaining will be on the customer's expense in the approved places.

Term 5- Ownership of connection lines

All connection lines which located in main roads or sidewalks will belong to the Municipality, hence it has the right to cancel, replace, change and install any linked line, which has been put based on the agreement condition as long as it doesn't affect the pipes and other fittings possessory, that belong either to the customer's possessory or to a private estate even owned or rented.

Term 6- Pipes and fittings condition according to Water and Wastewater department conditions

The water pipes and fittings will be installed and linked to the customer's estate according to the conditions and instructions of the Water and Wastewater Department. The customer should not obscure or hide the water meter site or block the access to it and its easy reading by the Municipality.

Term 7- Certification of job proficiency

The customer's line will not be linked to the main network unless he/she has a fully approved commitment certification of the mentioned conditions from the Water and Wastewater Department.

Term 8- Method of water supply

The Municipality has the right to supply water to customers by a water meter with definite type and diameter determined by the Water and Wastewater Department before using or linking it. Besides, it has the right to provide or sell a water meter for the customer. Receive the full water meter price as cash.

Term 9- Observation/examination

Based on the effective laws and regulations, the responsible person of Water and Wastewater Department has the right to access the subscription place to examine the water meter and the other fittings which occurred in the customer's estate, in order to check, take results, test the water meter accuracy and reset it and not allowed the customer to prevent the staff to do that.

Term 10- Water meter preservation

1. The customer pledges to conserve the water meter and inform the Municipality of any defects or faults in the water meter, where he has to compensate the Municipality for at least the defects or leaks that are caused by the customer's intentional negligence to conserve the water meter and he takes the responsibility of paying due repair costs as per requested by the Municipality.
2. Any works which expose water meters to stealing, misusing, tampering with the meter system and

wasting the water either by using materials that affect the water meter or breaking the locks or taking water before the water meter, will lead to water disconnection, paying a fine, prosecution, deprivation of all the Municipality services for one month, without reconnecting the subscription unless all the deserved fine is paid.

- Any illegal case is 5,000 NIS and estimated consumption during the illegal use
- If customer damage the meter: 3,000 NIS for minor parts or illegal use fine amount (5000NIS+) for main part of meter
- Pipe connected before meter, playing with meter system: illegal use fine amount (5000 NIS + consumption)
- If the customer sells municipal water to others will pay 10,000 NIS as penalty.
- If the customer install pump directly to the network: 2,000 NIS and pump is removed and taken to Municipality.

3. The municipality has the right to replace the meter with another approved one, if it found that the meter is broken or damaged or does not meet the purpose which it has installed for.

4. The water meter installed in customer's property is owned by the Municipality.

Term 11- Municipality's irresponsibility

This agreement does not include any obligation to provide the customer with water regularly and constantly. Therefore, the Municipality is not responsible for any weakness in water pressure, damages or losses which may affect the customer, in case of interruption of water, delay in delivering water to the estate, supplying water irregularly or water supply discontinuity.

Term 12- Preventing customer from selling water to a third party

1. According to the contract, the customer is not allowed to sell or supply the sold water to a third party.

2. The customer is not allowed to pump up water from the main line by using a pump or any other device, causing water disconnection for other customers. If the customer does this, the municipality has the right to disconnect the water, expropriate the pump and impose a fee by the Water and Wastewater Department.

Term 13- Municipality's authorization to lock the main pipes and to change the subscription category

A. Disconnecting water from the main water network is a right of the Municipality, in case of composition, link, maintenance and repair arrangements and other reasons.

B. The Municipality has the right to the mentioned subscription category after a written informing to the customer.

Term 14- Municipality's irresponsibility

In any conditions the Municipality is irresponsible to customer's compensation in case of water losses caused by water disconnection or resources defection.

Term 15- Agreement efficiency on other estate

This agreement is efficient on any other estate that the customer moves to, provided that the customer should make a written notification for the Municipality about such movement, which requires paying the subscription change deserved fees.

Term 16- Agreement Duration

The validity of this agreement is unlimited, hence the customer can ask for a temporary stop of the water service and it should not be more than one year after paying the deserved disconnections fees, whereas the customer cannot reconnect the water unless he paid the deserved reconnection fees.

Term 17- Minimum tariff

1. The Municipality is authorized to collect 6.2 shekels from the customer as the cost of the network maintenance and 1.0 Shekle for water meter maintenance.
2. The Municipality is authorized to collect the previous debts from the credit charged by the customer.

Term 18-

After signing this agreement, the customer must agree on any modifications to the water tariff and other modification that may be done by the Municipality, regardless of the cost.

Term 19-

The second party has the right to move the water subscription to his new place based on-

- 1- The identity of features and technical conditions between the new and old estate should match.
- 2- Mobility is allowed for maximum one year from the old subscription disconnection.
- 3- An amount of money - not less than 25% - must be paid from the decided subscription fees according to the ratable fees in the period of subscription mobility.
- 4- The customer's subscription should be moved only by his name.
- 5- In case of the mobility approval, an examination on the water meter and the installation efficiency and work availability must be done by a technician according to the technical standards.
- 6- The second party must present a clearance with the mobility request.
- 7- A new agreement shall be signed with the mobility request whereas canceling the old one.

Term 20-

It is not allowed to reconnect the customer's subscription unless by the customer's name, in which only the applicant of the reconnection request can benefit from the water line. In case that the second party commits a breach of this condition, the first party has the right to disconnect the water without notification, where the second party is not allowed to reclaim the first party about any defect or failure or other things.

Term 21- Penalties

If the costumer violates any of the agreement conditions, he shall be subjected to the penalties provided in the valid laws and regulations

Special condition:

Signature of Mayor:

Date;

Witness: Manger of Citizen Center/ WWD

別冊資料 CD 1.6

Revised Water Supply Contract

別冊資料 CD 1.6.2 Arabic Version

اتفاقية تطوير نظامي لخدمة تم مراجعتها

رقم نقديّة:
تاريخ نقديّة:
اسم المشترك:
رقم الهيئة:
للعنوان:
المالك:
رقم الخط النحوي:
سروم الشبكات: 1500 NIS
استعداد المشترك التي أين بموجب مستخدم صرف رقم:

التاريخ: .../.../...

اتفاقية تطوير د لوي اوم ش ب ك ل م ي ر ا ه ل ي س ي ة

لقد نقلا في هذا اليوم من شهر سنة 201... في بيدينا لخدمة تطوير لوي اوم ش ب ك ل م ي ر ا ه ل ي س ي ة في ماطي و بيالدي (الفريق اول وفي السريه) لمشار اليه مشتركك (الفريق ثنائي على ماطي:

لبند ا و لتوري د ل م ي ا ب ع و ق ي ع ا ا ق ي ة

ا) يبقى للفيق الثاني طبا رسيا مشترك ليهاه، وتقدر **طائرة** لوي اوال صرف الصحي حمله لغلي قايته، في هذا الطلب، ذلك ل لكش ف على موقع مشترك من قبل المقدس المخصص، وليان لمكفري قوصريل ليهاه وم الى ذلك.
ب) توردي لوي اوال مشترك ليهاه من خطوط شبكة لهيه التبلغ لليلي قعد التحقق من أن لغلة الشروط الواردي في هذه نقدي قه تم تزاها، وعد أني ومع المشترك على هذه نقدي قعد ال دوسوم لم طلبه.
ج) يقع المشترك الذي يقع موقع مشتركه خارج حدود اللطبي حرمسون فيزار مسا هم قني خط ليهاه.
د) يقع المشترك لقصيم اشترك لهي الس لئوي التجار ي الذي ضوي على عدة شقق أو مح تالي عدة لئترك اشترك
تملك ك شقة اشتركة الخ اصرها، أهلي حال كان لهي ل عملة مهدف ان نقبي تراك اشجاري.

لبند ا ل ل ل ن ي ل ت ا ه ن ق ط ل م ي ه م ي ب ل ل ت ا غ ي د ف ع ل م س ق ح ق ات

لبند ا ل ل ل ن ي ل ر س و ل م س ت ح ي ع ن د ا ع د ك ش ب ك ل م ي ا ه

إذ أقطعت ليهاه عدم مرعاة المشترك لشروط هذه نقدي ف يقع المشترك ليلبي بطاغق درم ثون شويك مع غرامه التي تقبل أن يؤاد شبكتك مشتركك ليهاه.

لبند ا ل ل ل ن ي ل ر س و ل م س ت ح ي ع ن د ا ع د ك ش ب ك ل م ي ا ه

يحرز شريك ط المشترك لشبكة التي اقبل لفئة اللدي - **طائرة** لوي اوال صرف الصحي على رقة الشبكات و مشتركك أو على موقع خط التوصيل.

لبند ا ل ا ب ع ت م ي د ا ل خط و ط ل و ل ل ق ص و ا ر ت ه ا ق ي ا ن ظ م ة ل م ي ح س ا ل م ا ش ت ر ك

يتجهت ميري الخطوط الوطنية قواسط قبيي **طائرة** لوي اوال صرف الصحي وتوضع هذه الخطوط فوق اللخططات و ق طار زليلي بالموائل مصادق على ها من قبل اللديه بموجب بشرط **طائرة** لوي اوال صرف الصحي يتم اجضار ل مواد وتوليفها وتميها وشبكاتها وصيها واعلى سحب المشترك على أن شبكتك هذه لم ملك ل م س ن ف ي ق ل ل ش ر و ط ا ل ل ي ي ة .

لبند ا ل ا خ ا م س ر ك ي ة ا ل خط و ط ل و ا ص ل ة

يجع الخطوط الاصله اليت اعف لي شوارع العمومية أو رصفتتعد لمك ل اللديه، ولطبي لة ل ح ق ل ل ل ق ا ن ل غ ي ا و ت م د ا و ت س ي ب د ل ا و ت غ ي ر ا ي خط مشبك وض عم ق ن ص ي هذا العقيد وبقني لمك ل اللديه ضيفي حال وجودها من ع ق ا ر خ ا ص ر و ا

كأن نيك لا يخار ملهوكا أو مأجورا.

لبين دلاس ادس ووض ع النيب وللوازم فوق الشروط لئز قلام ياه لئاصرف لصحي

يتيمت ميو شوك رليوب لئيا هو العدادول واز مهم ضمن قخر الم شتر لك بموجب شروط وتعلي مات نظرة لئيا وال صرف الصحي على انيكون موقع العداد ظاهر ل موظف الليي ةو سلك ال وصول اليه .

لبين دلاس ابع - أمر لشبك ونلفي ذ

يتم شبك خط الم شتر ك عم الشبك ةال وبيرية ضيحي صلل الم شتر لك على ش هادة من نظرة لئيا وال صرف الصحي يفيد أن الشروط الوار قف ي هذا العقد قتم اتزامها للتزامات ما، وعلي هيم القيد.

لبين دال الثامن طري ق توري لئلام ياه

للبيبة ال حقف يتوري لئيا ال ل شتر لك بولس طة عداني ح دد ن وعه ق طره نظرة لئيا وال صرف الصحي قلى شكه واستعماله، وقوم الليي ق توري لئلام ياه ويكفى س عره مشم ن ر تراك و تكون طويقة الفع قدا.

لبين دال تسع - لم اينة و لئ حص

يحق لطا قم نظرة لئيا وال صرف الصحي من بلق و لئين نظم الساية، ال دخول لئيا شتر اك لم عينة العداد ولئيصري ت اخرى له موضوع ة ضمن قخر الم شتر ل الفئيش وأخذ قراءات العداد شتبار قة العداد ومعلت هو صيقتة و يقق لئلام شتر ك ينج ال طقم مل لئيا مبدل ك.

لبين دال عشر - لم حفظة قئ لئلام ياه

- 1 يتيمت الم شتر لك بولس م خلط على العداد و عدم لئيا سوا عا جزئه لئلام ياه وال داخلي ة توفي حال حدوث اي خلل أو عطف في عداد لئيا علي مبل بللي قبل ك.
- 2 بقوم لليي قبل سبب ال عدا ب عدا نخر في حال وجود عطل أو خلل من عطف في العداد.
- 3 بتعود لئيا ة عداد الفع ال ميق لئلام ياه ع قار لئلام ياه لئيا ة.

لبين دال ادي عشر - لئلام ياه و لئلام ياه

في حال ال لئلام ياه و كل عمل يتيهف ال عدا من سرقة أو سوء بلت عم ال أوليقت في لئيا أو نظام العداد و القبيري سوا الك انب تخدام لئيا الم شروع أوبخ تام أوب إدخال مواد لئيا ال عدا م شتر علي هف لئلام ياه لئلام ياه عن الم شتر ك وتغريم لئلام ياه:

1. في حال اذالك ال وصل ة غير شرعي يفع الم شتر ك غرام قدرها 5000 شكيل وبقدر كئيه سته ك خ سبب تخدام لئلام ياه لئلام ياه لئلام ياه ال لئلام ياه لئلام ياه لئلام ياه.
2. في حال الكسر لئلام ياه ال لئلام ياه الم شتر ك غرام قدرها 3000 شكيل لئلام ياه لئلام ياه و 5000 شكيل لئلام ياه.
3. في حال ال لئلام ياه ال عدا أوال ال وصل قلى ال عدا يفع غرام ةم ال قدرها 5000 شكيل وبقدر كئيه لئلام ياه لئلام ياه لئلام ياه لئلام ياه لئلام ياه.
4. في حال القيم الم شتر لك بولس ع لئلام ياه لئلام ياه لئلام ياه غرام ةم ال قدرها 10000 شكيل.
5. في حال القيم الم شتر لك بولس ع لئلام ياه لئلام ياه لئلام ياه لئلام ياه غرام ةم ال قدرها 2000 شكيل وبتزال ة لئلام ياه و مصا دت ها.

لبين دالغني عن رسم وولي ليلبي

1. الليبية غير مسؤولة عن ضمان غطالها وعن أي قصاص اني صرافي مورد لها.
2. بتتحمل الليبية مسؤولية صيانة الاعداد.
3. لليبية غير مسؤولة في أي حال من احوال عن دفع تعويض الالتمسك لها عن أي خمرات رجعت عن لقطاع لها أو اضال مورد لها.

لبين دالغني عن رسم غطالها عن علمي ادهيرق ثلث

- أ- يجوز للتمسك ان يبيع أو يورد لها البعاعه ليلبي بموجب هذا العمل في وقتلث.
- ب- يجوز للتمسك سحب لها في الخط الالتمسك يبولطة مضخة وبأي طريقة كانت مهيبة عدم وصول لها ادا لى الالتمسك يين، ولذا فالالتمسك ذلك ليقول الحق لليبي فصل لها عليه ومصادرة للمضخة وقطع لها فرض غرام تقدرها **طيرة** لها الى صرف الصافي.

لبين دالغني عن رسم ليلبي قبل ان يبلو يسي وقت عي للرسوم

لليبية الحرفي جيع حوال انقطع لها مع الشيفه الالتمسك ليلبي بوا الشيك أو إجراء أعمال ص والصيانة أو سباب أخرى على ان يعلن لالتمسك ليلبي ان يقطع عيشي عشر ساعة على اشرول لليبية الحرفي اعم الالتمسك خطيا ان تغرفي شتراك المذكور في هذا العقد.

لبين دالغني عن رسم ويري ان اقية غي عقر آخر

يسري عول هذه اتفاقية على أي عقر آخر يقطع الالتمسك خ فلتتار الذين ظم له هذه اتفاقية، ويشترط في ذلك ان يقطع الالتمسك لليبية خطيا عن هذا تقال، ويتبع علي مدقوع الرسوم المقررة عنق شتراك.

لبين دالغني عن رسم -مدة اقلية

مدة هذه اتفاقية غير محدودة، في حال تمسك ان يطلب لقا شتراك بعد دفع رسوم وقي تراك، يعاد شيك لها ابع دفع رسوم وقي شتراك المقررة.

لبين دالغني عن رسم ادا حد ادا

1- يحظر لليبي قبت تغيير كني من صفر م³ -4م³ يقطع لليبي قبت تغيير كمية وكني نيين يمين واخر حسب ما تراه ليلبا.

2- يحظر لليبية ان تستوفي الالتمسك ببلغ 6.2 شريك لصيانة الشيفه.

3- يحظر لليبية ان تستوفي الالتمسك ببلغ 6.2 شريك لصيانة الشيفه.

4- يحظر لليبية ان تستوفي الالتمسك ببلغ 6.2 شريك لصيانة الشيفه.

لبين دالغني عن رسم ويري ع اقلية

بعد التوقي على هذه اتفاقية يصبح الالتمسك ليلبي ملزم بالابق على التعهف لها المقررة لليبية مهملة لث لث بل لليب على التعهف لتتقررها لليبية من وقت ر.

لبين دالغني عن رسم ويري عن اقلية

حق للالتمسك ليلبي ان يقطع الالتمسك ليلبا لكانس لئج الجيد حسب الشروط التالية:-

- 1- تقليل المواصفات والشروط الفنيين العقر الالتمسك الجيد.
- 2- يجوز النقل لمدقاصها سن شمسية مخصص شتراك ليلبي.
- 3- ان يقطع ليلبي يقطع عن 25% تراك المقررة حسب الرس ولم يفرضة وقت نقل ا تراك.
- 4- ان يقطع ليلبي ليلبا تراك وأسره فقوط ويجوز ان يقطع ليلبي م اي شخص اخر.

5- في حالة الخلق على النقل يجب أن يتفحص التمديدات والعدادات من حيث صحتها وجاهاً وفقاً للعمل من قبل فني وذلك حسب الجولف الفني.

6- عمل الفني القليل يتحقق براءة ذمة حسب الأصول معتقياً بمطلب النقل.

7- يتبعون عيشية جيدة مع طلب النقل وتغذى نفدياً في مة.

لبين في عيشرون- إعادة ا راك

يجوز إعادة اشتراك لبي بسوا المشترك
ي جوز أن يفتب ع خ ط ل ياه ! ق دم ط ل ع اف تق ط فوي حالة
خلف الفني القليل عن هذا الشرط خ ل ب فل ي ل ق ل ف ي ول ق ط ع ل ياه دون اذار مسبق حق ل ل ف ي ق الق ل ي
طابقا ل ف ي ق ا ول ب أي عطل أو ضرر أو أية طالبة أخرى م ه ل ك أن نوع ها.

لبين دال حادي في عيشرون- لا عيوبات

إذا أخل المشترك بأي شروط من شروط هذه نفدياً فل ي ع ر ط ل ع ق و بات ل ي نص و ص ع ل ي ا ف ي ل ق و ل ي ن ظ م ال س ا ر ية .

شروط خاصة:

تحريري م/...../.....م

فريق أول ف ي ق ل ي

ه ي س ي ل ية ع ي ن ا س ال م ش ت ر ك :

رقم الهية :

التوقيع :

شاهد بكتب نظرة ل ي ا م ش ا ه د / م ي ر ق م خ د م ا ت ل م ش ت و ل ي ن

.....

別冊資料 CD 1.7

**Capacity Building Assessment of CSS and PR
– English Version**



Jenin Municipality

Project for Strengthening the Capacity of Water
Service Management in Jenin Municipality
(WaSIP)

**Assessment of Capacity Building of
Customer Service Section
and PR Department**

December 2021



Japan International Cooperation Agency

وكالة التعاون الدولي الياباني

Introduction

Beside the core capacity building assessment as presented in the Project's Completion Report, this attachment provides a detailed review of the specific major improvements in Customer Service Section and the PR department in comparison with their status at the baseline.

Assessment Scale

Four scale levels were taken into account to measure the capacity status at the baseline and endline stages.

Scales for Measurement of Capacity Building for CSS and PR

Measurement scale level	Measuring item
0	Not exist.
1	Exists but not working.
2	Exists but working only to some extends.
3	Exists and working well.

The following categories were taking into account to measure the status at baseline and endline;

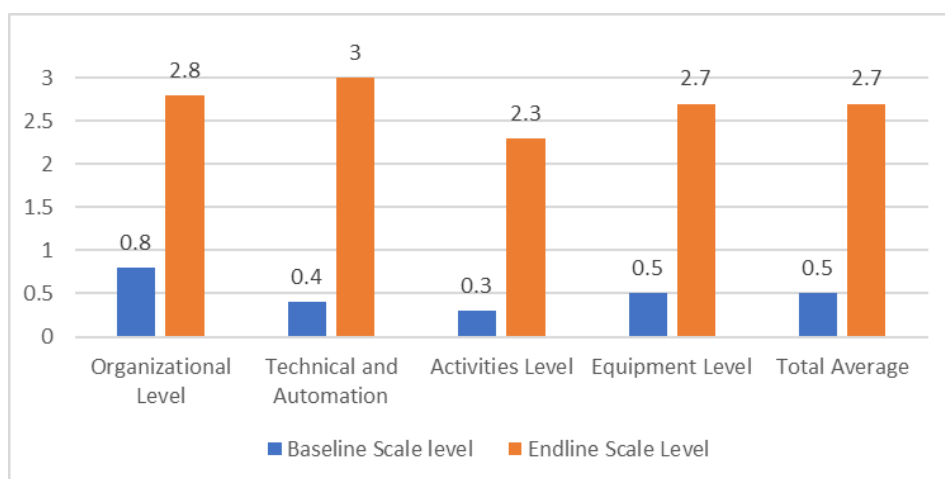
- a) Organizational level
- b) Technical and automation level
- c) Activities level
- d) Equipment level

A) Capacity Assessment of CSS

Overall Status of the Capacity Building of CSS

The assessments scale numbers were judged based on the status of the built capacity of the customer service section at the endline level compare with the baseline. As seen in the figure below, the section has reached to the overall scale of 2.7 which is close to the working well though the section needs some improvements such as:

- 1) get hands on experience with maintenance of the PPWMs and improve the maintenance section.
- 2) increase monitoring of the installed PPWM and the mechanical meters for any malfunctions or misuse.
- 3) improve automation of its inventory system and warehouse using AlShamel instead of paper-base inventories.
- 4) enhance its capacity in terms of preparation of plans, planning, report generation, and data analysis. Shortage of skills among some of the staff that may affect their promotion to be more involved in project activities such as familiarity with Excel for tasks related data entry and report writing.
- 5) take preventative measure to reduce customer complaints.
- 6) increase bill collection ratio of the customers with mechanical meters and also increase collection ratio of debt amount. Take actions and follow up with the collection campaign and re-payment model introduced by this project (for both PPWM and mechanical meter customers).



Improvement in Capacity Building of CSS

Comparison Status by each Level: CSS

Below is an assessment of the capacity building status of the customer service section including the collection unit compare with their status of capacity at the baseline level.

A) At Organizational Level

Summary of the organizational level is as bellow:

Capacity Building of CSS at Organizational Level

Category	Item	Baseline Assessment	Endline Assessment
		Scale level	Scale level
Organizational	1) Morning meetings with staff	0	3
	2) Monthly plan of activities	0	3
	3) Detail job descriptions	2	3
	4) Supervision of readers and collectors	0	3
	5) Staff allocation	2	2
Average scale level		0.8	2.8

1) Regular meetings for daily work allocation

Baseline assessment: There were no morning meetings among the head of the customer service section and staff for distribution and allocation of activities, at the baseline assessment.

Endline assessment: There are a 30 minute briefing meeting every morning to for task distribution and review of the pending works.

2) Monthly plan of activities

Baseline assessment: No monthly plan of activities.

Endline assessment: A monthly plan and targets for each of its activities.

3) Job descriptions of the section staff

Baseline assessment: The job descriptions needed updates.

Endline assessment: The job descriptions were updated, revised, and created if they didn't exist and included the followings:

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Director of WWD	Head of Water Section	Head of Customer Service Section
Head of Studies and Planning Division	Head of Lab Division	Head of Network Maintenance Division at Water Section
Head of WWTP Section	Head of Sewer Network Maintenance of WWD	Head of Collection Unit
Warehouse Manager of WWD	Warehouse Clerk of WWD	Archive Division
Chief Distribution Technician of Water Section	Data Entry of Kateb Division	
Other (only in English draft):		
Head of Public Relation Department	Media Division / PR Department	Protocol Division / PR Department

4) Supervision of the collection team

Baseline assessment: They were not under supervision of the Customer Service section.

Endline assessment: The collection unit (readers and collectors) all moved to Customer service section.

5) Staffing allocation

Baseline assessment: They were short of staff and affected the work delays.

Endline assessment: Three staff added to the section and the section activities were followed smoothly. The section, yet, is in need of re-distribution of some tasks as the number of PPWM installation increase and number of mechanical meters decrease.

B) At Technical Level

Summary of the technical level is as below:

Capacity Building of CSS at Technical and Automation Level

Category	Item	Baseline Assessment	Endline Assessment
		Scale level	Scale level
Technical and automation	1) Technical trainings	0	3
	2) Use of GIS and GIS database	1	3
	3) Customer management platform (AlShamel)	2	3
	4) Mobile reading and billing system	0	3
	5) Customer database server and backup system	2	3
	6) Automated customer complaint system	0	3
	7) Automated bill collection for mechanical water meter customers (PalPay)	0	3
	8) Automated bill collection for PPWM customers via integration of PPWM and PalPay	0	3
	9) Automated monitoring of customer water consumption (Use of Gateway system)	0	3
	10) Automated customer application processing (DMAS system)	0	3
	11) System integrations	0	3
Average scale level		0.4	3

1) Technical training

Baseline assessment: There were no trainings at the customer service section for technical and software platforms.

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Endline assessment: The section staff received several trainings on use of different software such as mobile billing system, AlShamel, PalPay system, GIS, PPWM system and analysis of the information.

2) Use of GIS and GIS database

Baseline assessment: The existing GIS data was outdated and rarely utilized. Also, no one at the section was familiar with GIS or the database.

Endline assessment: Several of the staff received basic and advance training on GIS. All GIS databases were updated, and additional geo-database were created by expansive field surveys and pipe location, and maintained on a daily basis. The CSS section uses GIS for PR activities, collection ratio measurement, customer database, customer complaints, mapping, etc. The GIS database should be shared within the server and create a plan for maintaining the GIS database as the database expands.

3) Customer management platform (AlShamel)

Baseline assessment: AlShamel, as the platform for the customer information system had some malfunctioning and missed some necessary functions. The license was outdated, and the staff were utilizing the old version (version 3.0.0.5) with limited functions.

Endline assessment: AlShamel's license is renewed to higher version 6 and new necessary functions and modules are added to the system. The processing speed has improved greatly due to the new JM server.

4) Mobile reading and billing system

Baseline assessment: There readings and billings were paper-base and time consuming and contained errors. The paper base system caused a two months delay in billing.

Endline assessment: The paper-base reading and billing were replaced with mobile reading and billing system. This solved problems of errors and delays in bill printing and bill collections. For details, refer to Annex 1.4 "MIS Report".

• MBS training



• MBS work in the site



5) Customer database server and backup system

Baseline assessment: The server was old and slow with low capacity and processor speed: windows server 2003, Processor: 1.60 GHz, Installed memory (RAM): 3.25 GB, Storage capacity: 592 GB. This had slowed down the AlShamel system and thus the staff work.

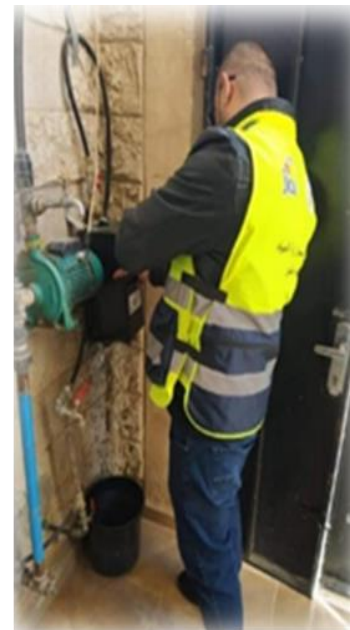
Endline assessment: The server license upgraded to windows 2012, two processors: 2.80 GHz & 2.79 GHz, Installed memory (RAM): 64 GB, Storage capacity: 900 GB*5 = 4.5 TB. The improved server

capacity increased the speed of CSS staff work using for customer management using AlShamel (which is on the server).

6) Automated customer complaint system

Baseline assessment: The customer complaints were received manually; in person or by phone. There were paper based records of customer complaints. No 24/7 call services.

Endline assessment; The customer complaints are received via a 24/7 call service, in-person, by phone, and by the JM website, also via live chat system available on the JM website as well. It is convenient for customers especially when they send their complaints online and receive the responses automatically after it is processed by CSS in cooperation with the water section is needed. The form below is a screen shot of the JM website's complaint section where a customer complaint filed online and their communication with the relate section. Technician visit customer and solves issues.



7) Automated bill collection for mechanical water meter customers (via PalPay)

Baseline assessment: The bill collection was paper base and by the collectors visiting the customers door by door. It was time consuming and would have contained some errors while the collected amount been processed manually from paper to AlShamel for each customer and to the financial department. It was also time consuming.

Endline assessment: In addition to use of mobile billing system for collection, customers have options to pay at payment point via PayPal system. The Pal Pay system processes the collected amount to the JM bank, automatically. It is integrated with the financial platform (AlShamel).

8) Automated bill collection for PPWM customers via integration of PPWM and PalPay

Baseline assessment: There were no PPWM system and all collections were conducted without any integrations and manually.

Endline assessment: The number of PPWM customers increased and collections were automatically collected and processed by the integration of PPWM and PalPay at the vending stations (payment points) and transferred to JM bank automatically. It is integrated with the financial platform (AlShamel)

9) Automated monitoring of customer water consumption (Use of Gateway system)

Baseline assessment: The periodical monitoring not existed unless a customer complaint of the amount of their consumption or billed amount. The monitoring was on case basis and paper based in such cases.

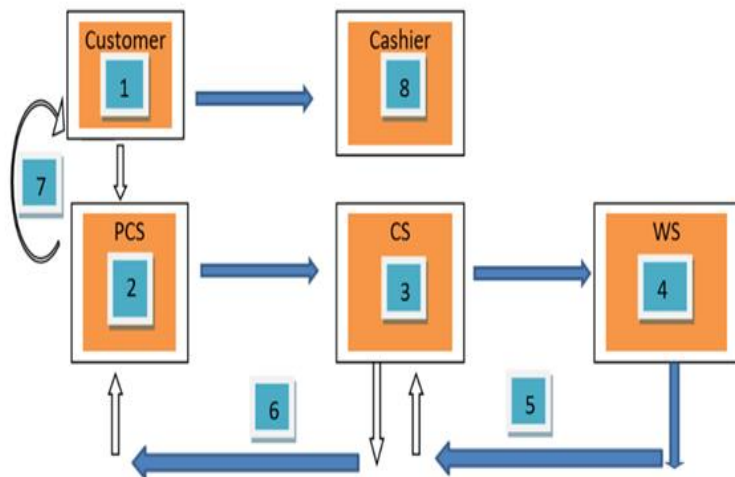
Endline assessment: The customer service section monitored the customer consumption on a periodical basis and monitors any abnormality in the consumption and thus its effect on the billed amount. The gateway system also is used for processing customer complaints. CSS follow up with the malfunction PPWM by gateway warning notifications and take the required actions either fix the PPWM in WWD or send it to the maintenance center of Fury Trade Company.



10) Automated customer application processing (DMAS system)

Baseline assessment: The DMAS system, developed by Itlaq Company since 2015, was used for facilitate citizen works introducing receiving and processing applications from applicants, also saving time. It was utilized by the engineering department by the WWD and the CSS did not utilize it and relied on paper base on the customer applications and processing for water related services. Not convenient for customers and time consuming work for CSS staff.

Endline assessment: Jenin Municipality renewed the general license and created new paths for processing customer applications for various services for water such as new customers, water meter change of ownership, water meter re-location, disconnection, re-connection, etc. in cooperation with the Public Customer Service and Water Section.



11) System integrations

Baseline assessment: There were no system integrations.

Endline assessment: The integrations were created for the following systems:

- AlShamel and PPWM and PalPay
- AlShamel and MBS
- AlShamel and DMAS system

C) At Activities Level

At the activities level, as presented in table below, the capacity of the section has increased from the average measuring scale of 0.3 at the baseline to the scale of 3 at the endline for the six major items in the Activities Level category.

Capacity Building of CSS at Activities Level

Category	Item	Baseline Assessment	Endline Assessment
		Scale level	Scale level
Activities level	1) Experience with PPWM implementation and installation	0	2 (need experience with PPWM maintenance, and monitoring of the PPWM installations and any malfunctions.
	2) Monitoring of meter reading and billing, also water meters such as: a) coverage of all city for meter reading and billing b) monitoring of mechanical meters with zero consumptions or PPWMs with no charge for a period of time c) random check of installed PPWMs for any issues or mis-use d) periodic monitoring of installed PPWMs	1	2 (need to increase the number of monitored meters)
	3) Regular bill collection activities such as a) sending SMS reminders for bill/debt payments b) collection campaigns c) increase/rehabilitate collection centers d) PR activities in close cooperation with PR department such as door-to-door visits, production of PR materials, and extensive use of social media e) installation of signboards, and billboards, and project movies	1	2 (need to take actions especially with debt collection and collection of mechanical meters)
	4) Customer database survey	0	3
	5) Monthly measurement of collection ratios	0	3
	6) Regular activity recording, reporting, weekly meetings, manuals and workshop for knowledge sharing	0	2 (need to prepare more schedules for activities and preparation of reports)
Average scale level		0.3	2.3

1) Experience with PPWM implementation and installation

Baseline assessment: There were no experience with installation of PPWM.

Endline assessment: The CSS in cooperation with water section gained capacity and experience with installation of PPWM via the project in the pilot areas also areas installed by PPWM funded with JM.

2) Monitoring of meter reading and billing, also water meters

Baseline assessment: Checking of water meter status were conducted based on cases received or discovered or via customer complaints. Problems were solved as cases received. There were no regular monitoring activities for water meters. Also, not all city was covered by the readers for meter reading and billing.

Endline assessment: Almost all city is covered for meter reading and billing. There are regular weekly basis of various monitoring activities for mechanical meters and PPWM meters and actions are taken accordingly within the week such as:

- a) coverage of all city for meter reading and billing
- b) monitoring of mechanical meters with zero consumptions; Actions: broken meters are fixed or replaced.



c) random check of installed PPWMs for any issues or misuse such as issues with the box, with the valves, uncharged meters, issues with lora not activated, boxes not sealed, broken meters; Actions: fix where needed.

d) periodic monitoring of installed PPWMs for issues such as broken meters, issues with PPWM charging cards, errors in consumptions, issues with the battery, damage in the meter, internal wire connections and reverses flow, leakage inside meter, valve failure, fire mode issues, tariff calculation issues; Actions: fix where needed.

3) Regular bill collection activities

Baseline assessment: There were some bill collection campaigns in the past. However, they were not based on a planned activities.

Endline assessment: CSS now regularly conducts various activities to promote collection such as

- a) sending SMS reminders for bill/debt payments
- b) collection campaigns
- c) increase/rehabilitate collection centers
- d) PR activities in close cooperation with PR department such as door-to-door visits, production of PR materials, and extensive use of social media
- e) rollup, installation of signboards, and billboards, project movies



4) Customer database survey

Baseline assessment: The customer database on AlShamle needed to establish accurate customer database which can help WD in sufficient management of customer services including bill collections and NRW activities.

Endline assessment: The database on AlShamel is updated for customers who have been installed with PPWM. The CDS survey is ongoing for the new DMAs and also will continue as the installation of PPWM for the entire city. The CDS is conducted in two phases; Phase 1: Updating building shapefile on the GIS customer database, and Phase 2: Updating building shapefile on the GIS customer database through door-to-door visits. The CDS included information collection such as customer name, household status, building info, potential customers, connection status and illegal connections, non-customers, use of private networks, etc. including drawings.

5) Monthly measurement of collection ratio

Baseline assessment: There were no routine collection ratio measurement.

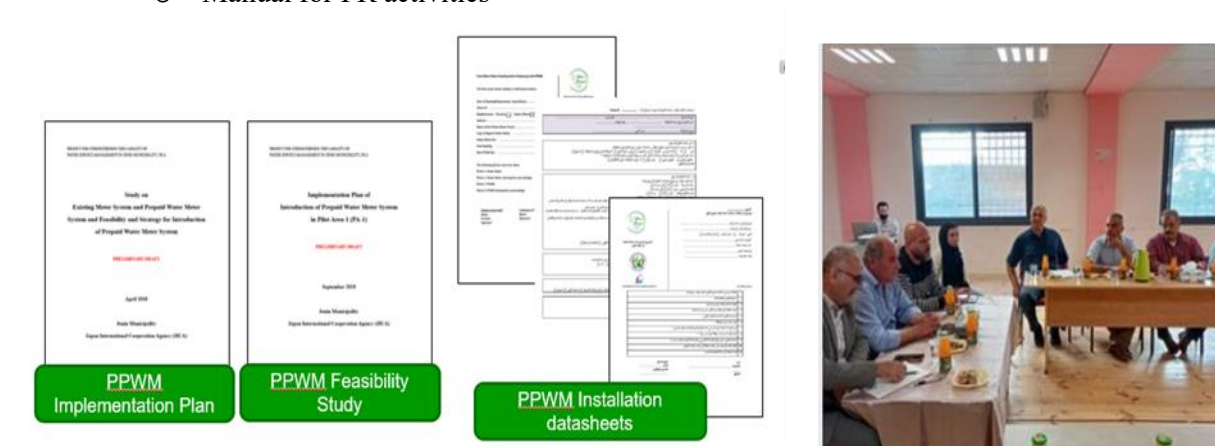
Endline assessment: The collection ratios have been calculated on a monthly basis for the PA areas, and for the All city for without debt and with debt ratios since 2017.

6) Regular activity recording, reporting, weekly meetings, manuals and workshop for knowledge sharing

Baseline assessment: There were no activities on keeping a regular recording of data, reports, or manuals.

Endline assessment: Several manuals and reports are generated, and workshops and seminars have been implemented to share the knowledge with other municipalities. Manuals such as:

- Manual for 0-reading procedure
- Manual for collection campaign
- Manual for measuring collection ratio
- Manual for random check of PPWMs
- Manual for pre-installation door-to-door visits
- Manual for PR activities



D) At Equipment Level

Summary of the equipment level is as follows:

Capacity Building of CSS at Equipment Level

Category	Item	Baseline Assessment	Endline Assessment
		Scale level	Scale level
Equipment level	1) Necessary office tools and equipment	0.5	2.5
	2) Car for conducting the daily activities	0.5	3
Average scale level		0.5	1.8

Baseline assessment: The section was in need of additional printers, scanners, additional phone device, additional computer, etc. Also, the customer service section suffered from lack of vehicle and had to share the vehicle of the water section when it was available so to conduct the customer services. This had caused many delays in conduct of the section’s activities such as customer complaints and meter monitoring, etc.

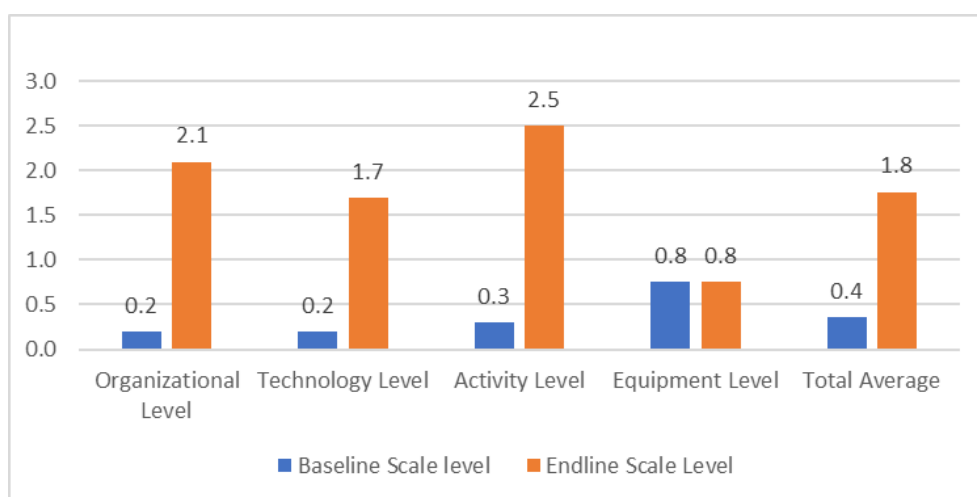
Endline assessment: JICA provided with a car and the customer service section utilizes the car on daily basis. The Municipality purchased scanners and a printer during this project for CSS. The necessary devices are available to the section. The section, yet, suffers from time to time of printers not working or in need of tuners and had to wait for long time for maintenance from the Jenin Municipality due to fund issues.

B) Capacity Assessment of PR Department

Overall Status of the Capacity Building of PR Department

The assessments scale numbers were judged based on the status of the built capacity of the PR Department at the endline level in comparison with the baseline. As seen in the figure below, the Department's average capacity building improved from 0.4 to the scale of 1.8 to as 'Exists but working only to some extends'. The followings are among the remaining matters that need improvements:

- 1) Close monitoring of the monthly activities as planned
- 2) Lack of annual plans and goals
- 3) Clarification of tasks by each staff according to the job description
- 4) Improvement in preparation for public meetings such as selection of targeted residents and areas
- 5) Training of the PR staff and use of software for PR material production and presentation
- 6) Shortage in coverage of PR activities in inter-departmental level
- 7) Need car and photography tools



Improvement of Capacity Building of PR Department

Comparison Status by each Level

Below is an assessment of the capacity building status of the PR Department compare with their status of capacity at the baseline level shown by each categories.

A) At Organizational Level

Summary of the organizational level is as bellow:

Capacity Building of PR Department at Organizational Level

Category	Item	Baseline Assessment	Endline Assessment
		Scale level	Scale Level
Organizational level	1) Monthly plan of activities and annual plan	0	1.5
	2) Knowledge exchange with other Municipalities/training	0	3
	3) Staff-task allocation	1	2
	4) Regular meetings of the Head with staff	0	2
Average scale level		0.2	2.1

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1) Monthly plan of activities

Baseline assessment: There was no monthly plan of scheduled goal-based activities in the city. PR activities were limited to cover municipality news and random activities.

Endline assessment: They have a monthly plan for each of their activities relates to this project in cooperation with the WWD. They are still in shortage of capability to monitor the monthly plan progress and also create an annual plan accordingly. It should, however, be noted that the Head of the PR department had been replaced recently. The new Head, was not related to PR department and was re-allocated from the position as the Head of the Diwan section 2 years ago. He is gradually gaining leadership skills for PR department.

2) Visit other Municipalities for knowledge exchange

Baseline assessment: There were no practice of visits to other municipalities for knowledge sharing.

Endline assessment: PR section staff visit other municipalities for experiences sharing in accompany with other JM's departments such as WWD, IT, and FD. In such visiting event, they learn lessons from other local municipalities and customize their skills and activities with the projects in Jenin and design and implement PR activities accordingly.

Joint Trainings of the PR Staff

Training Name	Training Period	Training Place	No. of Participants	Participants
Training visit to Jenin JSC & Maythaloan JSC on how to deal with social cases	Jan 11, 2021	Jenin JSC & Maythaloan JSC	5 (JET, PR & WWD)	JET (1), JM (3), Jenin JSC (1) and Maythaloan JSC (2)
Training visit to Ramallah Municipality for PR activities	Feb 15, 2020	Ramallah Municipality	4 (PR)	JET (2), Ramallah Municipality (2)
Training seminar on discussing about projects for professional public audience	Apr 7 to Apr 9 2019	JM, Korian Center	6 (PR , CU, CS)	JM (6), JET (2)
Pre-installation Door to Door visits	Mar 19, 2019	WWD	3 (PR , CU, CSS)	JM (6) JET (3)
Training meeting with EXPERT Company on introduction of Mobile Billing System	Aug 7, 2018	JM	6 (IT, CU, FD, CS, PR)	JM (6); JET (3); EXPERT Co. (2)
Training meeting with Allsra company on introduction of Mobile Billing System	Aug 5, 2018	JM	10 (IT, CU, FD, CS, PR , PCS)	JM (10); JET (2); Allsra Co. (2)
Prepaid water meter workshop	Nov.20, 2017	JM	4 (WWD, PR)	JM (4); JET (3)
Training visit to Tulkarem Municipality's water and sewerage department to learn about PPWM challenges and success including PR activities	Nov 1, 2017	Tulkarem Municipality	1 (PR)	JM (1); JET (3); TM (4)
Training on conducting social survey	Oct 22, 2017	JM	2 (PR)	JM (2); JET (2)

* JM: Jenin Municipality; JSC: Joint Service Council; WWD: Water and Wastewater Department; CS: Customer service section of WWD; PCS: Public Customer Service; PR: Public Relations; FD: Financial Department; CU: Collection Unit; IT: Information Technology

3) Regular meetings with staff:

Baseline assessment: There were no regular meetings with staff. Most of the communications were on phone or WhatsApp individually on a situation case base.

Endline assessment: The activities have expanded and more various. It requires regular meetings on matters such as the progress of the PR task distribution and following up the progress of each activity and review the pending works and updates. The meetings are every 2 other days.

B) At Technology Level

Summary of the technology level is as bellow:

Capacity Building of PR Department at Use of Technology Level

Category	Item	Baseline Assessment	Endline Assessment
		Scale level	Scale Level
Technology level	1) Expand of topics to share with residents on social media (Facebook and YouTube)	1	2
	2) Use of design software such as photoshop for preparation of PR materials i.e. calendar, posters	0	1
	3) Digital communication with people by the Live Chat feature of the JM website, also publish of PR information and materials on the website	0	3
	4) Use of Excel, Word, and PowerPoint for planning of PR activities and reports, and oral presentations	0	1
Average scale level		0.2	1.7

1) Using Social media (Facebook)

Baseline assessment: Usage of social was randomly and limited to cover municipality news.

Endline assessment: Organized usage the social media to publish about a lot of useful subjects including awareness posts to raise people awareness in the city. They need skills in promotional movie preparation and production)

2) Using design software:

Baseline assessment: At this stage PR section have no ability to design PR material since the staff have no design skills.

Endline assessment: After training on some design software, PR staff can now design their own posts, brochures and other PR material. However, they need professional training courses.



3) Contact people by internet website

Baseline assessment: There were no direct contact with people by internet website.

Endline assessment: After introducing the new website, PR staff now contacting with people and response to their requests and complaints.

4) Using MS office programmes

Baseline assessment: There were no use of MS office programs.

Endline assessment: PR staff using MS office to prepare plans and recording the activities progress in addition to prepare the presentations if needed

C) At Activity Level

Summary of the activity level is as bellow:

Capacity Building of PR Department at Activity Level

Category	Item	Baseline Assessment	Endline Assessment
		Scale level	Scale Level
Activity level	1) Door to Door visits; PPWM's pre-installation and collection campaigns	0	3
	2) Customer satisfaction survey	0	3

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

	3) Public meetings	1	2
	4) Awareness campaigns	0	2
	5) Interdepartmental cooperation; join the customers database survey (CDS) with WWD/CSS	0	3
	6) Overall coverage of the Municipality's activities	1	2
Average scale level		0.3	2.5

1) DtD visits

Baseline assessment: There were no DtD visits.

Endline assessment: DtD visit for each customer before installing the PPWM to explain the Municipality's purpose and to inform customers about PPWM features. The PR team also conducts collection campaigns.

2) Customer satisfaction survey

Baseline assessment: There were no survey to measure customer satisfaction.

Endline assessment: PR staff conducted the satisfaction survey to measure customer satisfaction particularly for PPWM post-installation and pass the customers' requests to WWD. response for response and satisfaction analysis.

3) Public meetings

Baseline assessment: Public meetings with customers were limited and not regular.

Endline assessment: More public meetings with the water subscribers (customers) in cooperation with the other departments i.e. WWD. The content of meetings expands to cover more targets and to take people requests in addition to raise people awareness. The public meeting activities has more rooms to be improved for management and selection and invitation of the audience.

4) Awareness campaigns

Baseline assessment: There were no awareness campaigns beside posts on FB for JM's general news.

Endline assessment: At this stage, PR staff prepare awareness campaign materials and conduct the campaigns even with other departments such as cleaning campaigns and campaigns on water save.

5) Interdepartmental cooperation; join the customers database survey (CDS) with WWD/CSS

Baseline assessment: There were no activity coverage with other departments but only news share.

Endline assessment: PR section cooperates with other departments in the municipality such as WWD to conduct the related activities together and to put the plans of each department. Furthermore, the cooperation with other facilities in the city such as the Children Centre of Jenin, the Ministry of Education, and the Ministry of Religious Affairs have also been a great improvement of the PR department.

6) Overall coverage of the Municipality's activities

Baseline assessment: At baseline the coverage of municipality activities was not organized and not regular.

Endline assessment: Coverage of municipality activities became more organized and regular with improved content. The PR department is preparing a booklet to share achievements of JM by each department to be shared with the residents.

D) At Equipment level

Summary of the equipment level is as bellow:

Category	Item	Baseline Assessment	Endline Assessment
		Scale level	Scale level
Equipment level	1) Necessary office tools	1.5	1.5
	2) Car for conducting the daily activities	0	0
Average scale level		0.75	0.75

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Baseline assessment: The Department had sufficient computer for staff work, as some been shared by the mail staff. The main issue is the car availability. For PR activities they often had to use their own cars. They didn't have camera for photo sharing and movie recording.

Endline assessment: The situation stays the same in terms of car and photography tools and camera.

別冊資料 CD 1.8

Collection Ratio Calculations and Charts (2017 to 2021) – English Version



Jenin Municipality

Project for Strengthening the Capacity of Water
Service Management in Jenin Municipality
(WaSIP)

**Report on Collection Ratio Calculations
and Charts (2017 to 2021)**

Worksheet files

December 2021



Japan International Cooperation Agency

وكالة التعاون الدولي الياباني

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Collection Ratio Calculations and Charts (2017 to 2021)

(The followings are Excel worksheets shared for the purpose of reference).

Bill Collection Ratio% (City) 2021																
Billed Month-Year (as recorded in same month in data)	Total Bills			Total Bills (A)	Collected including Debts			Total including debts (B)	Collected without Debts (Current Collection)			Total without debt (C)	Collection Ratio%(with debts) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio%(without debts) O=C/A	Avg. used to estimate for December without debt for Non-PPWM customers Avg.=C/B
	Issued to non-PPWM customers (Alshamel data)	Issued to customers by tanker water	PPWM customers		By Non-PPWM customers (Alshamel data) (b)	By tanker water	By PPWM customers including 15% dept pay		By Non-PPWM customers (Alshamel data) (c)	By tanker water	By PPWM customers excluding 15% dept pay					
Jan-21	560,843	4,225	168,220	733,288	279,479	4,225	180,057	463,760.35	82,323	4,225	168,220	254,768	63.24%	28.50%	34.74%	29.46%
Feb-21	476,526	3,945	167,672	648,143	218,245	3,945	179,660	401,850	119,364	3,945	167,672	290,982	62.00%	17.11%	44.89%	54.69%
Mar-21	451,079	0	195,418	646,496	159,154	0	210,551	369,705	106,982	0	195,418	302,400	57.19%	10.41%	46.78%	67.22%
Apr-21	460,989	0	236,821	697,810	165,295	0	258,449	423,744	118,560	0	236,821	355,381	60.72%	9.80%	50.93%	71.73%
May-21	606,496	0	233,891	840,387	182,252	0	254,961	437,213	112,031	0	233,891	345,922	52.03%	10.86%	41.16%	61.47%
Jun-21	975,690	0	233,694	1,209,384	282,423	0	254,927	537,350	199,127	0	233,694	432,821	44.43%	8.64%	35.79%	70.51%
Jul-21	595,256	0	239,861	835,116	207,102	0	261,975	469,077	151,678	0	239,861	391,539	56.17%	9.28%	46.88%	73.24%
Aug-21	554,098	0	226553.3	780651.3	227841.3	0	246,831	474672.3	151759.3	0	226553.3	378312.6	60.80%	12.34%	48.46%	66.61%
Sep-21	547,251	0	212496	759747.3	278433.8	0	231,328	509761.8	184230.1	0	212,496	396726.1	67.10%	14.88%	52.22%	66.17%
Oct-21	541956	0	203914	745870	273192	0	221464	494656	197340	0	203914	401254	66.32%	12.52%	53.80%	72.23%
Nov-21	0	0	0	0	0	0	0	0	0	0	0	0				#DIV/0!
Dec-21	0	0	0	0	0	0	0	0	0	0	0	0				Avg. #DIV/0!
												Avg.	59.00%	13.43%	45.57%	270407.3

Important note:
 1- There is no clear data for the month of January 2020 due to start using the MBS
 2- Alshamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According to CSS (Khaled and Omar) that they close the financial year after Dec so the payment in January for Dec bills can not record on the same columns at Alshamel as other months because they already closed the calculations for last year so they record it on another column without separation (with debt or without debt) and they called it "arrears" which equal the collected with debts in calculation.)

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Ratio% (City) 2020																	
Billed Month-Year (as recorded in same month in	Total Bills			Total Bills (A)	Collected including Debts				Total including debts (B)	Collected without Debts (Current Collection)			Total without debt (C)	Collection Ratio%(with debts) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio%(without debts) O=C/A	Avg. used to estimate for December without debt for Non-PPWM customers Avg.=C/B
	Issued to non-PPWM customers (Alshamel data)	Issued to customers by tanker water	PPWM customers		By Non-PPWM customers (Alshamel data) (b)	By tanker water	By PPWM customers including 15% dept pay	By Non-PPWM customers (Alshamel data) (c)		By tanker water	By PPWM customers excluding 15% dept pay						
Jan-20																	#DIV/0!
Feb-20	769,805	5,730	103,149	878,684	322,352	5,730	106,195	434,277	212,571	5,730	103,149	321,449	49.42%	12.84%	36.58%		65.94%
Mar-20	582,010	6,730	137,451	726,191	164,724	6,730	141,808	313,262	116,190	6,730	137,451	260,371	43.14%	7.28%	35.85%		70.54%
Apr-20	532,480	7,810	121,529	661,819	39,205	7,810	124,572	171,587	37,184	7,810	121,529	166,523	25.93%	0.77%	25.16%		94.85%
May-20	531,027	7,005	139,011	677,043	77,219	7,005	143,030	227,254	63,908	7,005	139,011	209,924	33.57%	2.56%	31.01%		82.76%
Jun-20	695,426	9,494	148,119	853,038	369,940	9,494	152,315	531,749	206,628	9,494	148,119	364,240	62.34%	19.64%	42.70%		55.85%
Jul-20	537,219	6,285	172,077	715,581	215,738	6,285	180,766	402,789	130,421	6,285	172,077	308,783	56.29%	13.14%	43.15%		60.45%
Aug-20	594,689	7,200	161,829.37	763,718.8	265,708.89	7,200	174,593	447,501.89	163,420.22	7,200	161,829.37	332,449.6	58.60%	15.06%	43.53%		61.50%
Sep-20	549,605	9,565	198,024.66	757,194.3	221,350.95	9,565	212,527	443,442.95	143,662.57	9,565	198,024.66	351,252.2	58.56%	12.18%	46.39%		64.90%
Oct-20	549,091.3	8,955	189,512.64	747,558.9	203,421.31	8,955	203,205.2	415,581.51	139,112.49	8,955	189,512.64	337,580.1	55.59%	10.43%	45.16%		68.39%
Nov-20	533,124.8	7,520	166,549.1	707,193.9	177,692	7,520	179,061	364,273	115,025.4	7,520	166,549.1	289,094.5	51.51%	10.63%	40.88%		64.73%
Dec-20	499,355.1	6,911	183,546.9	689,813	195,659.8	6,911	196,930.5	399,501.3	90,427.3	6,911	183,546.9	280,885.2	57.91%	17.20%	40.72%	Avg.	#DIV/0!
												Avg.	50.26%	11.07%	39.19%		270407.3

Important note:
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Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Ratio% (City) 2019																
Billed Month-Year (as recorded in same month in	Total Bills			Total Bills (A)	Collected including Debts			Total including debts (B)	Collected without Debts (Current Collectio			Total without debt (C)	Collection Ratio%(with debts) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio%(without debts) O=C/A	Avg. used to estimate for December without debt for Non-PPWM customers Avg.=C/B
	Issued to non-PPWM customers (Alshamel data)	Issued to customers by tanker water	PPWM customers		By Non-PPWM customers (AlShamel data) (b)	By tanker water	By PPWM customers including 15% dept pay		By Non-PPWM customers (AlShamel data) (c)	By tanker water	By PPWM customers excluding 15% dept pay					
Jan-19	667661.48	4125	0	671786.5	345428.01	4125	0	349553.01	157385.44	4125	0	161510.4	52.03%	27.99%	24.04%	23.57%
Feb-19	654366.66	3625	0	657991.7	342798.81	3625	0	346423.81	212547.75	3625	0	216172.8	52.65%	19.80%	32.85%	32.48%
Mar-19	580546.5	3300	112.5	583959	295766.59	3300	150	299216.59	215825.51	3300	112.5	219238	51.24%	13.70%	37.54%	37.18%
Apr-19	753381.52	4200	1943.94	759525.5	316857.66	4200	2390	323447.66	210525.52	4200	1943.94	216669.5	42.59%	14.06%	28.53%	27.94%
May-19	577764.02	4900	5923.94	588588	279286.89	4900	6800	290986.89	193137.72	4900	5923.94	203961.7	49.44%	14.79%	34.65%	33.43%
Jun-19	716088.92	7100	9681.2	732870.1	376748.12	7100	10799	394647.12	251911.23	7100	9681.2	268692.4	53.85%	17.19%	36.66%	35.18%
Jul-19	634939.34	10000	23241.75	668181.1	271093.6	10000	24595	305688.6	228229.71	10000	23241.75	261471.5	45.75%	6.62%	39.13%	35.95%
Aug-19	630360.94	7725	27234.7	665320.6	372518.25	7725	28587	408830.25	278504	7725	27234.7	313463.7	61.45%	14.33%	47.11%	44.18%
Sep-19	700981.88	12115	49924.66	763021.5	366262.04	12115	52748.8	431125.84	296684.74	12115	49924.66	358724.4	56.50%	9.49%	47.01%	42.32%
Oct-19	678321.8	10385	52270.62	740977.4	325917.11	10385	55151	391453.11	238666.75	10385	52270.62	301322.4	52.83%	12.16%	40.67%	35.18%
Nov-19	908321.82	9200	53553.3	971075.1	303461.02	9200	56127	368788.02	264101.14	9200	53553.3	326854.4	37.98%	4.32%	33.66%	29.08%
Dec-19	590965.38	7175	52029.22	650169.6	379785.473	7175	54480.6	441441.07	202267.7004	7175	52029.22	261471.9	67.90%	27.68%	40.22%	34.23%
												Avg.	52.02%	15.18%	36.84%	
																270407.3

Important note:
 Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-Aug will be collected and added to AlShamel by 30-Sep.
 2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According to CSS (Khaled and Omar) that they close the financial year after Dec so the payment in January for Dec bills can not record on the same columns at Alshamel as other months because they already closed the calculations for last year so they record it on another column without separation (with debt or without debt) and they called it "arrears" which equal the collected with debts in calculation.)

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Ratio% (City) 2018													
Billed Month-Year (as recorded in same month in Al-Shamel)	Total Bills			Collected including Debts			Collected without Debts (Current Collection)			Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio% (without Debt) O=C/A	Avg. used to estimate for December without debt Avg.=c/b
	customers Bills (Alshamel data)	Issued to customers by tanker water	Total Bills (A)	Collected from customers bills (AlShamel data) (b)	By water tankers	Total including debts (B)	Collected from customers bills (AlShamel data) (c)	By water tankers	Total without debt (C)				
Jan-18	568445.3	6335	574780.3	372278.9	6335	378613.9	200750.14	6335	207085.14	65.87%	29.84%	36.03%	35.32%
Feb-18	547553.8	5775	553328.8	405665.35	5775	411440.35	240115.44	5775	245890.44	74.36%	29.92%	44.44%	43.85%
Mar-18	589084.42	5300	594384.42	387159.92	5300	392459.92	241175.79	5300	246475.79	66.03%	24.56%	41.47%	40.94%
Apr-18	585021	7290	592311	296377	7290	303667	207855.1	7290	215145.1	51.27%	14.95%	36.32%	35.53%
May-18	666931.62	7915	674846.62	272277.98	7915	280192.98	226310.85	7915	234225.85	41.52%	6.81%	34.71%	33.93%
Jun-18	541325.34	8520	549845.34	425996.64	8520	434516.64	330519.11	8520	339039.11	79.03%	17.36%	61.66%	61.06%
Jul-18	769957.1	10860	780817.1	359482.93	10860	370342.93	285766.56	10860	296626.56	47.43%	9.44%	37.99%	37.11%
Aug-18	733305.62	8960	742265.62	408894.78	8960	417854.78	322104.66	8960	331064.66	56.29%	11.69%	44.60%	43.93%
Sep-18	716371.44	9068	725439.44	353237.66	9068	362305.66	269421.16	9068	278489.16	49.94%	11.55%	38.39%	37.61%
Oct-18	670486.52	9650	680136.52	370330.26	9650	379980.26	231743.27	9650	241393.27	55.87%	20.38%	35.49%	34.56%
Nov-18	625449.32	8810	634259.32	374971.88	8810	383781.88	256861.17	8810	265671.17	60.51%	18.62%	41.89%	41.07%
Dec-18	580931.34	6040	586971.34	520997.58	6040	527037.58	234965.2598	6040	241005.26	89.79%	48.73%	41.06%	40.45%
Data source: Financial Department									Avg.	61.49%	20.32%	41.17%	
Important note:													
1. Bills which finalized by Alshamel for exact month need another month to be collected. For example, the bills finalized in Al-Shamel on 31-Aug will be collected and added to AlShamel by 30-Sep.													
2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According to CSS (Khaled and Omar) that they close the financial year after Dec so the payment in January for Dec bills can not record on the same columns at Alshamel as other months because they already closed the calculations for last year so they record it on another column without separation (with debt or without debt) and they called it "arrears" which equal the collected with debts in calculation.)													

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Ratio% (City) 2017													
Billed Month-Year (as recorded in same month in Al-Shamel)	Total Bills			Collected including Debts			Collected without Debts (Current Collection)			Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio% (Without Debt)	Avg. used to estimate for December without debt avg.=c/b
	customers Bills (Alshamel data)	Issued to customers by tanker water	Total Bills (A)	Collected from customers bills (AlShamel data)(b)	By water tankers	Total including debts (B)	Collected from customers bills (AlShamel data) (c)	By water tankers	Total without debt (C)				
Jan-17	662364.12	3325	665689.12	523793.11	3325	527118.11	228586.36	3325	231911.36	79.18%	44.35%	34.84%	34.51%
Feb-17	599505.34	3550	603055.34	447905.63	3550	451455.63	235511.93	3550	239061.93	74.86%	35.22%	39.64%	39.28%
Mar-17	606394.38	4275	610669.38	414695.14	4275	418970.14	221413.5	4275	225688.5	68.61%	31.65%	36.96%	36.51%
Apr-17	589408.06	4700	594108.06	389834.77	4700	394534.77	225849.33	4700	230549.33	66.41%	27.60%	38.81%	38.32%
May-17	603668.44	4800	608468.44	324565.679	4800	329365.679	183387.68	4800	188187.68	54.13%	23.20%	30.93%	30.38%
Jun-17	570948.34	5350	576298.34	516110.01	5350	521460.01	321234.12	5350	326584.12	90.48%	33.82%	56.67%	56.26%
Jul-17	671360.7	8050	679410.7	461975.4	8050	470025.4	299324.74	8050	307374.74	69.18%	23.94%	45.24%	44.58%
Aug-17	674222.9	10650	684872.9	416915.11	10650	427565.11	259615.29	10650	270265.29	62.43%	22.97%	39.46%	38.51%
Sep-17	668229.82	6775	675004.82	450151.82	6775	456926.82	307517.76	6775	314292.76	67.69%	21.13%	46.56%	46.02%
Oct-17	558365.38	6775	565140.38	364985.04	6775	371760.04	259162.03	6775	265937.03	65.78%	18.73%	47.06%	46.41%
Nov-17	592622.68	3825	596447.68	405935.18	3825	409760.18	279286.21	3825	283111.21	68.70%	21.23%	47.47%	47.13%
Dec-17	596566.12	4275	600841.12	479225.126	4275	483500.126	248345.1981	4275	252620.198	80.47%	38.43%	42.04%	41.63%
Data source: Financial Department									Avg.	70.66%	28.52%	42.14%	
Important note:													
Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-Aug will be collected and added to AlShamel by 30-Sep.													
2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According to CSS (Khaled and Omar) that they close the financial year after Dec so the payment in January for Dec bills can not record on the same columns at Alshamel as other months because they already closed the calculations for last year so they record it on another column without separation (with debt or without debt) and they called it "arrears" which equal the collected with debts in calculation.)													

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Ratio% (PA1) 2017										
Billed Month-Year (as recorded in same month in Al-Shamel)	# of Billed Customers	Total Bills (A)	Total including debts (B)	Total without debt (C)	Collection Ratio% (with Debt) $N=B/A$	Collection Ratio of Debt Only $D=O-N$	Collection Ratio% (without Debt) $O=C/A$		Avg. used to estimate for December without debt $Avg.=C/B$	
Jan-17	685	61198.22	69182.47	32615.79	113.05%	59.75%	53.30%		53.30%	
Feb-17	685	51017.28	41134.58	29600.36	80.63%	22.61%	58.02%		58.02%	
Mar-17	685	48387.88	48947.81	32378.87	101.16%	34.24%	66.92%		66.92%	
Apr-17	685	51282.4	33220.88	30414.46	64.78%	5.47%	59.31%		59.31%	
May-17	733	55075.3	37910.38	30266.46	68.83%	13.88%	54.95%		54.95%	
Jun-17	745	68635.72	38239.83	34217.02	55.71%	5.86%	49.85%		49.85%	
Jul-17	739	70988.22	36129.18	30801.58	50.89%	7.50%	43.39%		43.39%	
Aug-17	740	50143.74	48240.88	41482.58	96.21%	13.48%	82.73%		82.73%	
Sep-17	692	70247.38	62159.43	46736.1	88.49%	21.96%	66.53%		66.53%	
Oct-17	694	61717.34	48108.48	38950.02	77.95%	14.84%	63.11%		63.11%	
Nov-17	695	65964.74	64763.76	45557.98	98.18%	29.12%	69.06%		69.06%	
Dec-17	697	61994.68	60614.1	37600.8246	97.77%	37.12%	60.65%	Average	60.65%	
Data source: Financial Department				Avg.	82.80%	22.15%	60.65%			
Important note:										
1. Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-Aug will be collected and added to AlShamel by 30-Sep.										
2. AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of customers without debt in December was estimated using the average ratio of the previous 11 months ($C/B=76.71\%$).										

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Ratio% (PA2) 2017									
Billed Month-Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint)	Total Bills (A)	Total including debts (B)	Total without debt (C)	Collection Ratio%(with debts) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio%(witho ut debts) O=C/A		Avg. used to estimate for December without debt Avg.=C/B
Jan-17	587	51110.8	33103	14749.6	64.77%	35.91%	28.86%		28.86%
Feb-17	587	45769.6	33823.4	17173.3	73.90%	36.38%	37.52%		37.52%
Mar-17	589	44823.6	28425.7	13958.4	63.42%	32.28%	31.14%		31.14%
Apr-17	593	51357.6	32316	13763.8	62.92%	36.12%	26.80%		26.80%
May-17	614	48346.7	29759	14844	61.55%	30.85%	30.70%		30.70%
Jun-17	621	54249.9	18520	15974.4	34.14%	4.69%	29.45%		29.45%
Jul-17	621	43845	17965.8	14329.8	40.98%	8.29%	32.68%		32.68%
Aug-17	621	55042.5	27386.8	15864.6	49.76%	20.93%	28.82%		28.82%
Sep-17	599	47354.6	36731.3	19259.3	77.57%	36.90%	40.67%		40.67%
Oct-17	604	47615	34541.6	19897.9	72.54%	30.75%	41.79%		41.79%
Nov-17	604	42911.7	25516.3	15790.8	59.46%	22.66%	36.80%		36.80%
Dec-17	604	40837.8	34859.7	13559.35011	85.36%	52.16%	33.20%	Avg.	33.20%
Data source: Finanical Department				Avg.	62.20%	28.99%	33.20%		
Important note:									
1. Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-Aug will be collected and added to AlShamel by 30-Sep.									
2. AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of customers without debt in December was estimated using the average ratio of the previous 11 months (C/B=57.52%).									

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Ratio% (PA2 without New Camp) 2017								
Billed Month-Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills			Collected Amount			Avg. used to estimate for December without debt for Non-PPWM customers
		Total Bills By Non-PPWM customers (AlShamel data) (A)	Total including debts by Non-PPWM customers (AlShamel data) (B)	Total without debt by Non-PPWM customers (AlShamel data) (C)	Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio% (without Debt) O=C/A	
Jan-17	489	42537.96	44730.72	20112.88	105.15%	57.87%	47.28%	47.28%
Feb-17	489	40132.42	38986.96	19554.76	97.15%	48.42%	48.73%	48.73%
Mar-17	490	35633.02	27864.78	16189.82	78.20%	32.76%	45.43%	45.43%
Apr-17	491	45888.84	19843.68	17564.68	43.24%	4.97%	38.28%	38.28%
May-17	502	34686.8	9501.63	8287.71	27.39%	3.50%	23.89%	23.89%
Jun-17	507	41515.06	33614.3	20022.46	80.97%	32.74%	48.23%	48.23%
Jul-17	507	41193.24	22354.94	17805.88	54.27%	11.04%	43.23%	43.23%
Aug-17	507	39713.82	35306.85	17370.01	88.90%	45.17%	43.74%	43.74%
Sep-17	495	40092.08	35367.32	21502.4	88.22%	34.58%	53.63%	53.63%
Oct-17	496	33743.04	25508.9	18791.68	75.60%	19.91%	55.69%	55.69%
Nov-17	498	41301.84	29744.4	19162.38	72.02%	25.62%	46.40%	46.40%
Dec-17	498	39153.8	32068.05	17602.26125	81.90%	36.95%	44.96%	Avg. 44.96%
				Avg.	74.42%	29.46%	44.96%	
Important note:								
Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-Aug customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According to CSS (Khaled and Omar) that they close the financial year after Dec so the payment in January for Dec bills can not record on the same columns at Alshamel as other months because they already closed the calculations for last year so they record it on another column without separation (with debt or without debt) and they called it "arrears" which equal the collected with debts in calculation.)								

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Ratio% (PA3) 2017									
Billed Month-Year (as recorded in same	# of Billed	Total Bills (A)	Total including debts (B)	Total without debt (C)	Collection Ratio% (with	Collection Ratio of Debt Only	Collection Ratio%	Avg. used to estimate for	
Jan-17	488	42514.39	44730.72	20112.88	105.21%	57.90%	47.31%	47.31%	
Feb-17	488	40108.86	38986.96	19554.76	97.20%	48.45%	48.75%	48.75%	
Mar-17	489	35609.46	27864.78	16189.82	78.25%	32.79%	45.46%	45.46%	
Apr-17	490	45865.28	20088.78	17809.78	43.80%	4.97%	38.83%	38.83%	
May-17	501	34908.34	9501.63	8287.71	27.22%	3.48%	23.74%	23.74%	
Jun-17	506	41491.5	33614.3	20022.46	81.01%	32.76%	48.26%	48.26%	
Jul-17	506	41169.68	22354.94	17805.88	54.30%	11.05%	43.25%	43.25%	
Aug-17	506	39690.26	35466.29	17529.45	89.36%	45.19%	44.17%	44.17%	
Sep-17	494	40327.96	35576.76	21711.84	88.22%	34.38%	53.84%	53.84%	
Oct-17	495	33978.92	25768.34	19051.12	75.84%	19.77%	56.07%	56.07%	
Nov-17	497	41537.72	29953.84	19371.82	72.11%	25.48%	46.64%	46.64%	
Dec-17	497	39389.68	32018.05	17772.42	81.29%	36.17%	45.12%	Aevrage 45.12%	
Data source: Finanical Department				Avg.	74.48%	29.36%	45.12%		
Important note:									
1. Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-Aug									
2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM)									

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Ratio% (New Refugee Camp) 2017											
Billed Month-Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills	Collected Amount		Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio% (without Debt) O=C/A	Avg. used to estimate for December without debt for Non-PPWM customers			
		Total Bills By Non-PPWM customers (AlShamel data) (A)	Total including debts by Non-PPWM customers (AlShamel data) (B)	Total without debt by Non-PPWM customers (AlShamel data) (C)							
Jan-17	99	6808	1772.36	1330.66	26.03%	6.49%	19.55%	19.55%			
Feb-17	99	5416.32	1646.36	1437.06	30.40%	3.86%	26.53%	26.53%			
Mar-17	99	5817.4	1161.86	1126.34	19.97%	0.61%	19.36%	19.36%			
Apr-17	99	6320.16	1136.58	1136.58	17.98%	0.00%	17.98%	17.98%			
May-17	96	6508.78	568	568	8.73%	0.00%	8.73%	8.73%			
Jun-17	100	8303.82	1565.84	1565.84	18.86%	0.00%	18.86%	18.86%			
Jul-17	100	5693.34	1080.7	1080.7	18.98%	0.00%	18.98%	18.98%			
Aug-17	100	7213.08	1791.66	1491.66	24.84%	4.16%	20.68%	20.68%			
Sep-17	99	6050.34	1070.1	1042.2	17.69%	0.46%	17.23%	17.23%			
Oct-17	99	5968.48	1266.5	1169.16	21.22%	1.63%	19.59%	19.59%			
Nov-17	99	5813.22	1188	1188	20.44%	0.00%	20.44%	20.44%			
Dec-17	99	5807.48	1772.36	1097.710902	30.52%	11.62%	18.90%	Avg. 18.90%			
				Avg.	21.30%	2.40%	18.90%				

Important note:
 Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-Aug
 2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According to CSS (Khaled and Omar) that they close the financial year after Dec so the payment in January for Dec bills can not record on the same columns at Alshamel as other months because they already closed the calculations for last year so they record it on another column without separation

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Ratio% (PA1) 2018											
Billed Month-Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills (A)	Total including debts (B)	Total without debt (C)	Collection Ratio% (with Debt) $N=B/A$	Collection Ratio of Debt Only $D= O-N$	Collection Ratio% (without Debt) $O=C/A$		Avg. used to estimate for December without debt $Avg.=C/B$		
Jan-18	700	63021.84	40860.84	31019.8	64.84%	15.62%	49.22%			49.22%	
Feb-18	703	56611.24	52814.68	40781.86	93.29%	21.26%	72.04%			72.04%	
Mar-18	704	52456.5	46379.26	34694.56	88.41%	22.28%	66.14%			66.14%	
Apr-18	706	62342.16	39297.84	35142.98	63.04%	6.66%	56.37%			56.37%	
May-18	707	68801.1	32402.37	29720.24	47.10%	3.90%	43.20%			43.20%	
Jun-18	709	60094.76	52497.07	47585.39	87.36%	8.17%	79.18%			79.18%	
Jul-18	716	73946.5	49640.4	41844.5	67.13%	10.54%	56.59%			56.59%	
Aug-18	719	80744.04	56691.2	50780.2	70.21%	7.32%	62.89%			62.89%	
Sep-18	719	80865.68	47372.97	43769.05	58.58%	4.46%	54.13%			54.13%	
Oct-18	719	70347.22	47778.8	42408.48	67.92%	7.63%	60.28%			60.28%	
Nov-18	723	70652.86	54970	48642.72	77.80%	8.96%	68.85%			68.85%	
Dec-18	730	67499.9	69286.6	41045.26092	102.65%	41.84%	60.81%	Avg.		60.81%	
Data source: Financial Department				Avg.	74.03%	13.22%	60.81%				
Important note:											
1. Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-Aug will be collected and added to AlShamel by 30-Sep.											
2. AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of customers without debt in December was estimated using the average ratio of the previous 11 months (C/B=85.75%).											

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Bill Collection Ratio% (PA2) 2018									
Billed Month-Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills (A)	Total including debts (B)	Total without debt (C)	Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio% (without Debt) O=C/A		Avg. used to estimate for December without debt Avg.=C/B
Jan-18	605	45580.7	29886.3	15395.4	65.57%	31.79%	33.78%		33.78%
Feb-18	607	43474.8	25437.9	13195	58.51%	28.16%	30.35%		30.35%
Mar-18	607	45343	25267.5	17101	55.73%	18.01%	37.71%		37.71%
Apr-18	610	42428	16790	12992	39.57%	8.95%	30.62%		30.62%
May-18	610	45981	19630.9	14693	42.69%	10.74%	31.95%		31.95%
Jun-18	612	31114.5	27924.3	17709.3	89.75%	32.83%	56.92%		56.92%
Jul-18	613	56333.8	24192	21103	42.94%	5.48%	37.46%		37.46%
Aug-18	617	50403	25276.35	21365.5	50.15%	7.76%	42.39%		42.39%
Sep-18	617	50066	20704.6	16515.8	41.35%	8.37%	32.99%		32.99%
Oct-18	620	41227.6	22380.4	12071	54.28%	25.01%	29.28%		29.28%
Nov-18	620	42572	22436	17804.3	52.70%	10.88%	41.82%		41.82%
Dec-18	620	42799	29118.6	15768.42507	68.04%	31.19%	36.84%	Avg.	36.84%
Data source: Financial Department				Avg.	55.11%	18.26%	36.84%		
Important note:									
1. Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-Aug will be collected and added to AlShamel by 30-Sep.									
2. AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of customers without debt in December was estimated using the average ratio of the previous 11 months (C/B=70.14%).									

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Bill Collection Ratio% (PA2 without New Camp) 2018													
Billed Month-Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills	Collected Amount		Collection Ratio% (with Debt) $N=B/A$	Collection Ratio of Debt Only $D=O-N$	Collection Ratio% (without Debt) $O=C/A$	Avg. used to estimate for December without debt for Non-PPWM customers $Avg.=C/B$					
		Total Bills By Non-PPWM customers (AlShamel data) (A)	Total including debts by Non-PPWM customers (AlShamel data) (B)	Total without debt by Non-PPWM customers (AlShamel data) (C)									
Jan-18	501	41717.82	26502.01	17864.99	63.53%	20.70%	42.82%	42.82%					
Feb-18	503	34839.92	25563.24	16025.24	73.37%	27.38%	46.00%	46.00%					
Mar-18	503	38067.4	29301.12	19699.5	76.97%	25.22%	51.75%	51.75%					
Apr-18	503	50652.06	34741.02	20972	68.59%	27.18%	41.40%	41.40%					
May-18	503	46711.92	19316.18	16793.71	41.35%	5.40%	35.95%	35.95%					
Jun-18	503	36781	40522.8	30312.02	110.17%	27.76%	82.41%	82.41%					
Jul-18	505	42068.02	25540.92	16983.86	60.71%	20.34%	40.37%	40.37%					
Aug-18	507	40461.28	22564	19617.24	55.77%	7.28%	48.48%	48.48%					
Sep-18	507	41117.58	28142.97	18848.51	68.45%	22.60%	45.84%	45.84%					
Oct-18	507	40995.48	28777.21	16445.61	70.20%	30.08%	40.12%	40.12%					
Nov-18	507	34682.48	26838.32	18390.04	77.38%	24.36%	53.02%	53.02%					
Dec-18	507	41638.82	43768.1	19993.20487	105.11%	57.10%	48.02%	Avg. 48.02%					
				Avg.	72.63%	24.62%	48.02%						

Important note:
 1- Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-Aug will be
 2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months ($C/B=xx\%$)....(According to CSS (Khaled and Omar) that they close the financial year after Dec so the payment in January for Dec bills can not record on the same columns at Alshamel as other months because they already

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Bill Collection Ratio% (PA3) 2018											
Billed Month-Year (as recorded in same)	# of Billed	Total Bills (A)	Total including debts (B)	Total without debt (C)	Collection Ratio% (with)	Collection Ratio of Debt Only	Collection Ratio%		Avg. used to estimate for		
Jan-18	500	41694.26	26502.01	17864.99	63.56%	20.72%	42.85%			42.85%	
Feb-18	502	34816.36	25563.24	16025.24	73.42%	27.40%	46.03%			46.03%	
Mar-18	502	38043.84	29301.12	19699.5	77.02%	25.24%	51.78%			51.78%	
Apr-18	502	50628.5	34741.02	20972	68.62%	27.20%	41.42%			41.42%	
May-18	502	46688.36	19316.81	16793.71	41.37%	5.40%	35.97%			35.97%	
Jun-18	502	36757.44	40272.8	30170.66	109.56%	27.48%	82.08%			82.08%	
Jul-18	504	42044.46	25340.92	16883.86	60.27%	20.11%	40.16%			40.16%	
Aug-18	506	40437.72	22514	19567.24	55.68%	7.29%	48.39%			48.39%	
Sep-18	506	41094.02	28142.97	18848.51	68.48%	22.62%	45.87%			45.87%	
Oct-18	506	40971.92	28777.21	16445.61	70.24%	30.10%	40.14%			40.14%	
Nov-18	506	34658.92	26838.32	18390.04	77.44%	24.38%	53.06%			53.06%	
Dec-18	506	41615.26	43768.1	19965.54	105.17%	57.20%	47.98%		Avg.	47.98%	
Data source: Finanical Department				Avg.	72.57%	24.59%	47.98%				
Important note:											
1. Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-Aug will be											
2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According to CSS (Khaled and											

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Bill Collection Ratio% (New Refugee Camp) 2018													
Billed Month-Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills	Collected Amount		Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio% (without Debt) O=C/A	Avg. used to estimate for December without debt for Non-PPWM customers					
		Total Bills By Non-PPWM customers (AlShamel data) (A)	Total including debts by Non-PPWM customers (AlShamel data) (B)	Total without debt by Non-PPWM customers (AlShamel data) (C)									
Jan-18	100	5465.86	1490.6	1356.9	27.27%	2.45%	24.83%	24.83%					
Feb-18	100	6429.34	950.2	945.46	14.78%	0.07%	14.71%	14.71%					
Mar-18	100	5222.48	1100.8	1087.38	21.08%	0.26%	20.82%	20.82%					
Apr-18	100	5887.46	1119.54	1114.8	19.02%	0.08%	18.94%	18.94%					
May-18	100	6580.72	953.54	953.54	14.49%	0.00%	14.49%	14.49%					
Jun-18	100	5329.4	1212.76	1198	22.76%	0.28%	22.48%	22.48%					
Jul-18	100	7633.56	1386.06	1386.6	18.16%	-0.01%	18.16%	18.16%					
Aug-18	100	6257.52	1858.18	1409.94	29.70%	7.16%	22.53%	22.53%					
Sep-18	100	7019.42	429.08	429.08	6.11%	0.00%	6.11%	6.11%					
Oct-18	100	7433.02	70.48	70.48	0.95%	0.00%	0.95%	0.95%					
Nov-18	100	6579.68	2239.32	2239.32	34.03%	0.00%	34.03%	34.03%					
Dec-18	100	5807.48	2518.44	1045.594401	43.37%	25.36%	18.00%	Avg. 18.00%					
				Avg.	20.98%	2.97%	18.00%						
Important note:													
Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-Aug will be 2- Alshamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According to CSS (Khaled and													

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Bill Collection Ratio% (PA1) 2019

Billed Month-Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills			Collected including Debts			Collected without Debts (Current Collection)			Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O -N	Collection Ratio (without Debt) O=C/A	Avg. used to estimate for December without debt Avg.=c/b
		Issued to non-PPWM customers (Alshamel data)	PPWM customers	Total Bills (A)	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)				
Jan-19	740	65606.58	0	65606.58	64233.74	0	64233.74	36174.3	0	36174.3	97.91%	42.77%	55.14%	55.14%
Feb-19	740	69937.74	0	69937.74	47148.59	0	47148.59	34998.53	0	34998.53	67.42%	17.37%	50.04%	50.04%
Mar-19	744	60351.14	112.5	60463.64	39297.77	150	39447.77	33524.65	112.5	33637.15	65.24%	9.61%	55.63%	55.55%
Apr-19	746	63645.78	1943.94	65589.72	33220.88	2390	35610.88	30414.46	1943.94	32358.4	54.29%	4.96%	49.33%	47.79%
May-19	733	55075.3	5923.94	60999.24	37910.38	6800	44710.38	30266.46	5923.94	36190.4	73.30%	13.97%	59.33%	54.95%
Jun-19	745	68635.22	9681.2	78316.42	38204	10799	49003	34181.78	9681.2	43862.98	62.57%	6.56%	56.01%	49.80%
Jul-19	738	66710.5	23241.75	89952.25	36058.5	24595	60653.5	30730.9	23241.75	53972.65	67.43%	7.43%	60.00%	46.07%
Aug-19	738	48839.38	27234.7	76074.08	38757	28587	67344	28884.58	27234.7	56119.28	88.52%	14.75%	73.77%	59.14%
Sep-19	740	62747.08	49924.66	112671.74	20953.07	52748.8	73701.87	19968.33	49924.66	69892.99	65.41%	3.38%	62.03%	31.82%
Oct-19	735	24229.12	45517.02	69746.14	17998.46	48305	66303.46	11823.85	45517.02	57340.87	95.06%	12.85%	82.21%	48.80%
Nov-19	722	24388.4	43437.3	67825.7	16285.74	45932	62217.74	15569.74	43437.3	59007.04	91.73%	4.73%	87.00%	63.84%
Dec-19	722	14491.4	37453.22	51944.62	19724.62	39605.6	59330.22	7358.850211	37453.22	44812.07	114.22%	27.95%	86.27%	50.78%
										Avg.	78.59%	13.86%	64.73%	

Important note:

- 1- Bills which finalized by Alshamel for exact month need another month to be collected. For example, the bills finalized in Al-Shamel on 31-Aug will be collected and added to AlShamel by 30-Sep.
- 2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According to CSS (Khaled and Omar) that they close the financial year after Dec so the payment in January for Dec bills can not record on the same columns at Alshamel as other months because they already closed the
- 3 For the month of December 2019, the estimation was adjusted due to the higher payment with debts

Bill Collection Ratio% (PA2) 2019

Billed Month-Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills			Collected including Debts			Collected without Debts (Current Collection)			Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O -N	Collection Ratio (without Debt) O=C/A	Avg. used to estimate for December without debt Avg.=c/b
		Issued to non-PPWM customers (Alshamel data)	PPWM customers	Total Bills (A)	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)				
Jan-19	502	48354.62	0	48354.62	18184.26	0	18184.26	9312.86	0	9312.86	37.61%	18.35%	19.26%	19.26%
Feb-19	502	50044.82	0	50044.82	28513.58	0	28513.58	11938.68	0	11938.68	56.98%	33.12%	23.86%	23.86%
Mar-19	502	43087.82	0	43087.82	19763.46	0	19763.46	15114.94	0	15114.94	45.87%	10.79%	35.08%	35.08%
Apr-19	502	60611.34	0	60611.34	32316.16	0	32316.16	13763	0	13763	53.32%	30.61%	22.71%	22.71%
May-19	497	48496.8	0	48496.8	29759.12	0	29759.12	14844.94	0	14844.94	61.36%	30.75%	30.61%	30.61%
Jun-19	502	51553.36	0	51553.36	18520.84	0	18520.84	15974.38	0	15974.38	35.93%	4.94%	30.99%	30.99%
Jul-19	502	43718.62	0	43718.62	17965.84	0	17965.84	14329.76	0	14329.76	41.09%	8.32%	32.78%	32.78%
Aug-19	502	47009.2	0	47009.2	36050.24	0	36050.24	22667.86	0	22667.86	76.69%	28.47%	48.22%	48.22%
Sep-19	502	47583.24	0	47583.24	29858.98	0	29858.98	23228.8	0	23228.8	62.75%	13.93%	48.82%	48.82%
Oct-19	503	64077.58	0	64077.58	26389.2	0	26389.2	19407.62	0	19407.62	41.18%	10.90%	30.29%	30.29%
Nov-19	503	121695.2	0	121695.2	20359.92	0	20359.92	16935.08	0	16935.08	16.73%	2.81%	13.92%	13.92%
Dec-19	509	46123.28	300	46423.28	28107.54	300	28407.54	14632.92	300	14932.92	61.19%	29.03%	32.17%	31.73%
										Avg.	48.14%	17.54%	30.59%	

Important note:

- 1- Bills which finalized by Alshamel for exact month need another month to be collected. For example, the bills finalized in Al-Shamel on 31-Aug will be collected and added to AlShamel by 30-Sep.
- 2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According to

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Bill Collection Ratio% (PA2 without New Camp) 2019								
Billed Month-Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills	Collected Amount		Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio% (without Debt) O=C/A	Avg. used to estimate for December without debt for Non-PPWM customers Avg.=C/B
		Total Bills By Non-PPWM customers (AlShamel data) (A)	Total including debts by Non-PPWM customers (AlShamel data) (B)	Total without debt by Non-PPWM customers (AlShamel data) (C)				
Jan-19	507	49888.02	28377.06	12933.83	56.88%	30.96%	25.93%	25.93%
Feb-19	507	35594.72	25813.74	15085.02	72.52%	30.14%	42.38%	42.38%
Mar-19	507	34223.18	14615.74	10883.44	42.71%	10.91%	31.80%	31.80%
Apr-19	507	49296.58	19843.68	17504.68	40.25%	4.74%	35.51%	35.51%
May-19	507	34686.8	9501.63	8287.71	27.39%	3.50%	23.89%	23.89%
Jun-19	507	41515.06	33614.3	20022.46	80.97%	32.74%	48.23%	48.23%
Jul-19	507	41193.24	22354.94	17805.88	54.27%	11.04%	43.23%	43.23%
Aug-19	507	39713.82	24160.74	21849.74	60.84%	5.82%	55.02%	55.02%
Sep-19	507	48316	23009.42	17029.98	47.62%	12.38%	35.25%	35.25%
Oct-19	508	39085.64	27829.02	19256.74	71.20%	21.93%	49.27%	49.27%
Nov-19	508	68358.7	17713.28	15253.62	25.91%	3.60%	22.31%	22.31%
Dec-19	515	44837.24	13822.14	N/A*	30.83%	0.00%	0.00%	Avg.
				Avg.	55.47%	16.42%	39.05%	37.53%

Important note:

- 1- Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on
- 2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According to CSS (Khaled and Omar) that they close
- 3- * Regarding the month of December 2019 in PA2: the collection was very low. This low collection also had affected the estimated average debt collection of the month (to be larger than the total collection using the estimation method as the last months). The collection ratio team decided to exclude this exceptional month. It's worth to be noted that this

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Bill Collection Ratio% (PA3) 2019														
Billed Month- Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills			Collected including Debts			Collected without Debts (Current Collection)			Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio% (without Debt) O=C/A	Avg. used to estimate for December without debt Avg.=c/b
		Issued to non-PPWM customers (Alshamel data)	PPWM customers	Total Bills (A)	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)				
Jan-19	502	49633.54	0	49633.54	23457.06	0	23457.06	12813.83	0	12813.83	47.26%	21.44%	25.82%	25.82%
Feb-19	502	35233.26	0	35233.26	25650.74	0	25650.74	14922.02	0	14922.02	72.80%	30.45%	42.35%	42.35%
Mar-19	502	34042.8	0	34042.8	14615.08	0	14615.08	10883.44	0	10883.44	42.93%	10.96%	31.97%	31.97%
Apr-19	502	49081.82	0	49081.82	19803.68	0	19803.68	17524.68	0	17524.68	40.35%	4.64%	35.71%	35.71%
May-19	497	34471.54	0	34471.54	9281.63	0	9281.63	8067.71	0	8067.71	26.93%	3.52%	23.40%	23.40%
Jun-19	502	40782.58	0	40782.58	33614.3	0	33614.3	20022.46	0	20022.46	82.42%	33.33%	49.10%	49.10%
Jul-19	502	41039.56	0	41039.56	22111.94	0	22111.94	17562.88	0	17562.88	53.88%	11.08%	42.80%	42.80%
Aug-19	502	39381.9	0	39381.9	22300.74	0	22300.74	21789.74	0	21789.74	56.63%	1.30%	55.33%	55.33%
Sep-19	502	48037.32	0	48037.32	23009.42	0	23009.42	17029.98	0	17029.98	47.90%	12.45%	35.45%	35.45%
Oct-19	503	38683.4	0	38683.4	23099.02	0	23099.02	19056.74	0	19056.74	59.71%	10.45%	49.26%	49.26%
Nov-19	503	67740.14	0	67740.14	17413.28	0	17413.28	14953.62	0	14953.62	25.71%	3.63%	22.07%	22.07%
Dec-19	509	44431.36	1520	45951.36	1572	1520	3092	N/A*	1520	#VALUE!	6.73%	0.00%	0.00%	Avg. 38.74%
										Avg.	46.94%	13.02%	37.57%	

Important note:

- 1- Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on
- 2- Alshamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According to CSS (Khaled and Omar) that they close
- 3- * Regarding the month of December 2019 in PA3: the collection was low because the collector of PA3 area was suspended by JM and thus there was a low collection this month. This low collection also had affected the estimated average debt collection of the month (to be larger than the total collection using the estimation method as the last months). The

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Ratio% (New Refugee Camp) 2019													
Billed Month-Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills	Collected Amount		Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio% (without Debt) O=C/A	Avg. used to estimate for					
		Total Bills By Non-PPWM customers (AlShamel data) (A)	Total including debts by Non-PPWM customers (AlShamel data) (B)	Total without debt by Non-PPWM customers (AlShamel data) (C)									
Jan-19	100	5230.8	2185.86	563.34	41.79%	31.02%	10.77%		10.77%				
Feb-19	100	5376.08	960.3	909.42	17.86%	0.95%	16.92%		16.92%				
Mar-19	100	6385.52	842.34	812.82	13.19%	0.46%	12.73%		12.73%				
Apr-19	100	6958.58	1136.58	1136.58	16.33%	0.00%	16.33%		16.33%				
May-19	100	6508.78	568	568	8.73%	0.00%	8.73%		8.73%				
Jun-19	100	8303.82	1565.84	1565.84	18.86%	0.00%	18.86%		18.86%				
Jul-19	100	5693.34	1080.7	1080.7	18.98%	0.00%	18.98%		18.98%				
Aug-19	100	7213.08	8447.9	2604.9	117.12%	81.01%	36.11%		36.11%				
Sep-19	100	7727.98	1403.78	1197.48	18.16%	2.67%	15.50%		15.50%				
Oct-19	100	6656.2	1235.92	926	18.57%	4.66%	13.91%		13.91%				
Nov-19	100	7010.3	972.04	972.04	13.87%	0.00%	13.87%		13.87%				
Dec-19	100	5893.78	1410.34	978.9052269	23.93%	7.32%	16.61%	Avg.	16.61%				
				Avg.	28.96%	12.08%	16.88%						

Important note:

1- Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on

2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According to CSS (Khaled and Omar) that they close

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Ratio% (PA1) 2020

Billed Month-Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills			Collected including Debts			Collected without Debts (Current Collection)			Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio (without Debt) O=C/A	Avg. used to estimate for December without debt Avg.=c/b
		Issued to non-PPWM customers (Alshamel data)	PPWM customers	Total Bills (A)	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)				
Jan-20														#DIV/0!
Feb-20	706	12882.04	42218.6	55100.64	16445.02	44778	61223.02	5157.18	42218.6	47375.78	111.11%	25.13%	85.98%	40.03%
Mar-20	691	11217.92	55447.63	66665.55	8729.36	58948	67677.36	4987.88	55447.63	60435.51	101.52%	10.86%	90.65%	44.46%
Apr-20	714	15412.2	29949	45361.2	4415.46	30702	35117.46	2634.46	29949	32583.46	77.42%	5.59%	71.83%	17.09%
May-20	714	15370.42	54049.2	69419.62	5354.68	57174	62528.68	4242.98	54049.2	58292.18	90.07%	6.10%	83.97%	27.60%
Jun-20	680	28395.2	53997.83	82393.03	28700.73	56882	85582.73	14388.98	53997.83	68386.81	103.87%	20.87%	83.00%	50.67%
Jul-20	673	17909.06	58682.44	76591.5	12145.57	62489	74634.57	8515.11	58682.44	67197.55	97.44%	9.71%	87.73%	47.55%
Aug-20	674	27268.08	53663.56	80931.64	15805.15	57703	73508.15	9714.32	53663.56	63377.88	90.83%	12.52%	78.31%	196.80%
Sep-20	662	19807.34	57332.34	77139.68	17464.55	61797	79261.55	11186.31	57332.34	68518.65	102.75%	13.93%	88.82%	56.48%
Oct-20	670	21109.8	53473.19	74582.99	15038.54	57691.2	72729.74	12157	53473.19	65630.19	97.52%	9.52%	88.00%	57.59%
Nov-20		26427.8	47046.76	73474.56	10651.37	50483	61134.37	8444.86	47046.76	55491.62	83.20%	7.68%	75.52%	31.95%
Dec-20		13617.98	48727.44	62345.42	16950.37	52395	69345.37	8962.62	48727.44	57690.06	111.23%	18.69%	92.53%	57.02%
										Avg.	97.00%	12.78%	84.21%	16505.56

Important note:
 1- There is no clear data for the month of January 2020 due to start using the MBS
 2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According to CSS (Khaled and Omar) that they close the financial year after Dec so the payment in January for Dec bills can not record on the same columns at Alshamel as other months because they already closed the

Bill Collection Ratio% (PA2) 2020

Billed Month-Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills			Collected including Debts			Collected without Debts (Current Collection)			Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio (without Debt) O=C/A	Avg. used to estimate for December without debt Avg.=c/b
		Issued to non-PPWM customers (Alshamel data)	PPWM customers	Total Bills (A)	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)				
Jan-20														#DIV/0!
Feb-20	626	54428.84	26841	81269.84	24921.66	26913	51834.66	13002.88	26841	39843.88	63.78%	14.75%	49.03%	23.89%
Mar-20	631	32906.84	34808.16	67715	6055.18	34955	41010.18	3580.26	34808.16	38388.42	60.56%	3.87%	56.69%	10.88%
Apr-20	632	32894.82	29874.6	62769.42	2235.92	30341	32576.92	2125.32	29874.6	31999.92	51.90%	0.92%	50.98%	6.46%
May-20	636	32574.38	30336.46	62910.84	3255.46	30423	33678.46	1586.58	30336.46	31923.04	53.53%	2.79%	50.74%	4.87%
Jun-20	635	37940.58	33082	71022.58	14225.44	33248	47473.44	7650.44	33082	40732.44	66.84%	9.49%	57.35%	20.16%
Jul-20	633	20307.9	37601.18	57909.08	9680.3	39395	49075.3	5254.3	37601.18	42855.48	84.75%	10.74%	74.00%	25.87%
Aug-20	626	19952.06	31592.46	51544.52	11820.8	34640	46460.8	4703.48	31592.46	36295.94	90.14%	19.72%	70.42%	23.57%
Sep-20	626	36506.54	36053.56	72560.1	11242.54	39268	50510.54	3747	36053.56	39800.56	69.61%	14.76%	54.85%	10.26%
Oct-20	622	33127	35603.72	68730.72	8747.26	38694	47441.26	2889.84	35603.72	38493.56	69.02%	13.02%	56.01%	8.72%
Nov-20		39207.7	29629.68	68837.38	7556.12	32310	39866.12	4415.04	29629.68	34044.72	57.91%	8.46%	49.46%	11.26%
Dec-20		18680.86	33225.36	51906.22	10003.88	36097	46100.88	3905.38	33225.36	37130.74	88.82%	17.28%	71.53%	14.60%
										Avg.	68.81%	10.53%	58.28%	1460.17

Important note:
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 2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According to the collection ratio decreased in PA2 because there are 4 government institutions have 18523.9 NIS water bill and they did not pay.

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Bill Collection Ratio% (PA2 without New Camp) 2020

Billed Month- Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills			Collected including Debts			Collected without Debts (Current Collection)			Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio% (without Debt) O=C/A	Avg. used to estimate for December without debt Avg.=c/b
		Issued to non-PPWM customers (Alshamel data)	PPWM customers	Total Bills (A)	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)				
Jan-20														#DIV/0!
Feb-20	515	28372.9	28110	56482.9	7944.77	28389	36333.77	5306.25	28110	33416.25	64.33%	5.17%	59.16%	18.70%
Mar-20	515	26870.18	21586.11	48456.29	8859.33	21870	30729.33	5000.94	21586.11	26587.05	63.42%	8.55%	54.87%	18.61%
Apr-20	515	14664.24	22444.5	37108.74	3384.98	22606	25990.98	3190.48	22444.5	25634.98	70.04%	0.96%	69.08%	21.76%
May-20	515	15222.48	21901.16	37123.64	5442.86	22020	27462.86	5036.52	21901.16	26937.68	73.98%	1.41%	72.56%	33.09%
Jun-20	515	28587.96	33082	61669.96	13013.12	33248	46261.12	6438.12	33082	39520.12	75.01%	10.93%	64.08%	34.06%
Jul-20	534	13213.78	37551.18	50764.96	7927.14	39345	47272.14	4501.14	37551.18	42052.32	93.12%	10.28%	82.84%	#REF!
Aug-20	525	11350.7	31556.46	42907.16	10560.12	34600	45160.12	3442.8	31556.46	34999.26	105.25%	23.68%	81.57%	30.33%
Sep-20	526	28800.76	36008.56	64809.32	8301.66	39218	47519.66	2806.52	36008.56	38815.08	73.32%	13.43%	59.89%	9.74%
Oct-20	520	25778.9	35603.72	61382.62	7851.74	38694	46545.74	1994.32	35603.72	37598.04	75.83%	14.58%	61.25%	7.74%
Nov-20	518	28725.88	29584.68	58310.56	4764.32	32260	37024.32	3623.2	29584.68	33207.88	63.50%	6.55%	56.95%	12.61%
Dec-20		10773.44	33225.36	43998.8	8905.7	36097	45002.7	2934.2	33225.36	36159.56	102.28%	20.10%	82.18%	Avg. #REF!
										Avg.	78.19%	10.51%	67.68%	

Important note:

Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-2- Alshamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According

The collection ratio decreased in PA2 in Sep 2020, because there are 4 government institutions have 18523.9 NIS water bill and they did not pay.

Bill Collection Ratio% (PA3) 2020

Billed Month- Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills			Collected including Debts			Collected without Debts (Current Collection)			Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio% (without Debt) O=C/A	Avg. used to estimate for December without debt Avg.=c/b
		Issued to non-PPWM customers (Alshamel data)	PPWM customers	Total Bills (A)	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)				
Jan-20														#DIV/0!
Feb-20	514	28349.34	28110	56459.34	7944.77	28389	36333.77	5306.25	28110	33416.25	64.35%	5.17%	59.19%	18.72%
Mar-20	513	26846.62	33223.61	60070.23	8517.94	33565	42082.94	5000.94	33223.61	38224.55	70.06%	6.42%	63.63%	18.63%
Apr-20	513	14664.24	27589.87	42254.11	2607.85	28367	30974.85	3190.48	27589.87	30780.35	73.31%	0.46%	72.85%	21.76%
May-20	513	15222.48	36203.66	51426.14	5236.52	36410	41646.52	5036.52	36203.66	41240.18	80.98%	0.79%	80.19%	33.09%
Jun-20	513	17287.26	36810	54097.26	15634.48	36990	52624.48	6988.48	36810	43798.48	97.28%	16.32%	80.96%	40.43%
Jul-20	513	10456.88	39562.5	50019.38	10154.99	41234	51388.99	4709.59	39562.5	44272.09	102.74%	14.23%	88.51%	45.04%
Aug-20	515	10484.96	35643.8	46128.76	9003.94	38740	47743.94	6029.94	35643.8	41673.74	103.50%	13.16%	90.34%	57.51%
Sep-20	514	11315.04	37629.1	48944.14	7181.86	37963	45144.86	4735.86	37629.1	42364.96	92.24%	5.68%	86.56%	41.85%
Oct-20	514	10410.4	35150.62	45561.02	6461.18	38260	44721.18	5868.96	35150.62	41019.58	98.16%	8.12%	90.03%	56.38%
Nov-20	518	9618.02	30640.16	40258.18	10147.92	33268	43415.92	7512.54	30640.16	38152.7	107.84%	13.07%	94.77%	78.11%
Dec-20		9088.56	32155.64	41244.2	7095.06	35183.5	42278.56	5246.64	32155.64	37402.28	102.51%	11.82%	90.68%	Avg. 41.15%
										Avg.	90.27%	8.66%	81.61%	

Important note:

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2- Alshamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According

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Bill Collection Ratio% (New Camp) 2020

Billed Month- Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills			Collected including Debts			Collected without Debts (Current Collection)			Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O -N	Collection Ratio% (without Debt) O=C/A	Avg. used to estimate for December without debt Avg.=c/b
		Issued to non-PPWM customers (Alshamel data)	PPWM customers	Total Bills (A)	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)				
Jan-20														#DIV/0!
Feb-20		5295.64	0	5295.64	1277.08	0	1277.08	926.7	0	926.7	24.12%	6.62%	17.50%	17.50%
Mar-20		6352.24	0	6352.24	668.22	0	668.22	588.9	0	588.9	10.52%	1.25%	9.27%	9.27%
Apr-20		6414.96	0	6414.96	495.04	0	495.04	495.04	0	495.04	7.72%	0.00%	7.72%	7.72%
May-20		6414.96	0	6414.96	499.28	0	499.28	499.28	0	499.28	7.78%	0.00%	7.78%	7.78%
Jun-20		9352.62	0	9352.62	1212.32	0	1212.32	1212.32	0	1212.32	12.96%	0.00%	12.96%	12.96%
Jul-20		7045.5	50	7095.5	1753.16	50	1803.16	753.16	50	803.16	25.41%	14.09%	11.32%	10.69%
Aug-20		8026.8	36	8062.8	1260.68	40	1300.68	1260.68	36	1296.68	16.13%	0.05%	16.08%	15.71%
Sep-20		6898.58	45	6943.58	2940.88	50	2990.88	940.88	45	985.88	43.07%	28.88%	14.20%	13.64%
Oct-20		7348.66	0	7348.66	895.52	0	895.52	895.52	0	895.52	12.19%	0.00%	12.19%	12.19%
Nov-20		10481.82	45	10526.82	2791.8	50	2841.8	791.84	45	836.84	27.00%	19.05%	7.95%	7.55%
Dec-20		7907.42	0	7907.42	1098.18	0	1098.18	971.18	0	971.18	13.89%	1.61%	12.28%	11.50%
										Avg.	18.25%	6.50%	11.75%	

Important note:

Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-2- Alshamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According April and May bills were estimated based on the avg. consumption of each customer due to the Covid-19 situation in Palestine.

Bill Collection Ratio% (PA1) 2021

Billed Month- Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills			Collected including Debts			Collected without Debts (Current Collection)			Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O -N	Collection Ratio% (without Debt) O=C/A	Avg. used to estimate for December without debt Avg.=c/b
		Issued to non-PPWM customers (Alshamel data)	PPWM customers	Total Bills (A)	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)				
Jan-21		12829.32	40702.5	53531.82	11812.1	43488.5	55300.6	3073.68	40702.5	43776.18	103.30%	21.53%	81.78%	26.02%
Feb-21		11153.56	40690.27	51843.83	11634.57	43647	55281.57	5703.71	40690.27	46393.98	106.63%	17.14%	89.49%	51.14%
Mar-21		10115.52	49373.94	59489.46	5899.98	52825	58724.98	5826.54	49373.94	55200.48	98.71%	5.92%	92.79%	57.60%
Apr-21		12243.86	59399.93	71643.79	7105.8	63531	70636.8	6959.96	59399.93	66359.89	98.59%	5.97%	92.62%	56.84%
May-21		13470.46	59047.03	72517.49	10209.42	63226	73435.42	6281.22	59047.03	65328.25	101.27%	11.18%	90.09%	46.63%
Jun-21		26912.28	60593.87	87506.15	10885.56	65061	75946.56	9612.92	60593.87	70206.79	86.79%	6.56%	80.23%	35.72%
Jul-21		11909.74	64380.1	76289.84	14329.46	69193	83522.46	11604.18	64380.1	75984.28	109.48%	9.88%	99.60%	97.43%
Aug-21		14750.5	58066	72816.5	14608.68	62505	77113.68	8638.18	58066	66704.18	105.90%	14.30%	91.61%	393.65%
Sep-21		19406	54636.19	74042.19	15261.9	58675	73936.9	11676.52	54636.19	66312.71	99.86%	10.30%	89.56%	60.17%
Oct-21		16409	52323	68732	13401	55641	69042	12502	52323	64825	100.45%	6.14%	94.32%	76.19%
Nov-21														#DIV/0!
Dec-21														#DIV/0!
										Avg.	101.10%	10.89%	90.21%	16505.56

Important note:

1- There is no clear data for the month of January 2020 due to start using the MBS

2- Alshamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According to CSS (Khaled and Omar) that they close the financial year after Dec so the payment in January for Dec bills can not record on the same columns at Alshamel as other months because they already closed the

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Ratio% (PA2) 2021

Billed Month-Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills			Collected including Debts			Collected without Debts (Current Collection)			Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio% (without Debt) O=C/A	Avg. used to estimate for December without debt Avg.=c/b
		Issued to non-PPWM customers (Alshamel data)	PPWM customers	Total Bills (A)	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)				
Jan-21		44868.88	31627.7	76496.58	14508.44	34404	48912.44	2133	31627.7	33760.7	63.94%	19.81%	44.13%	14.70%
Feb-21		33698.8	30369.34	64068.14	26250.1	32893	59143.1	3659.62	30369.34	34028.96	92.31%	39.20%	53.11%	10.86%
Mar-21		25423.02	33254.56	58677.58	8866.62	36304	45170.62	3646.12	33254.56	36900.68	76.98%	14.09%	62.89%	14.34%
Apr-21		41533.26	40840	82373.26	6264.7	44523	50787.7	2387.7	40840	43227.7	61.66%	9.18%	52.48%	5.75%
May-21		42461.3	37371.54	79832.84	5879.64	40591	46470.64	4249.3	37371.54	41620.84	58.21%	6.07%	52.13%	10.01%
Jun-21		42888.46	36605.38	79493.84	7665.94	39763	47428.94	4968.96	36605.38	41574.34	59.66%	7.36%	52.30%	11.59%
Jul-21		31146.72	38794.98	69941.7	9887.84	42062.8	51950.64	4939.16	38794.98	43734.14	74.28%	11.75%	62.53%	15.86%
Aug-21		35528.7	37227.5	72756.2	7269.2	40339	47608.2	2867.2	37227.5	40094.7	65.44%	10.33%	55.11%	8.07%
Sep-21		32362.54	34666.36	67028.9	29791.14	37539	67330.14	10735.36	34666.36	45401.72	100.45%	32.71%	67.73%	33.17%
Oct-21		31578	31976.1	63554.1	9407.1	34756	44163.1	3353	31976.1	35329.1	69.49%	13.90%	55.59%	10.62%
Nov-21														#DIV/0!
Dec-21														#DIV/0!
										Avg.	72.24%	16.44%	55.80%	

Important note:

- 1- There is no clear data for the month of January 2020 due to start using the MBS
- 2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According The collection ratio decreased in PA2 because there are 4 government institutions have 18523.9 NIS water bill and they did not pay.

Bill Collection Ratio% (PA2 without New Camp) 2021

Billed Month-Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills			Collected including Debts			Collected without Debts (Current Collection)			Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio% (without Debt) O=C/A	Avg. used to estimate for December without debt Avg.=c/b
		Issued to non-PPWM customers (Alshamel data)	PPWM customers	Total Bills (A)	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)				
Jan-21		32138.76	31587.2	63725.96	11696.44	34359	46055.44	1884	31587.2	33471.2	72.27%	19.75%	52.52%	5.86%
Feb-21		25608.78	30342.34	55951.12	23151.54	32863	56014.54	2728.06	30342.34	33070.4	100.11%	41.01%	59.11%	10.65%
Mar-21		17139.84	33029.56	50169.4	8237.5	36054	44291.5	3017	33029.56	36046.56	88.28%	16.43%	71.85%	17.60%
Apr-21		34312.78	40770	75082.78	5783	44423	50206	1877	40770	42647	66.87%	10.07%	56.80%	5.47%
May-21		35356.28	37056.04	72412.32	5126.04	40246	45372.04	3526.3	37056.04	40582.34	62.66%	6.61%	56.04%	9.97%
Jun-21		32989.8	36628.38	69618.18	5426.74	39763.3	45190.04	3926	36628.38	40554.38	64.91%	6.66%	58.25%	15.51%
Jul-21		25216	38667	63883	8795	41920	50715	3910.84	38667	42577.84	79.39%	12.74%	66.65%	#REF!
Aug-21		28438.9	37038	65476.9	6221.5	40134	46355.5	1819.48	37038	38857.48	70.80%	11.45%	59.35%	6.40%
Sep-21		23389.44	34476.36	57865.8	28552	37339	65891	9496.22	34476.36	43972.58	113.87%	37.88%	75.99%	40.60%
Oct-21		25470	31886.1	57356.1	8092.1	34656	42748.1	2232	31886.1	34118.1	74.53%	15.05%	59.48%	8.76%
Nov-21														#DIV/0!
Dec-21														#REF!
										Avg.	79.37%	17.76%	61.60%	

Important note:

- 1- Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-
- 2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)....(According The collection ratio decreased in PA2 in Sep 2020, because there are 4 government institutions have 18523.9 NIS water bill and they did not pay.

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Ratio% (PA3) 2021

Billed Month- Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills			Collected including Debts			Collected without Debts (Current Collection)			Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio (without Debt) O=C/A	Avg. used to estimate for December without debt Avg.=c/b
		Issued to non-PPWM customers (Alshamel data)	PPWM customers	Total Bills (A)	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)				
Jan-21		9523.42	28503	38026.42	5979.58	31070	37049.58	1440	28503	29943	97.43%	18.69%	78.74%	24.08%
Feb-21		10855.8	28246.18	39101.98	6662.78	30727	37389.78	5387.02	28246.18	33633.2	95.62%	9.61%	86.01%	49.62%
Mar-21		7433.74	31681.2	39114.94	6909.74	34825	41734.74	6747.36	31681.2	38428.56	106.70%	8.45%	98.25%	90.77%
Apr-21		7983.52	37023.22	45006.74	6296.44	40690	46986.44	3923.74	37023.22	40946.96	104.40%	13.42%	90.98%	49.15%
May-21		9863	36551.45	46414.45	6952.45	40150	47102.45	4730.78	36551.45	41282.23	101.48%	12.54%	88.94%	47.96%
Jun-21		13037.82	35914.5	48952.32	7243.96	39557	46800.96	4761.28	35914.5	40675.78	95.61%	12.51%	83.09%	36.52%
Jul-21		7872.2	37396.16	45268.36	3424.58	41445	44869.58	3116.18	37396.16	40512.34	99.12%	9.63%	89.49%	39.58%
Aug-21		6846.8	33762.54	40609.34	5372.94	37190	42562.94	3475.44	33762.54	37237.98	104.81%	13.11%	91.70%	50.76%
Sep-21		7430.32	33467.46	40897.78	7199.26	36630	43829.26	4928.26	33467.46	38395.72	107.17%	13.29%	93.88%	66.33%
Oct-21		7903	30520	38423	5620	33690	39310	5520	30520	36040	102.31%	8.51%	93.80%	69.85%
Nov-21														#DIV/0!
Dec-21														#DIV/0!
										Avg.	101.46%	11.98%	89.49%	

Important note:

1- There is no clear data for the month of January 2020 due to start using the MBS

2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)...(According

Bill Collection Ratio% (New Camp) 2021

Billed Month- Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills			Collected including Debts			Collected without Debts (Current Collection)			Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio (without Debt) O=C/A	Avg. used to estimate for December without debt Avg.=c/b
		Issued to non-PPWM customers (Alshamel data)	PPWM customers	Total Bills (A)	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)				
Jan-21		12730.12	40.5	12770.62	2812	45	2857	249	40.5	289.5	22.37%	20.10%	2.27%	8.85%
Feb-21		8090.2	27	8117.2	3098.56	30	3128.56	931.56	27	958.56	38.54%	26.73%	11.81%	11.51%
Mar-21		7945.78	135	8080.78	629.12	150	779.12	629.12	135	764.12	9.64%	0.19%	9.46%	7.92%
Apr-21		7220.48	90	7310.48	490.64	100	590.64	490.64	90	580.64	8.08%	0.14%	7.94%	6.80%
May-21		7105	99	7204	753	110	863	723	99	822	11.98%	0.57%	11.41%	10.18%
Jun-21		9898.66	0	9898.66	2247.2	0	2247.2	1042.2	0	1042.2	22.70%	12.17%	10.53%	10.53%
Jul-21		5930.76	128.52	6059.28	1073.32	142.8	1216.12	1028.32	128.52	1156.84	20.07%	0.98%	19.09%	17.34%
Aug-21		7089.8	189.5	7279.3	1047.7	205	1252.7	1047.7	189.5	1237.2	17.21%	0.21%	17.00%	14.78%
Sep-21		8973.1	150	9123.1	1249.14	200	1449.14	1239.36	150	1389.36	15.88%	0.66%	15.23%	13.81%
Oct-21		6108	90	6198	1225	100	1325	1121	90	1211	21.38%	1.84%	19.54%	18.35%
Nov-21														#DIV/0!
Dec-21														#DIV/0!
										Avg.	18.79%	6.36%	12.43%	

Important note:

Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-

2- AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)...(According

April and May bills were estimated based on the avg. consumption of each customer due to the Covid-19 situation in Palestine.

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Ratio% (PA2 without new camp and Government institutions) 2021														
Billed Month- Year (as recorded in same month in Al-Shamel)	# of Billed Customers (Joint in GIS)	Total Bills			Collected including Debts			Collected without Debts (Current Collection)			Collection Ratio% (with Debt) N=B/A	Collection Ratio of Debt Only D= O-N	Collection Ratio% (without Debt) O=C/A	Avg. used to estimate for December without debt Avg.=c/b
		Issued to non-PPWM customers (Alshamel data)	PPWM customers	Total Bills (A)	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)				
Jan-21		7858.26	31587.2	39445.46	11696.44	34359	46055.44	1884	31587.2	33471.2	116.76%	31.90%	84.85%	23.97%
Feb-21		7885.98	30342.34	38228.32	23151.54	32863	56014.54	2728.06	30342.34	33070.4	146.53%	60.02%	86.51%	34.59%
Mar-21		5901.56	33029.56	38931.12	8237.5	36054	44291.5	3017	33029.56	36046.56	113.77%	21.18%	92.59%	51.12%
Apr-21		5469.58	40770	46239.58	5783	44423	50206	1877	40770	42647	109.68%	17.45%	92.23%	34.32%
May-21		9332.18	37056.04	46388.22	5126.04	40246	45372.04	3526.3	37056.04	40582.34	97.81%	10.33%	87.48%	37.79%
Jun-21		10039.8	36605.38	46645.18	7665.38	39763	47428.38	4968.96	36605.38	41574.34	101.68%	12.55%	89.13%	69.32%
Jul-21		5642.1	38667	44309.1	8795	41920	50715	3910.84	38667	42577.84	114.46%	18.36%	96.09%	#REF!
Aug-21		7947.2	37038	44985.2	6221.5	40134	46355.5	1819.48	37038	38857.48	103.05%	16.67%	86.38%	22.89%
Sep-21		10758.24	34476.36	45234.6	28552	37339	65891	9496.22	34476.36	43972.58	145.67%	48.45%	97.21%	88.27%
Oct-21		7351	31886.1	39237.1	8092.1	34656	42748.1	2232	31886.1	34118.1	108.95%	21.99%	86.95%	30.36%
Nov-21														#DIV/0!
Dec-21														#REF!
										Avg.	115.83%	25.89%	89.94%	

Important note:
 Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-2- Alshamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in December was estimated using the average ratio of the previous 11 months (C/B= xx%)...(According The collection ratio decreased in PA2 in Sep 2020, because there are 4 government institutions have 18523.9 NIS water bill and they did not pay.

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Collection Rate Summary															
Billed Month	With Debt					Only Debt					Without Debt				
PA1	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
January	113.05%	64.84%	97.91%		103.30%	59.75%	15.62%	42.77%		21.53%	53.30%	49.22%	55.14%		81.78%
February	80.63%	93.29%	67.42%	111.11%	106.63%	22.61%	21.26%	17.37%	25.13%	17.14%	58.02%	72.04%	50.04%	85.98%	89.49%
March	101.16%	88.41%	65.24%	101.52%	98.71%	34.24%	22.28%	9.61%	10.86%	5.92%	66.92%	66.14%	55.63%	90.65%	92.79%
April (start payments by PPWM)	64.78%	63.04%	54.29%	77.42%	98.59%	5.47%	6.66%	4.96%	5.59%	5.97%	59.31%	56.37%	49.33%	71.83%	92.62%
May	68.83%	47.10%	73.30%	90.07%	101.27%	13.88%	3.90%	13.97%	6.10%	11.18%	54.95%	43.20%	59.33%	83.97%	90.09%
June	55.71%	87.36%	62.57%	103.87%	86.79%	5.86%	8.17%	6.56%	20.87%	6.56%	49.85%	79.18%	56.01%	83.00%	80.23%
July	50.89%	67.13%	67.43%	97.44%	109.48%	7.50%	10.54%	7.43%	9.71%	9.88%	43.39%	56.59%	60.00%	87.73%	99.60%
August	96.21%	70.21%	88.52%	90.83%	105.90%	13.48%	7.32%	14.75%	12.52%	14.30%	82.73%	62.89%	73.77%	78.31%	91.61%
September	88.49%	58.58%	65.41%	102.75%	99.86%	21.96%	4.46%	3.38%	13.93%	10.30%	66.53%	54.13%	62.03%	88.82%	89.56%
October	77.95%	67.92%	95.06%	97.52%	100.45%	14.84%	7.63%	12.85%	9.52%	6.14%	63.11%	60.28%	82.21%	88.00%	94.32%
November	98.18%	77.80%	91.73%	83.20%		29.12%	8.96%	4.73%	7.68%		69.06%	68.85%	87.00%	75.52%	
December	97.77%	102.65%	114.22%	111.23%		37.12%	41.84%	27.95%	18.69%		60.65%	60.81%	86.27%	92.53%	
Avg.	82.80%	74.03%	78.59%	97.00%	101.10%	22.15%	13.22%	13.86%	12.78%	10.89%	60.65%	60.81%	64.73%	84.21%	90.21%
PA2 (with Camp)	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
January	64.77%	65.57%	37.61%		63.94%	35.91%	31.79%	18.35%		19.81%	28.86%	33.78%	19.26%		44.13%
February	73.90%	58.51%	56.98%	63.78%	92.31%	36.38%	28.16%	33.12%	14.75%	39.20%	37.52%	30.35%	23.86%	49.03%	53.11%
March	63.42%	55.73%	45.87%	60.56%	76.98%	32.28%	18.01%	10.79%	3.87%	14.09%	31.14%	37.71%	35.08%	56.69%	62.89%
April	62.92%	39.57%	53.32%	51.90%	61.66%	36.12%	8.95%	30.61%	0.92%	9.18%	26.80%	30.62%	22.71%	50.98%	52.48%
May	61.55%	42.69%	61.36%	53.53%	58.21%	30.85%	10.74%	30.75%	2.79%	6.07%	30.70%	31.95%	30.61%	50.74%	52.13%
June	34.14%	89.75%	35.93%	66.84%	59.66%	4.69%	32.83%	4.94%	9.49%	7.36%	29.45%	56.92%	30.99%	57.35%	52.30%
July	40.98%	42.94%	41.09%	84.75%	74.28%	8.29%	5.48%	8.32%	10.74%	11.75%	32.68%	37.46%	32.78%	74.00%	62.53%
August	49.76%	50.15%	76.69%	90.14%	65.44%	20.93%	7.76%	28.47%	19.72%	10.33%	28.82%	42.39%	48.22%	70.42%	55.11%
September	77.57%	41.35%	62.75%	69.61%	100.45%	36.90%	8.37%	13.93%	14.76%	32.71%	40.67%	32.99%	48.82%	54.85%	67.73%
October	72.54%	54.28%	41.18%	69.02%	69.49%	30.75%	25.01%	10.90%	13.02%	13.90%	41.79%	29.28%	30.29%	56.01%	55.59%
November	59.46%	52.70%	16.73%	57.91%		22.66%	10.88%	2.81%	8.46%		36.80%	41.82%	13.92%	49.46%	
December (start payments by PPWM)	85.36%	68.04%	61.19%	88.82%		52.16%	31.19%	29.03%	17.28%		33.20%	36.84%	32.17%	71.53%	
Avg.	62.20%	55.11%	49.22%	68.81%	72.24%	28.99%	18.26%	18.50%	10.53%	16.44%	33.20%	36.84%	30.72%	58.28%	55.80%
PA3	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
January	105.21%	63.56%	47.26%		97.43%	57.90%	20.72%	21.44%		18.69%	47.31%	42.85%	25.82%		78.74%
February	97.20%	73.42%	72.80%	64.35%	95.62%	48.45%	27.40%	30.45%	5.17%	9.61%	48.75%	46.03%	42.35%	59.19%	86.01%
March	78.25%	77.02%	42.93%	70.06%	106.70%	32.79%	25.24%	10.96%	6.42%	8.45%	45.46%	51.78%	31.97%	63.63%	98.25%
April	43.80%	68.62%	40.35%	73.31%	104.40%	4.97%	27.20%	4.64%	0.46%	13.42%	38.83%	41.42%	35.71%	72.85%	90.98%
May	27.22%	41.37%	26.93%	80.98%	101.48%	3.48%	5.40%	3.52%	0.79%	12.54%	23.74%	35.97%	23.40%	80.19%	88.94%
June	81.01%	109.56%	82.42%	97.28%	95.61%	32.76%	27.48%	33.33%	16.32%	12.51%	48.26%	82.08%	49.10%	80.96%	83.09%
July	54.30%	60.27%	53.88%	102.74%	99.12%	11.05%	20.11%	11.08%	14.23%	9.63%	43.25%	40.16%	42.80%	88.51%	89.49%
August	89.36%	55.68%	56.63%	103.50%	104.81%	45.19%	7.29%	1.30%	13.16%	13.11%	44.17%	48.39%	55.33%	90.34%	91.70%
September	88.22%	68.48%	47.90%	92.24%	107.17%	34.38%	22.62%	12.45%	5.68%	13.29%	53.84%	45.87%	35.45%	86.56%	93.88%
October	75.84%	70.24%	59.71%	98.16%	102.31%	19.77%	30.10%	10.45%	8.12%	8.51%	56.07%	40.14%	49.26%	90.03%	93.80%
November	72.11%	77.44%	25.71%	107.84%		25.48%	24.38%	3.63%	13.07%		46.64%	53.06%	22.07%	94.77%	
December (start payments by PPWM)	81.29%	105.17%	6.73%	102.51%		36.17%	57.20%	0.00%	11.82%		45.12%	47.98%	0.00%	90.68%	
Avg.	74.48%	72.57%	46.94%	90.27%	101.46%	29.36%	24.59%	11.94%	8.66%	11.98%	45.12%	47.98%	34.44%	81.61%	89.49%

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Camp	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
January	26.03%	27.27%	41.79%		22.37%	6.49%	2.45%	31.02%		20.10%	19.55%	24.83%	10.77%		2.27%
February	30.40%	14.78%	17.86%	24.12%	38.54%	3.86%	0.07%	0.95%	6.62%	26.73%	26.53%	14.71%	16.92%	17.50%	11.81%
March	19.97%	21.08%	13.19%	10.52%	9.64%	0.61%	0.26%	0.46%	1.25%	0.19%	19.36%	20.82%	12.73%	9.27%	9.46%
April	17.98%	19.02%	16.33%	7.72%	8.08%	0.00%	0.08%	0.00%	0.00%	0.14%	17.98%	18.94%	16.33%	7.72%	7.94%
May	8.73%	14.49%	8.73%	7.78%	11.98%	0.00%	0.00%	0.00%	0.00%	0.57%	8.73%	14.49%	8.73%	7.78%	11.41%
June	18.86%	22.76%	18.86%	12.96%	22.70%	0.00%	0.28%	0.00%	0.00%	12.17%	18.86%	22.48%	18.86%	12.96%	10.53%
July	18.98%	18.16%	18.98%	25.41%	20.07%	0.00%	-0.01%	0.00%	14.09%	0.98%	18.98%	18.16%	18.98%	11.32%	19.09%
August	24.84%	29.70%	117.12%	16.13%	17.21%	4.16%	7.16%	81.01%	0.05%	0.21%	20.68%	22.53%	36.11%	16.08%	17.00%
September	17.69%	6.11%	18.16%	43.07%	15.88%	0.46%	0.00%	2.67%	28.88%	0.66%	17.23%	6.11%	15.50%	14.20%	15.23%
October	21.22%	0.95%	18.57%	12.19%	21.38%	1.63%	0.00%	4.66%	0.00%	1.84%	19.59%	0.95%	13.91%	12.19%	19.54%
November	20.44%	34.03%	13.87%	27.00%		0.00%	0.00%	0.00%	19.05%		20.44%	34.03%	13.87%	7.95%	
December	30.52%	43.37%	23.93%	13.89%		11.62%	25.36%	7.32%	1.61%		18.90%	18.00%	16.61%	12.28%	
Avg.	21.30%	20.98%	27.28%	18.25%	18.79%	2.40%	2.97%	10.67%	6.50%	6.36%	18.90%	18.00%	16.61%	11.75%	12.43%
All City	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Avg.	70.66%	61.49%	52.02%	50.26%	59.00%	28.52%	20.32%	15.18%	11.07%	13.43%	42.14%	41.17%	36.84%	39.19%	45.57%

Important notes:

1. Bills which finalized by Alshamel for exact month need another month to collected. For example, the bills finalized in Al-Shamel on 31-Aug will be collected and added to
2. AlShamel does not, separately, record collection amount for without debt in the month of December. Thus, the collection of (Non-PPWM) customers without debt in
- 3 * Regarding the month of December 2019 in PA3: the collection was low because the collector of PA3 area was suspended by JM and thus there was a low collection this month.

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

PA2 (without Camp)	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
January	105.15%	63.53%	56.88%		72.27%	57.87%	20.70%	30.96%		19.75%	47.28%	42.82%	25.93%		52.52%
February	97.15%	73.37%	72.52%	64.33%	100.11%	48.42%	27.38%	30.14%	5.17%	41.01%	48.73%	46.00%	42.38%	59.16%	59.11%
March	78.20%	76.97%	42.71%	63.42%	88.28%	32.76%	25.22%	10.91%	8.55%	16.43%	45.43%	51.75%	31.80%	54.87%	71.85%
April	43.24%	68.59%	40.25%	70.04%	66.87%	4.97%	27.18%	4.74%	0.96%	10.07%	38.28%	41.40%	35.51%	69.08%	56.80%
May	27.39%	41.35%	27.39%	73.98%	62.66%	3.50%	5.40%	3.50%	1.41%	6.61%	23.89%	35.95%	23.89%	72.56%	56.04%
June	80.97%	110.17%	80.97%	75.01%	64.91%	32.74%	27.76%	32.74%	10.93%	6.66%	48.23%	82.41%	48.23%	64.08%	58.25%
July	54.27%	60.71%	54.27%	93.12%	79.39%	11.04%	20.34%	11.04%	10.28%	12.74%	43.23%	40.37%	43.23%	82.84%	66.65%
August	88.90%	55.77%	60.84%	105.25%	70.80%	45.17%	7.28%	5.82%	23.68%	11.45%	43.74%	48.48%	55.02%	81.57%	59.35%
September	88.22%	68.45%	47.62%	73.32%	113.87%	34.58%	22.60%	12.38%	13.43%	37.88%	53.63%	45.84%	35.25%	59.89%	75.99%
October	75.60%	70.20%	71.20%	75.83%	74.53%	19.91%	30.08%	21.93%	14.58%	15.05%	55.69%	40.12%	49.27%	61.25%	59.48%
November	72.02%	77.38%	25.91%	63.50%		25.62%	24.36%	3.60%	6.55%		46.40%	53.02%	22.31%	56.95%	
December (start payments by PPWM)	81.90%	105.11%	30.83%	102.28%		36.95%	57.10%	0.00%	20.10%		44.96%	48.02%	0.00%	82.18%	
Avg.	74.42%	72.63%	55.47%	78.19%	79.37%	29.46%	24.62%	16.42%	10.51%	17.76%	44.96%	48.02%	39.05%	67.68%	61.60%
	With Debt					Only Debt					Without Debt				
PA2 (without Camp and Witout government institutions)	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
January					116.76%					31.90%					84.85%
February					146.53%					60.02%					86.51%
March					113.77%					21.18%					92.59%
April					109.68%					17.45%					92.23%
May					97.81%					10.33%					87.48%
June					101.68%					12.55%					89.13%
July					114.46%					18.36%					96.09%
August					103.05%					16.67%					86.38%
September					145.67%					48.45%					97.21%
October					108.95%					21.99%					86.95%
November															
December (start payments by PPWM)															
Avg.					115.83%					25.89%					89.94%

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Amount (City) 2021						
Billed Month-Year (as recorded in same month in	Collected including Debts			Collected without Debts (Current Collection)		
	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)
Jan-20	279,479	180,057	459,535.35	82,323	168,220	250,543
Feb-20	218,245	179,660	397,904.92	119,364	167,672	287,037
Mar-20	159,154	210,551	369,704.68	106,982	195,418	302,400
Apr-20	165,295	258,449	423,743.70	118,560	236,821	355,381
May-20	182,252	254,961	437,212.70	112,031	233,891	345,922
Jun-20	282,423	254,927	537,349.90	199,127	233,694	432,821
Jul-20	207,102	261,975	469,077.40	151,678	239,861	391,539
Aug-20	227,841	246,831	474,672.30	151,759	226,553	378,313
Sep-20	278,434	231,328	509,761.80	184,230	212,496	396,726
Oct-20	273,192	221,464	494,656.00	197,340	203,914	401,254
Nov-20	0	0	0.00	0	0	0
Dec-20	0	0	0.00	0	0	0

Bill Collection Amount (PA1) 2021						
Billed Month-Year (as recorded in same month in	Collected including Debts			Collected without Debts (Current Collection)		
	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)
Jan-21	11812.1	43488.5	55300.6	3073.68	40702.5	43776.18
Feb-21	11634.57	43647	55281.57	5703.71	40690.27	46393.98
Mar-21	5899.98	52825	58724.98	5826.54	49373.94	55200.48
Apr-21	7105.8	63531	70636.8	6959.96	59399.93	66359.89
May-21	10209.42	63226	73435.42	6281.22	59047.03	65328.25
Jun-21	10885.56	65061	75946.56	9612.92	60593.87	70206.79
Jul-21	14329.46	69193	83522.46	11604.18	64380.1	75984.28
Aug-21	14608.68	62505	77113.68	8638.18	58066	66704.18
Sep-21	15261.9	58675	73936.9	11676.52	54636.19	66312.71
Oct-21	13401	55641	69042	12502	52323	64825
Nov-21	0	0	0	0	0	0
Dec-21	0	0	0	0	0	0

Project for Strengthening the Capacity of Water Service Management in Jenin Municipality

Bill Collection Amount (PA2) 2021

Billed Month-Year (as recorded in same month in	Collected including Debts			Collected without Debts (Current Collection)		
	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)
Jan-21	14508.44	34404	48912.44	2133	31627.7	33760.7
Feb-21	26250.1	32893	59143.1	3659.62	30369.34	34028.96
Mar-21	8866.62	36304	45170.62	3646.12	33254.56	36900.68
Apr-21	6264.7	44523	50787.7	2387.7	40840	43227.7
May-21	5879.64	40591	46470.64	4249.3	37371.54	41620.84
Jun-21	7665.94	39763	47428.94	4968.96	36605.38	41574.34
Jul-21	9887.84	42062.8	51950.64	4939.16	38794.98	43734.14
Aug-21	7269.2	40339	47608.2	2867.2	37227.5	40094.7
Sep-21	29791.14	37539	67330.14	10735.36	34666.36	45401.72
Oct-21	9407.1	34756	44163.1	3353	31976.1	35329.1
Nov-21	0	0	0	0	0	0
Dec-21	0	0	0	0	0	0

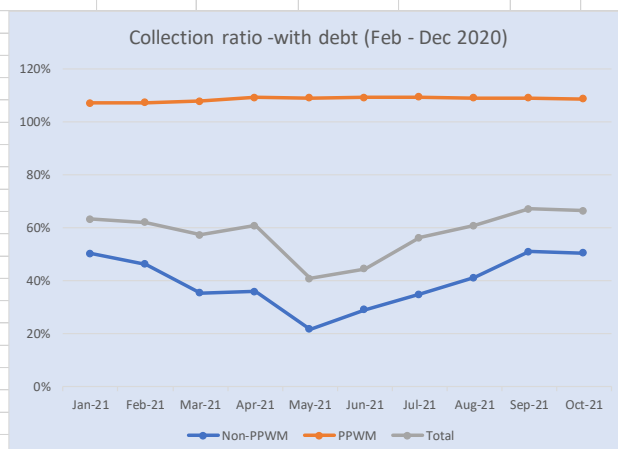
Bill Collection Amount (PA3) 2021

Billed Month-Year (as recorded in same month in	Collected including Debts			Collected without Debts (Current Collection)		
	By Non-PPWM customers (AlShamel data) (b)	By PPWM customers including 15% dept pay	Total including debts (B)	By Non-PPWM customers (AlShamel data) (c)	By PPWM customers excluding 15% dept pay	Total without debt (C)
Jan-21	5979.58	31070	37049.58	1440	28503	29943
Feb-21	6662.78	30727	37389.78	5387.02	28246.18	33633.2
Mar-21	6909.74	34825	41734.74	6747.36	31681.2	38428.56
Apr-21	6296.44	40690	46986.44	3923.74	37023.22	40946.96
May-21	6952.45	40150	47102.45	4730.78	36551.45	41282.23
Jun-21	7243.96	39557	46800.96	4761.28	35914.5	40675.78
Jul-21	3424.58	41445	44869.58	3116.18	37396.16	40512.34
Aug-21	5372.94	37190	42562.94	3475.44	33762.54	37237.98
Sep-21	7199.26	36630	43829.26	4928.26	33467.46	38395.72
Oct-21	5620	33690	39310	5520	30520	36040
Nov-21	0	0	0	0	0	0
Dec-21	0	0	0	0	0	0

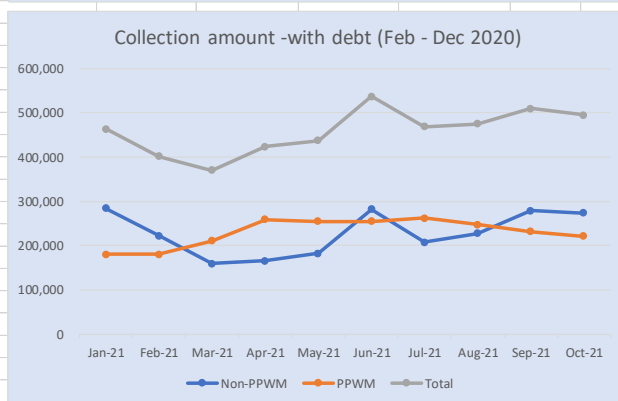
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with debt						
Month/2021	Billed-Non-PPWM	Collected Non-PPWM	Billed PPWM	Collected PPWM	Total billed	Total collected
Jan-21	565,068	283,704	168,220	180,057	733,288	463,760
Feb-21	480,471	222,190	167,672	179,660	648,143	401,850
Mar-21	451,079	159,154	195,418	210,551	646,496	369,705
Apr-21	460,989	165,295	236,821	258,449	697,810	423,744
May-21	840,387	182,252	233,891	254,961	1,074,277	437,213
Jun-21	975,690	282,423	233,694	254,927	1,209,384	537,350
Jul-21	595,256	207,102	239,861	261,975	835,116	469,077
Aug-21	554,098	227,841	226,553	246,831	780,651	474,672
Sep-21	547,251	278,434	212,496	231,328	759,747	509,762
Oct-21	541,956	273,192	203,914	221,464	745,870	494,656
Nov-21	0	0	0	0	0	0
Dec-21	0	0	0	0	0	0

Collection Ratio			
	Non-PPWM	PPWM	Total
Jan-21	50%	107%	63%
Feb-21	46%	107%	62%
Mar-21	35%	108%	57%
Apr-21	36%	109%	61%
May-21	22%	109%	41%
Jun-21	29%	109%	44%
Jul-21	35%	109%	56%
Aug-21	41%	109%	61%
Sep-21	51%	109%	67%
Oct-21	50%	109%	66%
Nov-21	#DIV/0!	#DIV/0!	#DIV/0!
Dec-21	#DIV/0!	#DIV/0!	#DIV/0!



Collection Amount			
	Non-PPWM	PPWM	Total
Jan-21	283,704	180,057	463,760
Feb-21	222,190	179,660	401,850
Mar-21	159,154	210,551	369,705
Apr-21	165,295	258,449	423,744
May-21	182,252	254,961	437,213
Jun-21	282,423	254,927	537,350
Jul-21	207,102	261,975	469,077
Aug-21	227,841	246,831	474,672
Sep-21	278,434	231,328	509,762
Oct-21	273,192	221,464	494,656
Nov-21	0	0	0
Dec-21	0	0	0

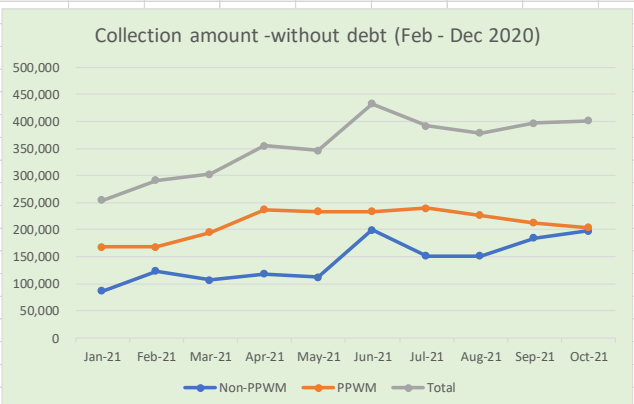
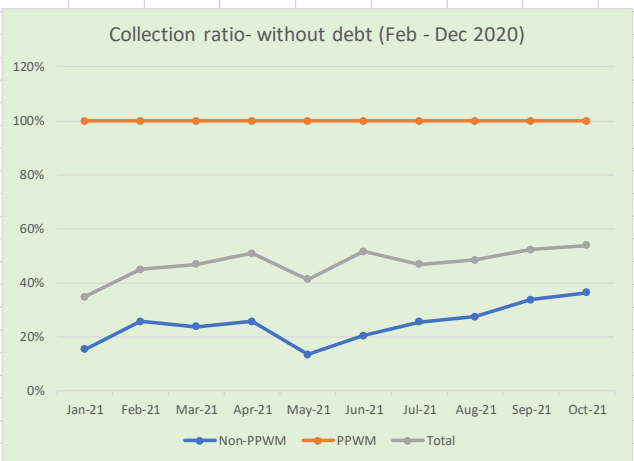


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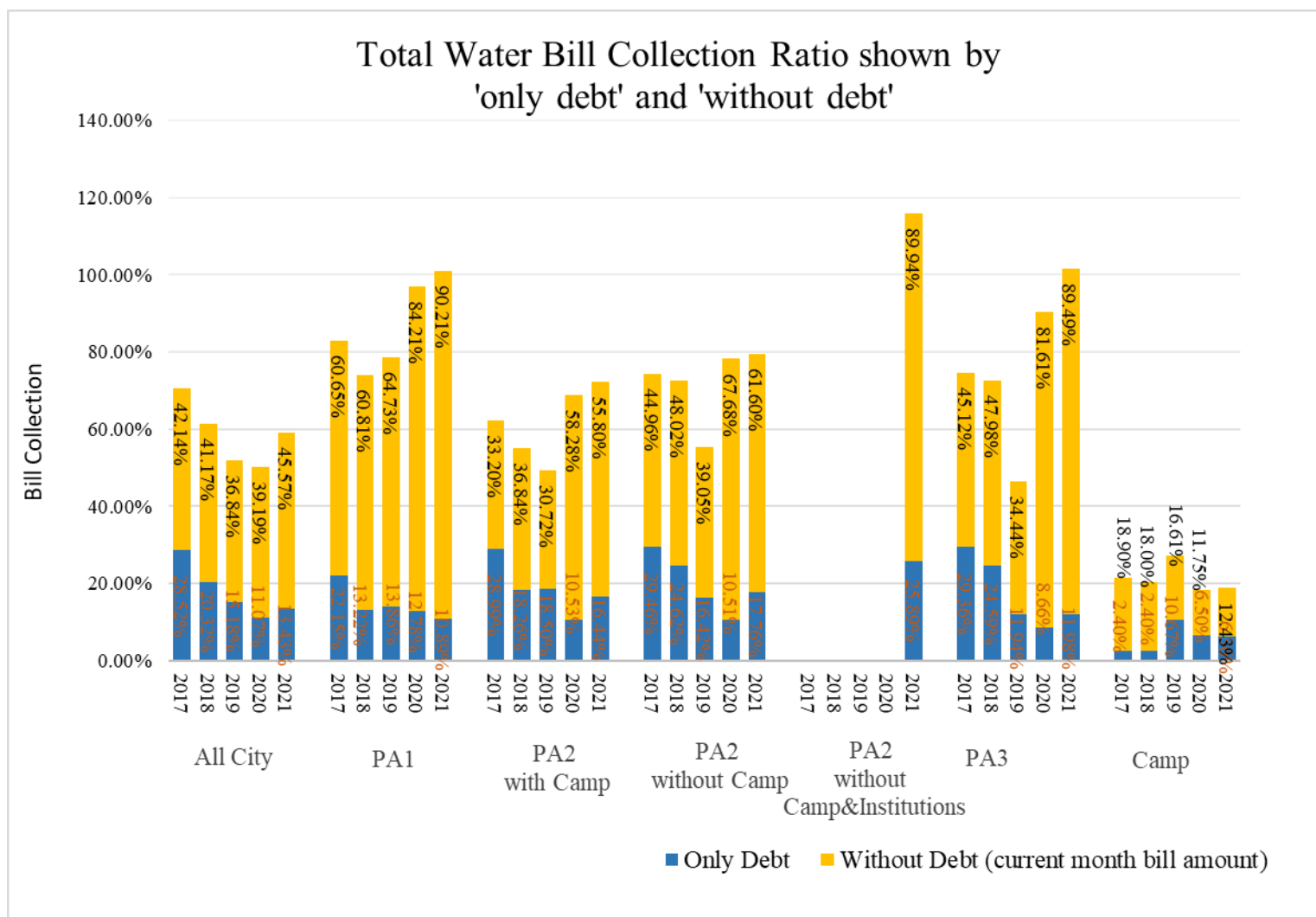
without debt						
Month/2021	Billed-Non-PPWM	Collected Non-	Billed PPWM	Collected PPWM	Total billed	Total collected
Jan-21	565,068	86,548	168,220	168,220	733,288	254,768
Feb-21	480,471	123,309	167,672	167,672	648,143	290,982
Mar-21	451,079	106,982	195,418	195,418	646,496	302,400
Apr-21	460,989	118,560	236,821	236,821	697,810	355,381
May-21	840,387	112,031	233,891	233,891	840,387	345,922
Jun-21	975,690	199,127	233,694	233,694	840,387	432,821
Jul-21	595,256	151,678	239,861	239,861	835,116	391,539
Aug-21	554,098	151,759	226,553	226,553	780,651	378,313
Sep-21	547,251	184,230	212,496	212,496	759,747	396,726
Oct-21	541,956	197,340	203,914	203,914	745,870	401,254
Nov-21	0	0	0	0	0	0
Dec-21	0	0	0	0	0	0

Collection Ratio			
	Non-PPWM	PPWM	Total
Jan-21	15%	100%	35%
Feb-21	26%	100%	45%
Mar-21	24%	100%	47%
Apr-21	26%	100%	51%
May-21	13%	100%	41%
Jun-21	20%	100%	52%
Jul-21	25%	100%	47%
Aug-21	27%	100%	48%
Sep-21	34%	100%	52%
Oct-21	36%	100%	54%
Nov-21	#DIV/0!	#DIV/0!	#DIV/0!
Dec-21	#DIV/0!	#DIV/0!	#DIV/0!

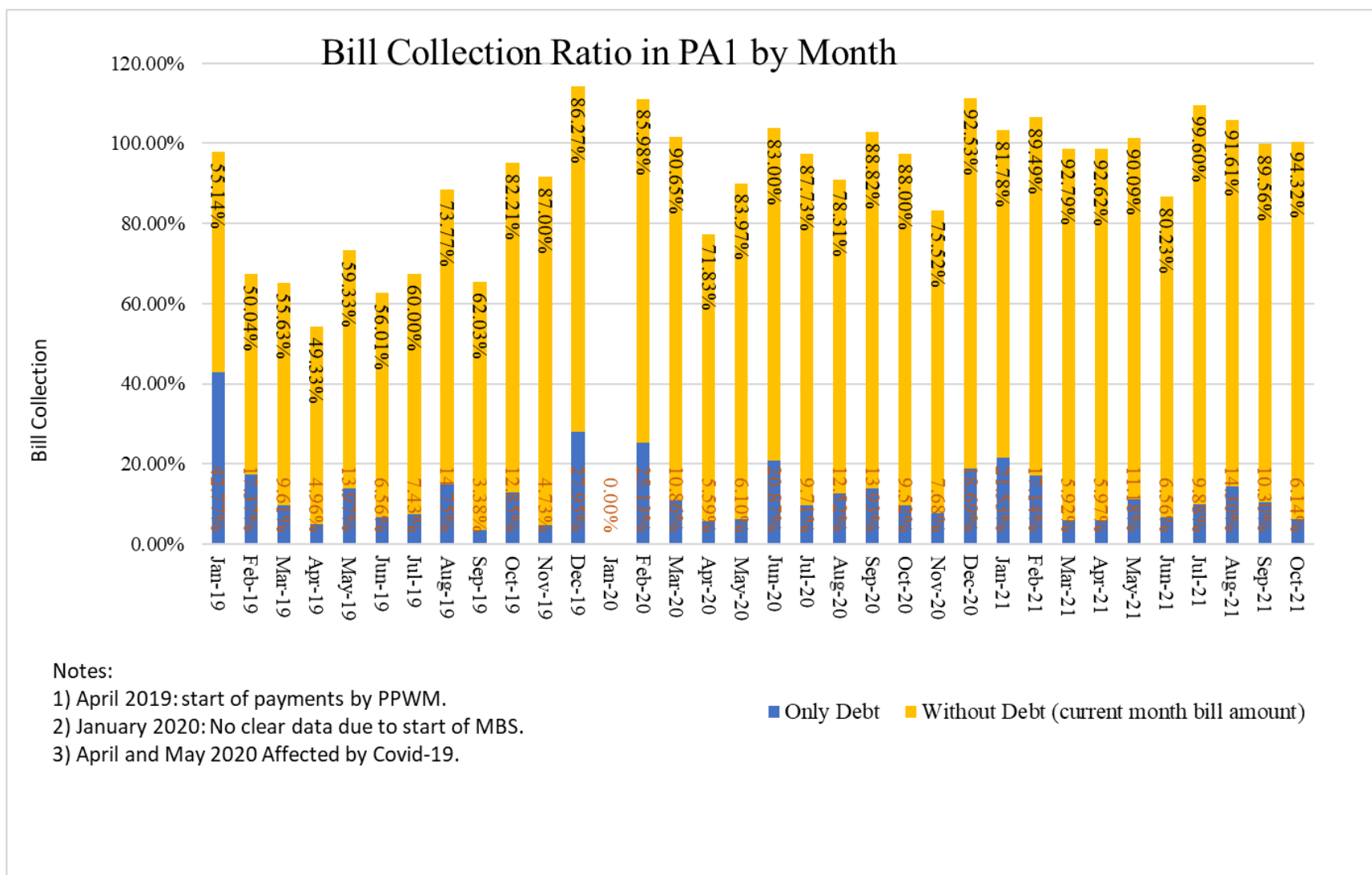
Collection Amount			
	Non-PPWM	PPWM	Total
Jan-21	86,548	168,220	254,768
Feb-21	123,309	167,672	290,982
Mar-21	106,982	195,418	302,400
Apr-21	118,560	236,821	355,381
May-21	112,031	233,891	345,922
Jun-21	199,127	233,694	432,821
Jul-21	151,678	239,861	391,539
Aug-21	151,759	226,553	378,313
Sep-21	184,230	212,496	396,726
Oct-21	197,340	203,914	401,254
Nov-21	0	0	0
Dec-21	0	0	0



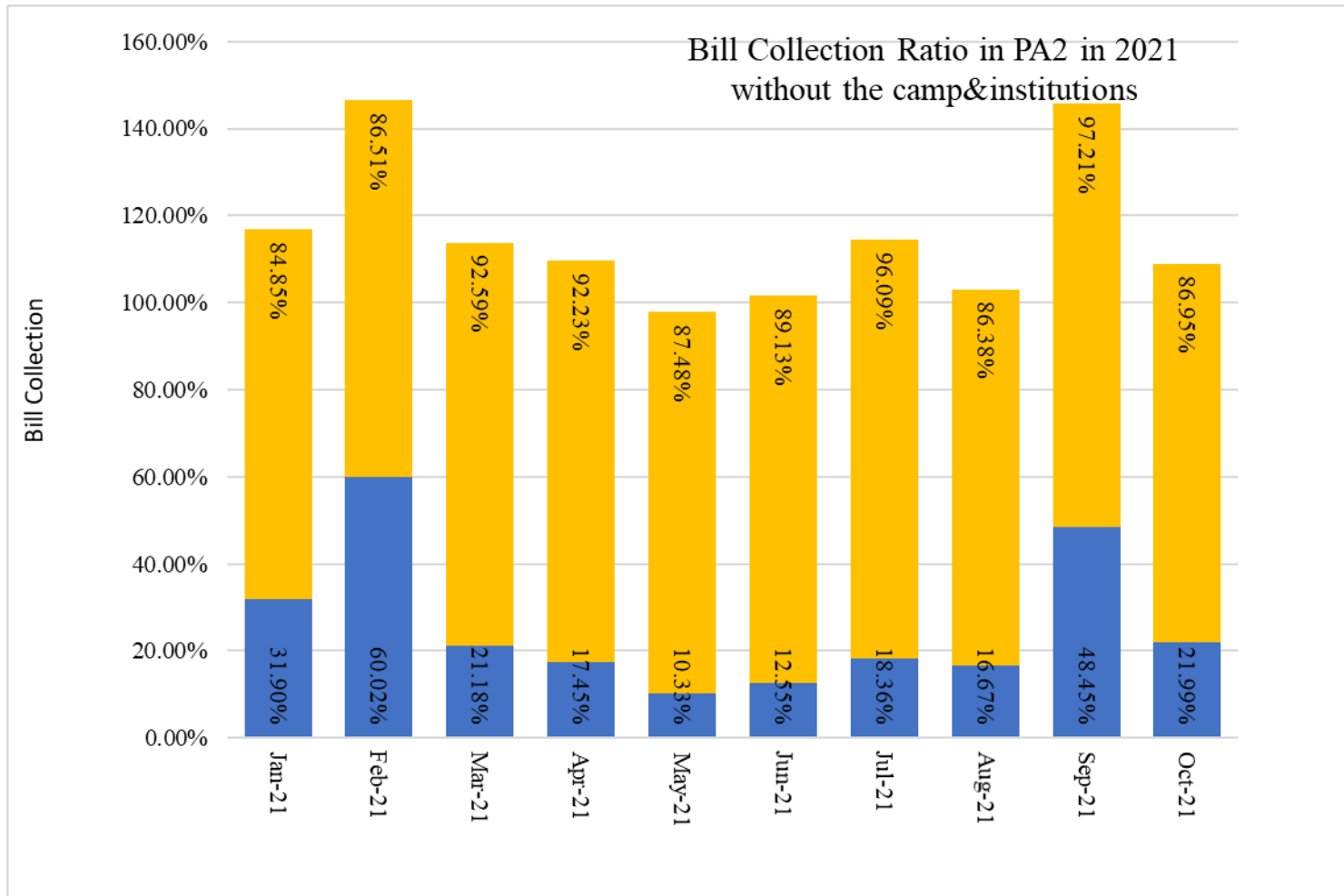
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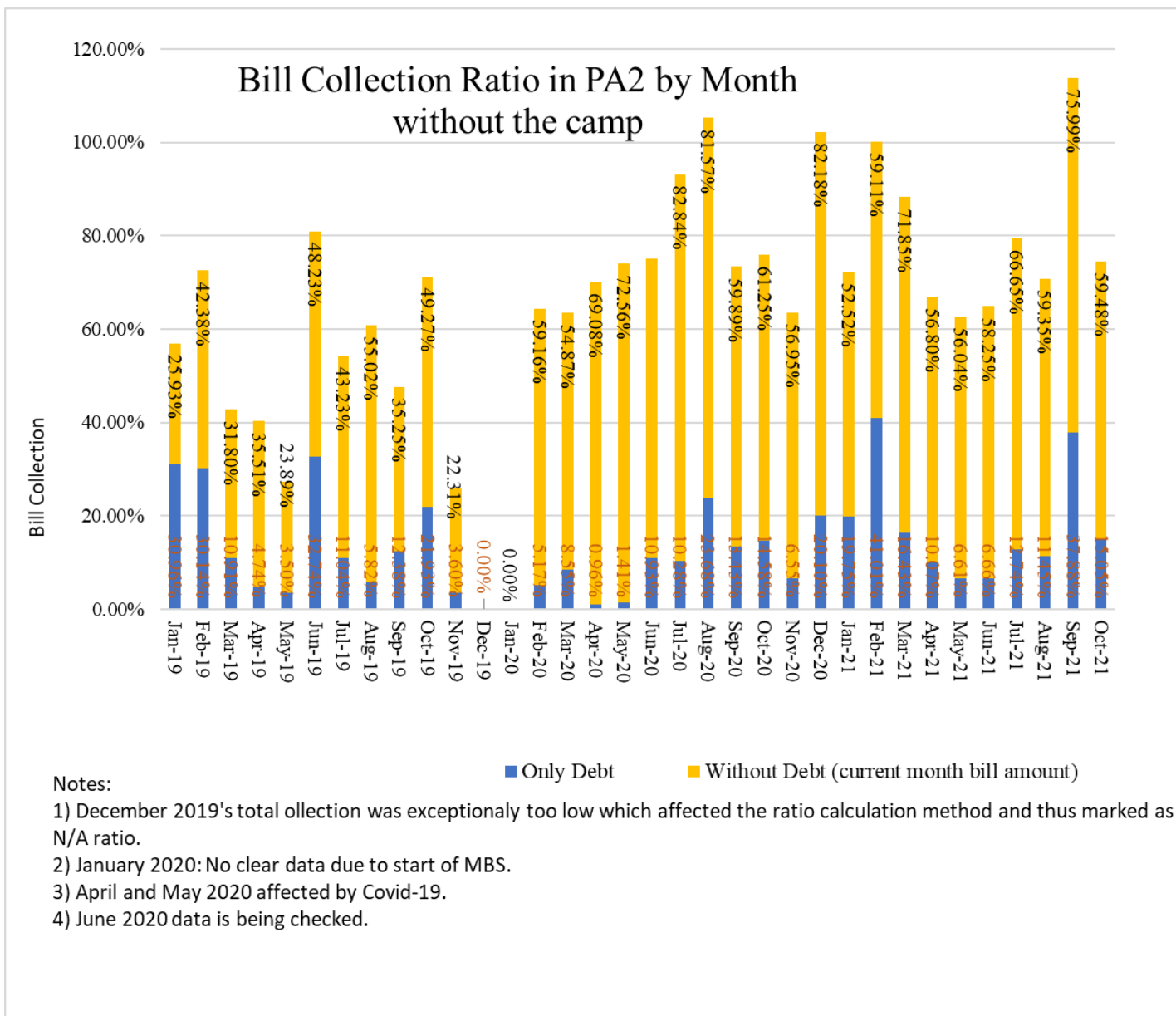


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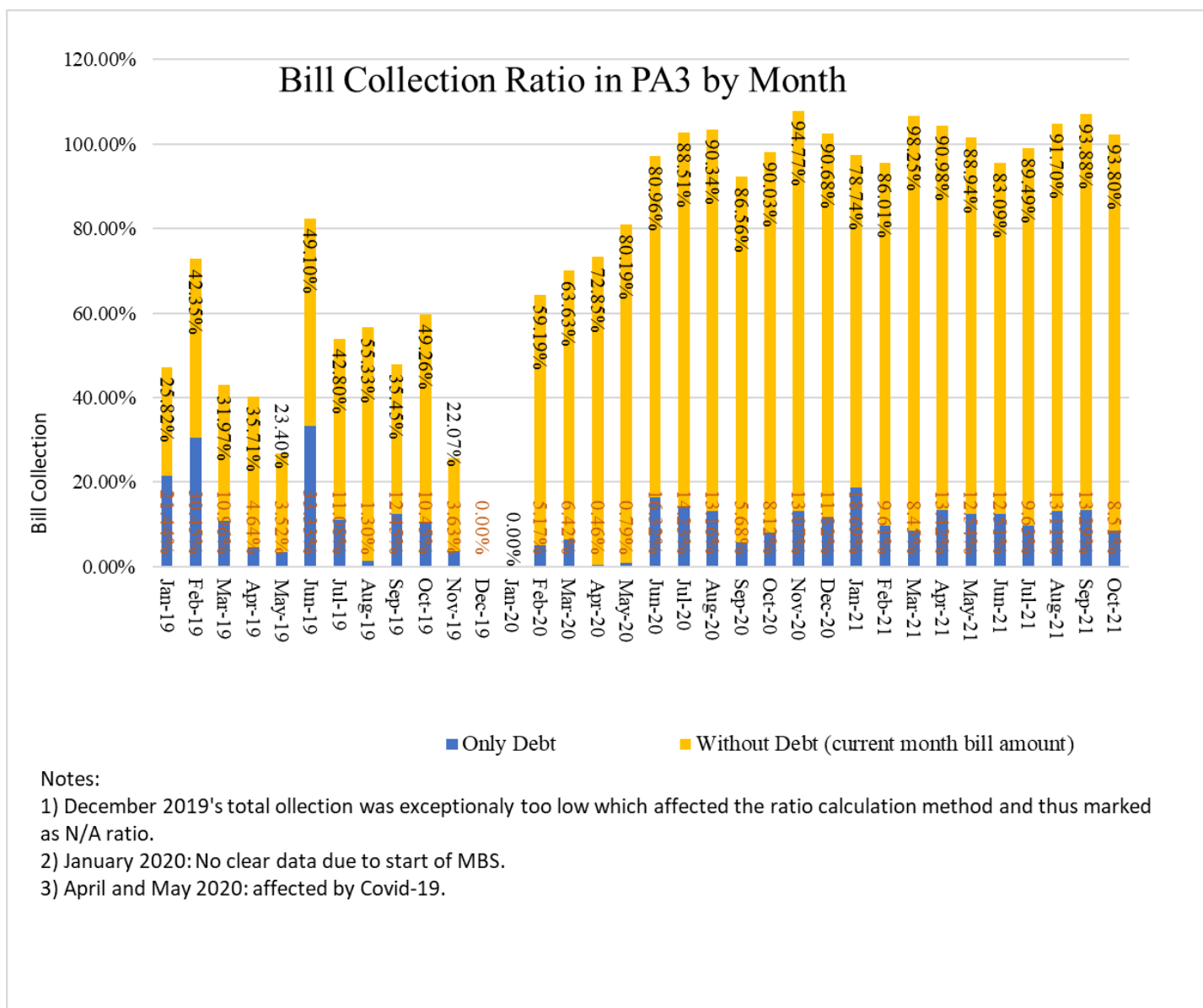


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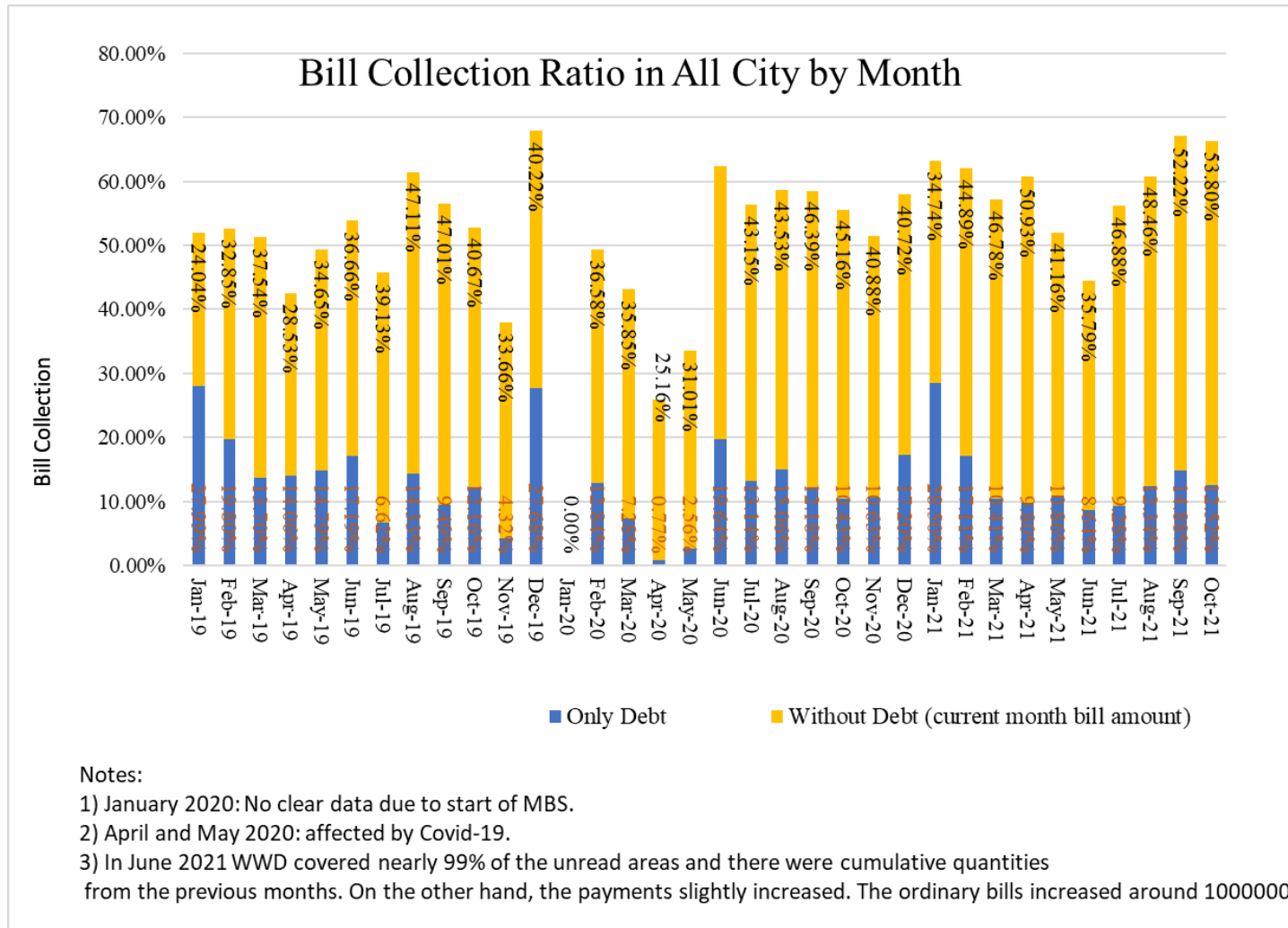




Project for Strengthening the Capacity of Water Service Management in Jenin Municipality



Project for Strengthening the Capacity of Water Service Management in Jenin Municipality



別冊資料 CD 1.9

NRW Management Manual (Basic Version)

別冊資料 CD 1.9.1 English Version



سلطة المياه الفلسطينية
PALESTINIAN WATER AUTHORITY



PALESTINIAN WATER AUTHORITY

THE PROJECT FOR STRENGTHENING THE CAPACITY OF WATER SERVICE MANAGEMENT IN JENIN MUNICIPALITY



NON-REVENUE WATER MANAGEMENT MANUAL (BASIC VERSION)

March 2021

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

TEC INTERNATIONAL CO., LTD.
PADECO CO., LTD.

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CHAPTER 1. PURPOSE AND USE OF THIS MANUAL



This manual is intended to provide a basic concept on non-revenue water (NRW) in simplified terms which will be easily understood by basic technicians involved in the NRW reduction works. It includes definition, components, importance, methods of calculation, and methods of reduction of NRW. It also describes briefly the tools and equipment most often used in NRW reduction programs.

This manual is prepared based on the lessons learned from the field works conducted in NRW pilot areas in Jenin. It is intended to serve as a reference for planning and implementing similar tasks in other part of JM and also in other parts of Palestine with conditions comparable to that of Jenin.

An Arabic version of this manual has also been prepared.

CHAPTER 2. INTRODUCTION TO WATER BALANCE AND NRW



2.1 Definition of Water Balance

Figure 1 shows an isolated area where the supplied volume is measured by a bulk meter at its inlet and consumed water is measured by meters of each customer.

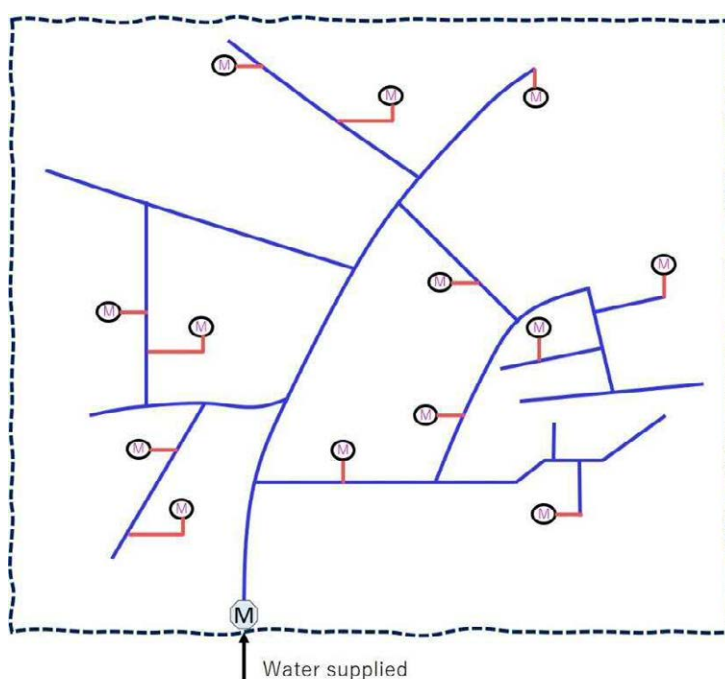


Figure 1: An Isolated Area for Water Balance



Question:

Do you think the supplied water volume in the above figure is equal to the sum of volumes consumed by all the customers in this area?

You are right, the correct answer is **No**. The consumed volume is less than the supplied volume.

It happens because:

- ✧ Some water might be leaking from pipe network,
- ✧ Some people might have used water illegally and that water is not measured,
- ✧ Some meters may be showing less volume than the actual,
- ✧ There may be wrong entry of meter reading or billing data, and so on.

*Finding how much water volume was **supplied** and how much of that water **went where** is called water balance.*

The following figure shows where a total supply can go.

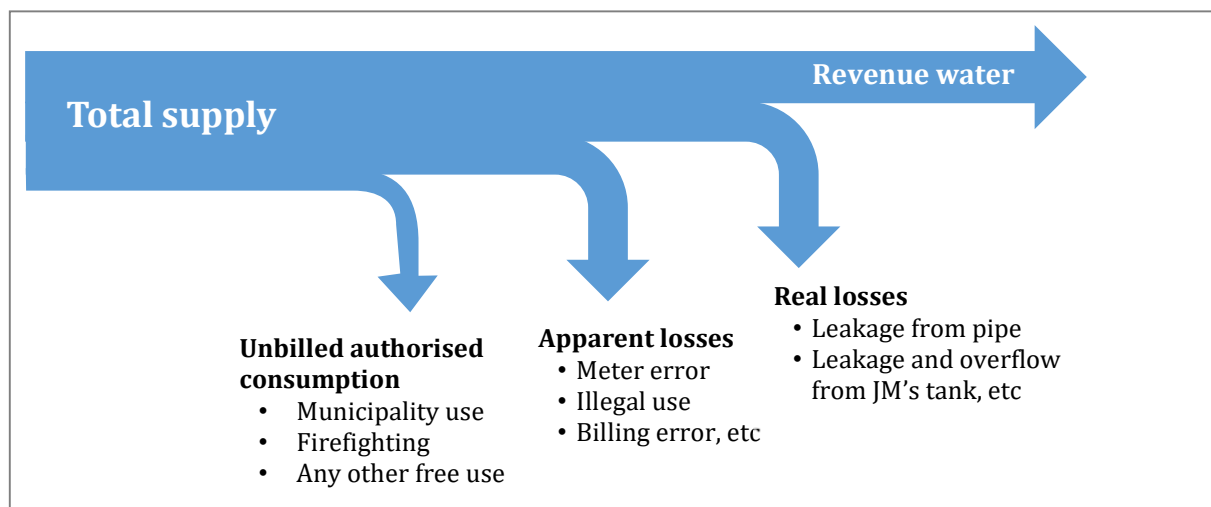


Figure 2: Components of Water Balance

A simplified water balance table based on IWA Standard Water Balance is shown below.

System Input Volume (SIV)	Water Exported			
	Water Supplied	Billed Authorised Consumption (metered and unmetered) within the Distribution System (Revenue Water)		
		Non-Revenue Water	Unbilled Authorised Consumption	
			Water Losses	Apparent Losses
				Real Losses

Figure 3: Simplified IWA Water Balance

- ❖ Water balance calculation is usually done for a **period of one year**. But to understand the situation or track progress of NRW reduction program etc, the water balance can also be done on monthly, bi-monthly, or quarterly basis.
- ❖ The water balance can be done for a **small, isolated area or for a whole system**.
- ❖ **Water volume** is tracked in the water balance.

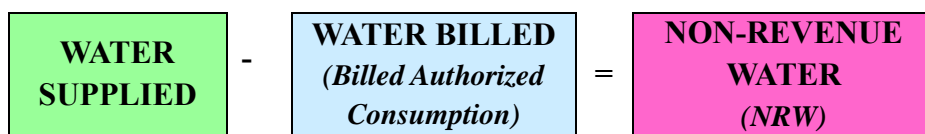
Let's see how will be the water balance of whole Jenin Municipality:

- ❖ Jenin municipality gets water from various sources; from municipality's own wells, private wells, Mekorot, and West Bank Water Department. When the volumes of all these sources

are added, this is the total volume put into the municipality every day or every month. This volume of water is called **System Input Volume (SIV)**.

- ✧ Out of the total SIV volume, some water may be exported to villages and towns outside of Jenin municipality. If yes, this volume is **Water Exported**.
- ✧ The balance (SIV minus Exported) is supplied within the municipality. This is **Water Supplied**.
- ✧ Majority of the Water Supplied reaches to the consumers and they are billed. This is **Billed Authorized Consumption**.
- ✧ Some part of the supplied water is used by the municipality or by offices permitted to use water freely. This is **Unbilled Authorized Consumption**.
- ✧ Some part of the supplied water is lost due to leakage in pipe network, unauthorized connections, defective meters and wrong reading/billing of meters. This portion is called **Water Losses**.

2.2 Definition of NRW



- ✧ **Non-revenue water (NRW)** is the difference between the amount of water produced (or supplied in a system) and the amount of water billed.

NRW ratio is calculated from the following formula:

$$\text{NRW \%} = \frac{\text{NRW Volume (m}^3\text{)}}{\text{Water Supplied Volume (m}^3\text{)}} \times 100$$

NRW and water loss components have been illustrated in figures 3 to 6.

2.3 Causes and Components of NRW

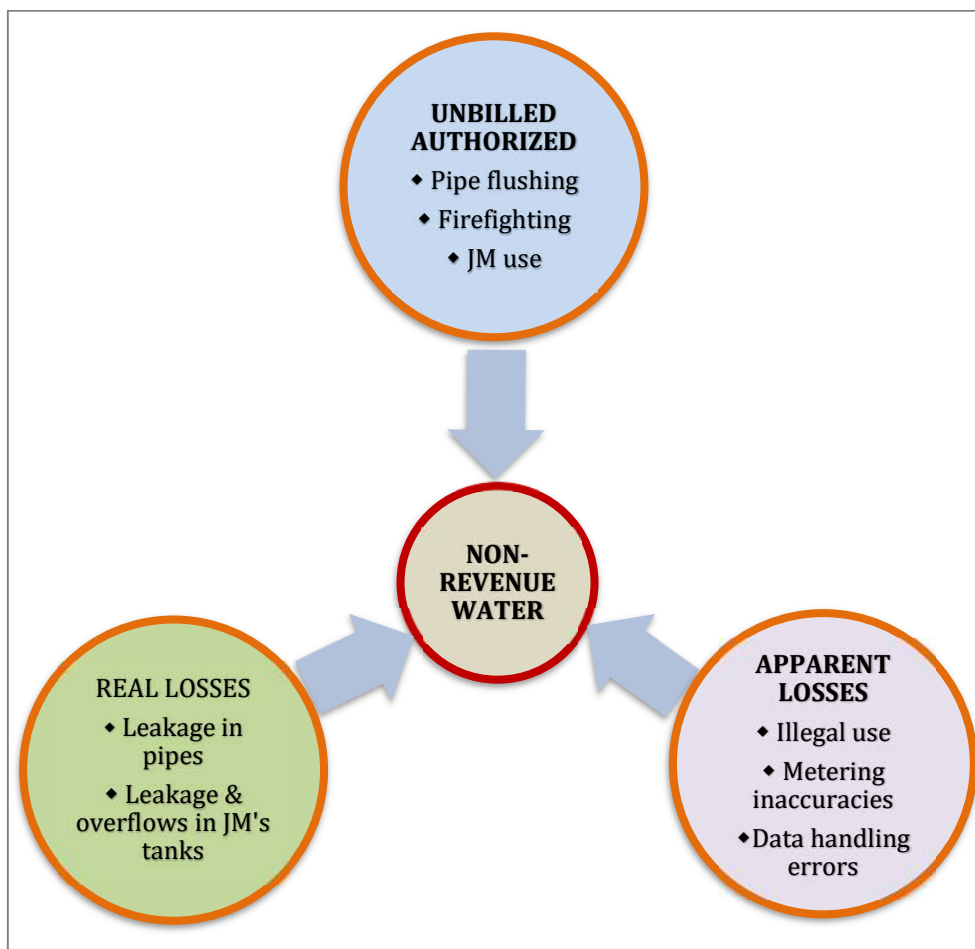


Figure 4: Main Components of NRW

-
- The Water Supplied has two parts: Revenue Water and Non-Revenue Water.
 - The NRW has two parts: Unbilled Authorized Consumption and Water Losses.
 - The Water Losses have two parts: Apparent Losses and Real Losses.
-

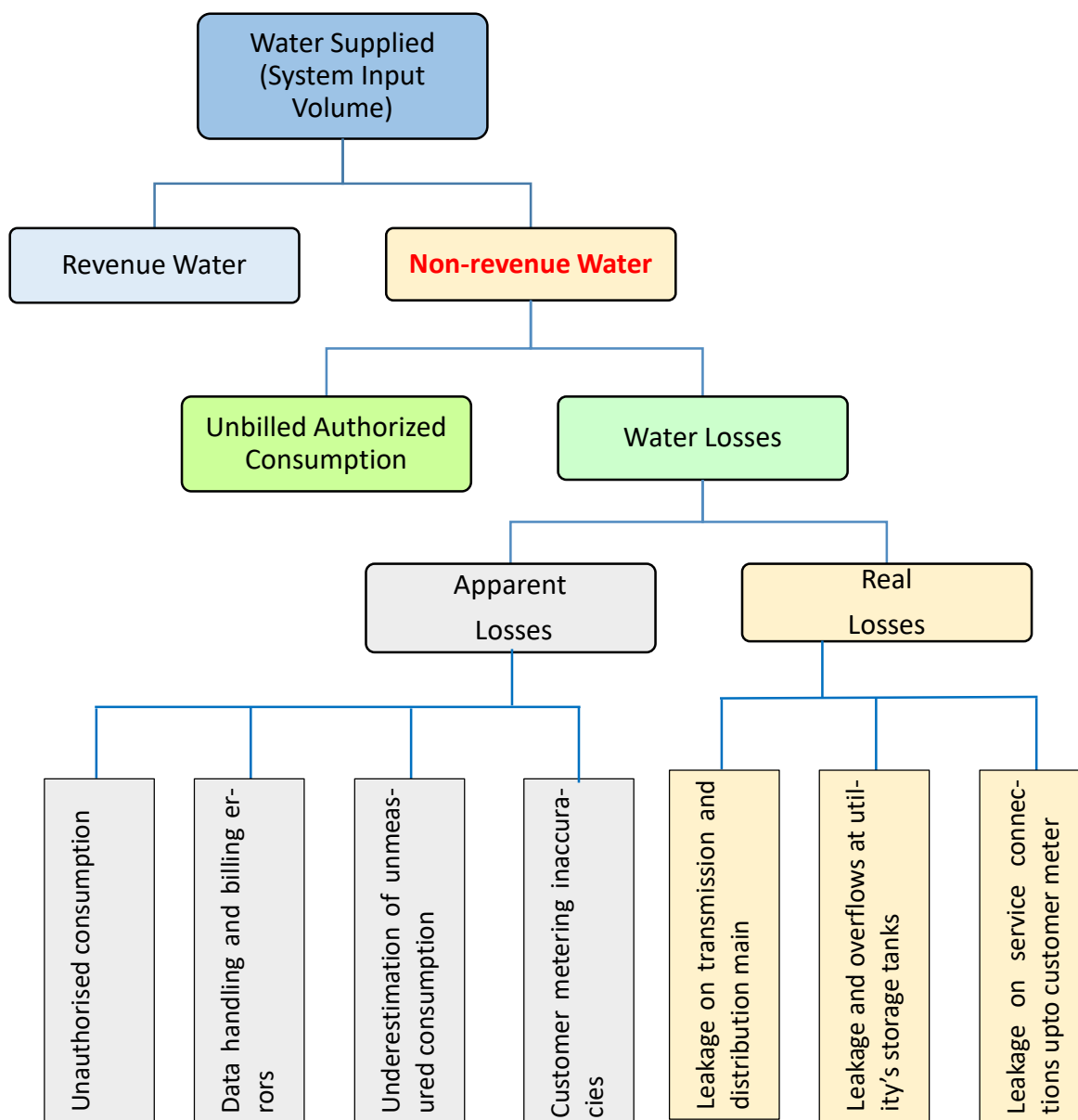


Figure 5: Components of NRW

Non-Revenue Water فاقد الإيراد فاقد الإيراد	Unbilled Authorized Consumption الاستهلاك المصرح به غير الفوترة وغير الفوترة	Such as Pipeline Flushing, Fire Fighting, Utility Use		
	Water Losses فاقد المياه	Apparent (Commercial) Losses الخسائر التجارية	Unauthorized Consumption الاستهلاك غير المصرح به	- Illegal Connection - Meter by-Pass - Meter Tampering
			Data Handling and Billing Errors	- Wrong (low) reading - Wrong (low) data entry
			Underestimation of Unmeasured Consumption	- Estimating less than actual when there is no meter
			Customer Metering Inaccuracies عدم دقة عداد المشترك	- Under-Registration - False Reading
	Real (Physical) Losses الخسائر الحقيقية	Leakage on Transmission and Distribution Mains التسرب في خطوط النقل وتوزيع الرئيسية		
Leakage and Overflows at Utility's Storage Tanks تسرب وفيضانات خزانات مرافق المياه				
Leakage on Service Connections up to point of Customer Metering التسرب في الوصلات المنزلية من عداد المشترك				

Figure 6: Examples of NRW components

The following figure shows where the water losses occur.

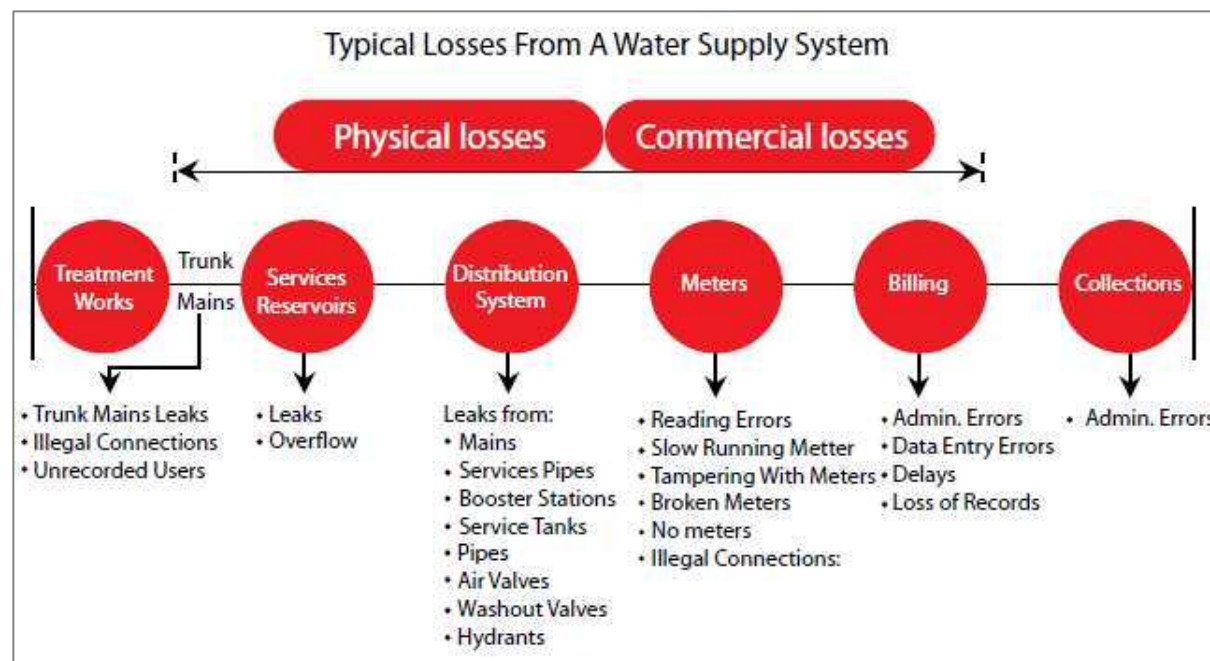


Figure 7: Typical losses from a water supply system

(Source: The Manager's NRW Handbook; 2008)

2.4 Definition of Terms Related to NRW

System Input Volume

The system input volume is the total volume of treated water, from all sources of water including municipality's own wells, private wells contracted by the municipality, and imported from outside the municipality.

Authorised Consumption

The volume of metered and/or unmetered water taken by registered customers or organizations authorized to use water. Authorised consumption may include items such as water taken for firefighting, fire training exercises, flushing of mains and sewers, street cleaning, watering of municipal gardens, public fountains, amongst others. These may be billed or unbilled, metered or unmetered.

Water Losses

The difference between system input volume and authorised consumption.

Billed Metered Consumption

All metered consumption which is also billed.

Billed Unmetered Consumption

All billed consumption which is calculated based on estimates or norms but is not metered.

Revenue Water

The volume of water for which income is obtained. This is the sum of billed metered and billed unmetered consumption.

Unbilled Authorised Consumption

Unbilled authorised consumption are those components of authorised consumption which comprise legitimate usage, but which are not billed and therefore do not produce revenue.

Unbilled Metered Consumption

Unbilled metered consumption is metered consumption which is, for any reason, unbilled. This may, for example, include metered consumption by the utility itself or water provided to institutions free of charge.

Unbilled Unmetered Consumption

Unbilled unmetered consumption is any kind of authorised consumption which is neither billed nor metered. This component typically includes items such as firefighting, flushing of mains and sewers, street cleaning, amongst others.

Non-Revenue Water (NRW)

Non-revenue water are those components of system input volume which are not billed and do not produce revenue, i.e. not revenue water. It is equal to unbilled authorised consumption plus real losses and apparent losses.

Apparent Losses (AL)

Apparent losses include all types of inaccuracies associated with customer metering as well as data handling errors, such as meter reading and billing, plus unauthorised consumption from theft or illegal use.

Unauthorised Consumption

Unauthorised consumption is any unauthorised use of water. This may include water illegally withdrawn from hydrants, for example, for unauthorised construction purposes, illegal connections, bypasses to consumption meters or meter tampering.

Illegal Connection

A connection which has been installed onto a main or another service pipe without the permission or authority of the municipality.

Data Handling and Billing Errors

The volume of true consumption which is not recorded on the billing system due to billing or data handling errors. These could include transcription errors, consumption on premises that have not been registered on the billing system due to internal procedural errors, premises incorrectly flagged on the billing system (e.g. flagged as demolished but still live), etc.

Customer Metering Inaccuracies

The volume by which meters under-record the true volume consumed by customers.

Real Losses (RL)

Real losses are water volumes lost through all types of leaks, bursts and overflows.

Leakage and Overflows from Utility Storage Tanks

Water lost from leaking storage tank structures (service reservoirs) or overflows from such tanks caused by operational or technical problems, for example, a failed level control mechanism or leaking tank joints.

Leakage on Service Connections up to the Point of Customer Metering

Water lost from leaks and breaks of service pipes from and including the tapping point up to the customer meter.

Leakage on Transmission and/or Distribution Mains

Water lost from leaks and breaks on transmission and distribution pipelines and appurtenances.

2.5 Importance and Benefits of Reducing NRW

The following figure shows how much water was supplied and how much of that was lost as NRW in Jenin in 2018.

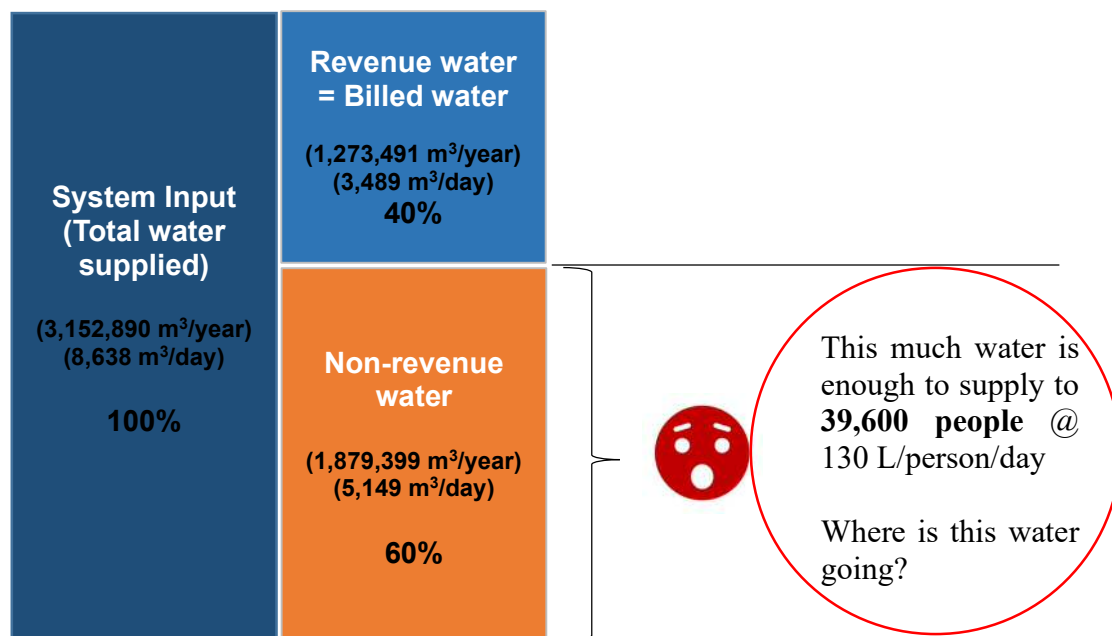


Figure 8: System Input and NRW volumes of Jenin in 2018

If the NRW is converted to monetary term, say at the average selling price of water in Jenin (about NIS 4.6/m³), it is equivalent to **8.64 million NIS**.

That means Jenin Municipality lost about 8.64 million NIS in potential revenue from water in year 2018!

2.5.1 Benefits of Reducing NRW

High NRW indicates that there are severe problems in the water system. The problems may be technical, or managerial, or both. When the NRW level is high, the system worsens day by day. This is also called a Vicious cycle.

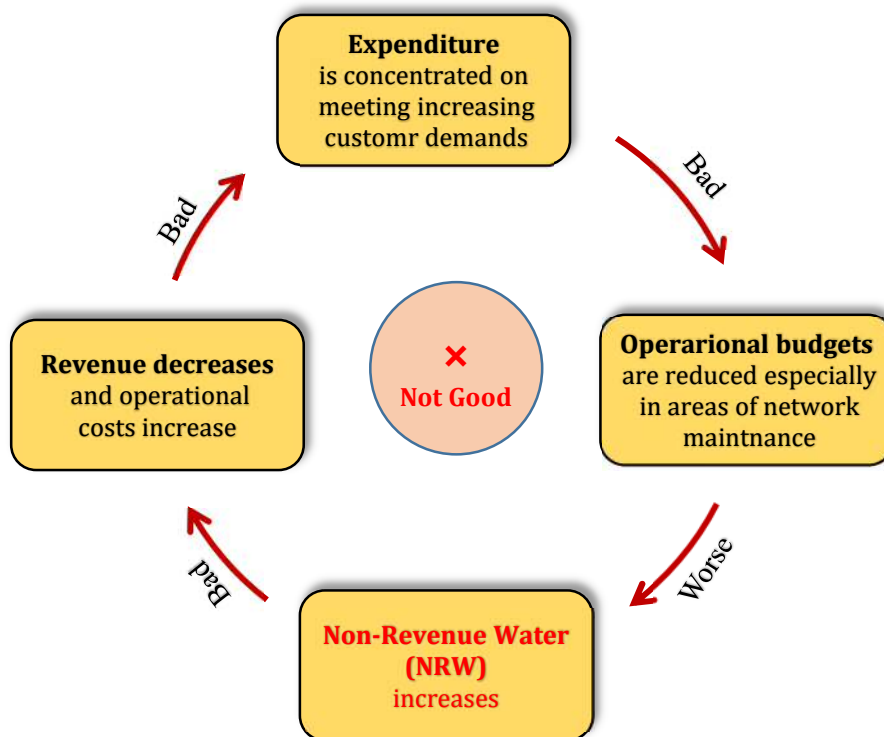


Figure 9: The Vicious Cycle of NRW

On the other hand, when NRW decreases, revenue increases. This increased revenue can be utilized for operational improvements and further reducing NRW. This starts a good cycle, known as a Virtuous Cycle.

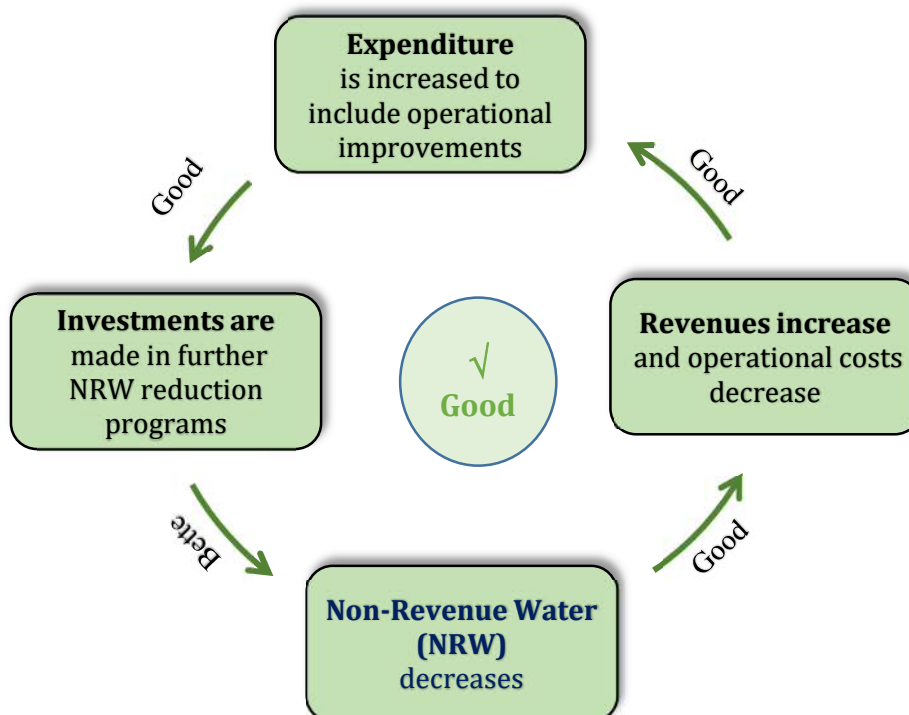


Figure 10: Virtuous Cycle of NRW

Decreasing NRW helps to start Virtuous Cycle.

The benefits of reducing **Real Loss** are many:

1. Water will be saved from wastage.
2. Operational costs will be reduced. There will be less need of leak repair materials, tools, less travels to the field to repair leaks / bursts.
3. Water availability will be improved. More water will be available for consumption and therefore revenue will increase. Increased revenue could be utilized to further improve water system.
4. Reliability of water supply will improve as water supply interruption due to repairs will be minimized.
5. The water quality will be preserved as chances of dirty water getting into pipe during leak repair or from leaking holes during non-supply period will be minimized.
6. Public image of the water utility (water department) will be improved as people think the water department is doing a good job.
7. Need for investment in new sources will be postponed.

The benefits of reducing **Apparent Loss** are:

1. The main benefit of reducing Apparent Loss is increase in revenue. This increased revenue can be used to further improve the water supply system and start the Virtuous Cycle.
2. People who use water illegally do not mind wasting water as it is free for them. Reducing Apparent Losses by reducing illegal users will reduce this waste.
3. Eliminating the illegal connections will reflect the municipality fairness towards treating the customers and this will increase the trust from the social point of view.

CHAPTER 3. METHOD OF NRW CALCULATION

NRW is calculated by subtracting the volumes of ‘Water Billed’ from ‘Water Supplied’.

$$\begin{array}{|c|} \hline \text{NON-} \\ \text{REVENUE} \\ \text{WATER} \\ \text{(NRW)} \\ \hline \end{array} = \begin{array}{|c|} \hline \text{WATER} \\ \text{SUPPLIED} \\ \hline \end{array} - \begin{array}{|c|} \hline \text{WATER} \\ \text{BILLED} \\ \text{(Billed} \\ \text{Authorized} \\ \text{Consumption)} \\ \hline \end{array}$$

So, we need to volumes of ‘Water Supplied’ and ‘Water Billed’ first.

3.1 Time Period

- ✚ NRW is usually calculated for each billing cycle which is generally each month. But if the billing cycle is every two-months or every quarter NRW is also calculated every two-months or every quarter.
- ✚ NRW is also calculated for each year.

3.2 Method of Calculating ‘Water Supplied’

Add monthly water volumes from all sources to calculate supplied water volume.

A. From municipality’s own wells

1. Municipality well No. 1 (Saadeh well)
2. Municipality well No. 2 (Al Mechanic well)
3. Balama well
4. Janzour well (under construction)

B. From contracted private wells

As of Jan 2021 JM purchases water from the following 10 private wells.

1. Farathy well
2. Qasrawi well
3. Turkman well
4. Abu Sameer well
5. Abu Hatab well No 1
6. Abu Hatab well No 2
7. Ashraf well
8. Alawneh well
9. Jarrar well
10. Ala Al-Sadi well

C. Imported through WBWD connections

1. Al Jalameh connection
2. Al Swetat connection
3. Abu Arab well

As an example, the ‘Supplied Water’ volume for the month of December 2020 is shown below.

Table1: Supplied water volume in Jenin for December 2020

S.N.	Source Name	Water volume (m ³ /month) (Dec'2020)	Remarks
A	Municipality's own wells		
1	Municipality well No. 1 (Saadeh well)	75,035	
2	Municipality well No. 2 (Al Mechanic well)	13,370	
3	Balama well	1,219	
4	Janzour well (under construction)	-	Under construction
	Sub-total	89,624	
B	From contracted private wells		
1	Farathy well	11,036	
2	Qasrawi well	18,817	
3	Turkman well	18,476	
4	Abu Sameer well	9,575	
5	Abu Hatab well No 1	15,751	
6	Abu Hatab well No 2	4,196	
7	Ashraf well	3,848	
8	Alawneh well	1,554	
9	Jarrar well	8,723	
10	Ala Al-Sadi well	9,903	
	Sub-total	101,879	
C	Imported through West Bank Water Department connections		
1	Al Jalameh connection	25,547	
2	Al Swetat connection	68,200	
3	Abu Arab well	28,148	
	Sub-total	121,896	
	Total	313,398	

Explanation

- ✚ For this purpose we need to take reading of all meters on the 1st day of each month. For water imported from outside we sometimes cannot access the meters to read. We need to calculate monthly volume from their water bills.
- ✚ If any meter is found to be stopped, then the volume from that source needs to be estimated based on the previous month's records.

3.3 Method of Calculating Water Billed or ‘Billed Authorized Consumption’

Billed Authorised Consumption (BAC) is the sum of:

Readings of postpaid meters (Alshamel software) + monthly consumption extracted from Gateways data for prepaid meters.

Explanation

- ✚ The time period should be same for both Water Supplied and Water Billed. For example, if the Water Supplied is for 31 days from 1st of Dec to 1st of January, then the Water Billed should also be for the same period.
- ✚ Consumption volume from prepaid meter can be extracted for any exact period needed. But interval of reading of postpaid meters may not always be same. Some meters may be read in less than 31 days and some in more than 31 days, for above example. In such case the consumption value should be adjusted to match with the period of Water Supplied. This is called adjustment for meter reading lag time.
- ✚ There may be some unmetered consumption due to meter problem or other reason. If such customers are billed, then their consumption should be estimated. Make the estimate based on previous month's consumption or family size or any other method.
- ✚ Add all consumptions which are billed. This gives the volume of Water Billed.

Calculate the volume of NRW from the formula given above.

An example of NRW calculation for PA1 and sub-areas in it is given in table below.

Table2: NRW calculation of PA1 and its sub-areas in Dec 2018

Area	Water supplied (m ³)	Water billed (m ³)	NRW (m ³)	Water billed adjusted for meter reading lag (m ³)*	Adjusted NRW (m ³)	Adjusted NRW (%)
Input at Jalameh	31,126					
Received at Sabah Al Kheir tank	30,326					
Lost in transmission			800		800	2.1%
PA1	27,365	11,637	15,728	11,193	16,172	59.1%
Sub-area 1 (24 hrs supply area)	1,392	714	678	645	747	53.7%
Sub-area 2 (Sabah Al Khir)	5,343	3275	2,068	2918	2,425	45.4%
Sub-area 3 (Kharoubeh)	7,411	4113	3,298	4016	3,395	45.8%
Sub-area 4 (Nazareth St.)	13,219	3535	9,684	3614	9,605	72.7%
Al Basateen area (outside PA1)	2,961					




For detail calculation of how to make adjustment of billed volume for meter reading lag time, please refer to the main NRW manual.


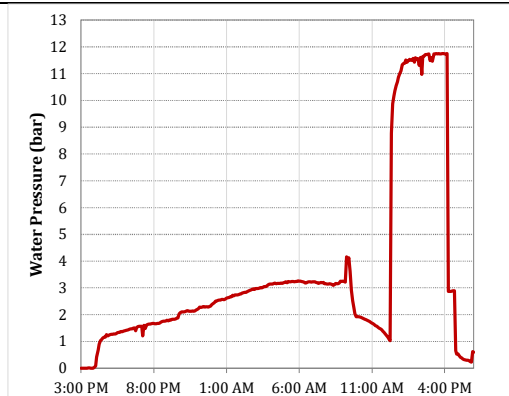

CHAPTER 4. CAUSES OF NRW

4.1 Causes of the Real Loss

Various causes of Real Loss are shown in the following figure and also elaborated in the following section.

Examples of Causes of Real Losses:

		
<p>Corrosion of transmission main (from Jalameh to Sabah Al Khir PS)</p>	<p>Corrosion of fitting (found in Al Basateen area)</p>	<p>Corrosion of pipe (found in downtown Jenin)</p>

		
<p>High Pressure (near Al Batikha circle)</p>	<p>High pressure (New Camp)</p>	<p>Very high pressure</p>



Leakage from improperly connected pipe



Leakage from improperly welded pipe



Leakage due to inadequate maintenance of valves



Overflow from water utility tank



Leakage from a valve in Sabah Al Khir area

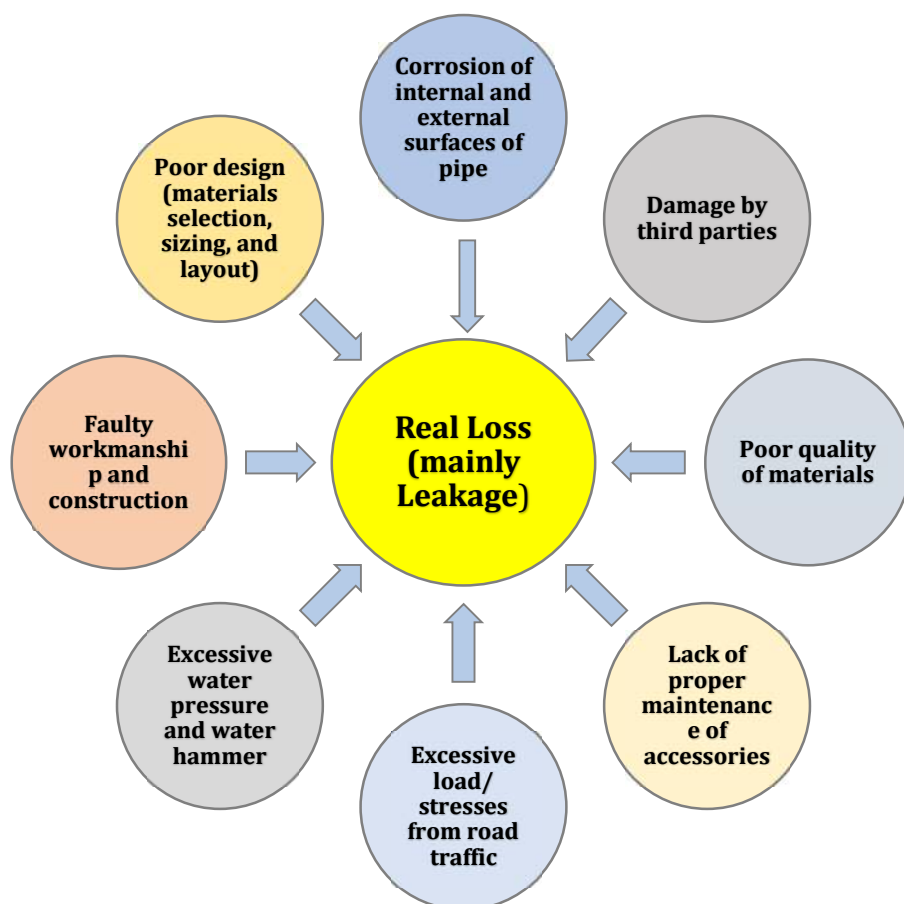


Figure 11: Causes of Real Loss

Table 3: Elaboration of causes of leakage from pipeline





Cause of leakage	Factors
Bad quality of pipe material and fittings	<ol style="list-style-type: none"> 1. Inadequate strength (pipe, joint, valve etc) 2. Lack of corrosion-resistance 3. Rapid progress of physical aging
Improper handling and storage of pipes	<ol style="list-style-type: none"> 1. Damage during transport of the piping material 2. Defective stacking and storage 3. Damage to the pipe wall and coating 4. Cracks in pipe during careless unloading and pipes striking against each other 5. Weathering effect due to unfavorable environment 6. Mixing up of different classes of pipes and their jointing materials

Cause of leakage	Factors
Improper condition and technique of pipe laying	<ol style="list-style-type: none"> 1. Deviation from proper laying procedures 2. Improper bedding 3. Slipping of trench sides 4. Sinking of soil after laying 5. Poor quality of backfill material 6. Improper compaction of trench backfill and its subsequent settling 7. Excessive overburden on piping trenches, not taken care of during the design of pipeline 8. Point loads coming on the pipe through the backfill. 9. Defective jointing material 10. Poor workmanship for jointing
Improper condition of water supply and water quality	<ol style="list-style-type: none"> 1. High water pressure 2. Water hammering 3. Corrosion by water quality 4. Rapid change of water temperature 5. Neglect of leakage
Adverse environment of pipe laying	<ol style="list-style-type: none"> 1. Increased traffic loads 2. Movement of soil around pipe (freezing, upheaval, and so on) 3. Corrosive soil for backfill 4. Change of temperature
Careless ness of other utilities' construction work and disasters	<ol style="list-style-type: none"> 1. Accidental damage as the result of construction works 2. Damage due to natural disaster such as floods, land slide, earthquake

4.2 Causes of Apparent Loss

The four main causes of Apparent Losses are shown below.

Examples of Causes of Apparent Losses:

			
Illegal connection (meter removed)	Illegal connection (underground connection before meter)	Illegal connection (connection before meter)	Malfunctioned unreadable meter (causing meter error)

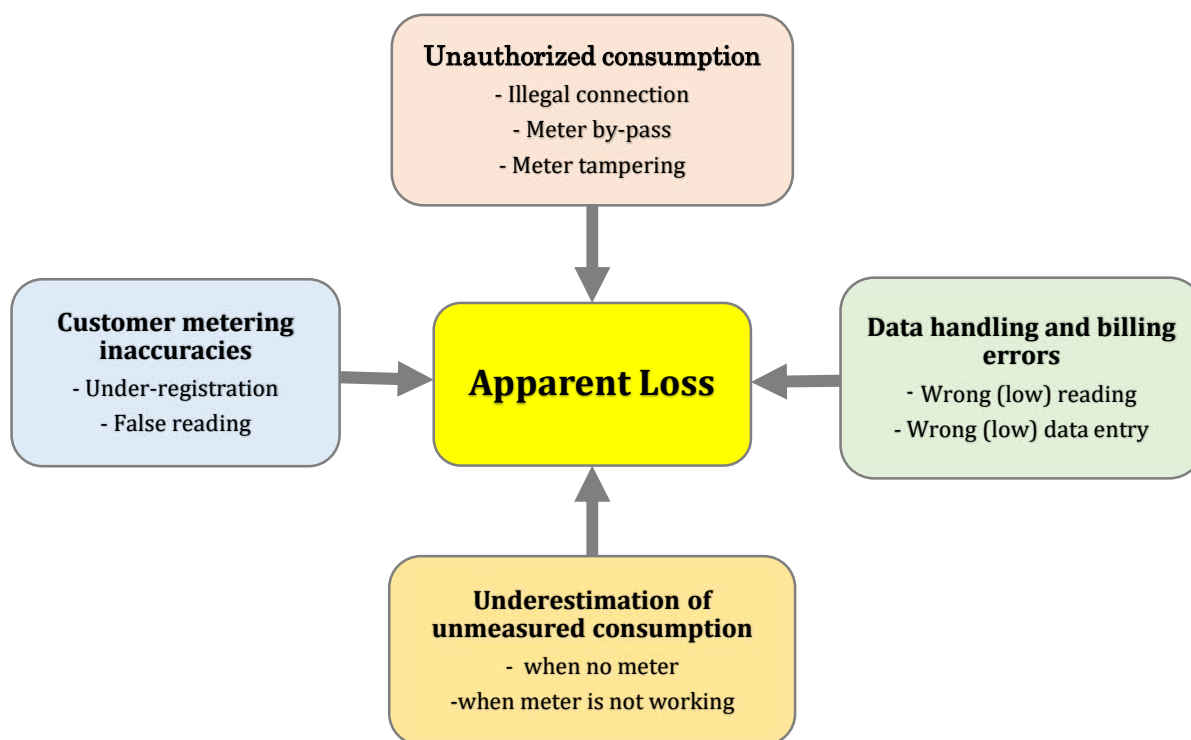
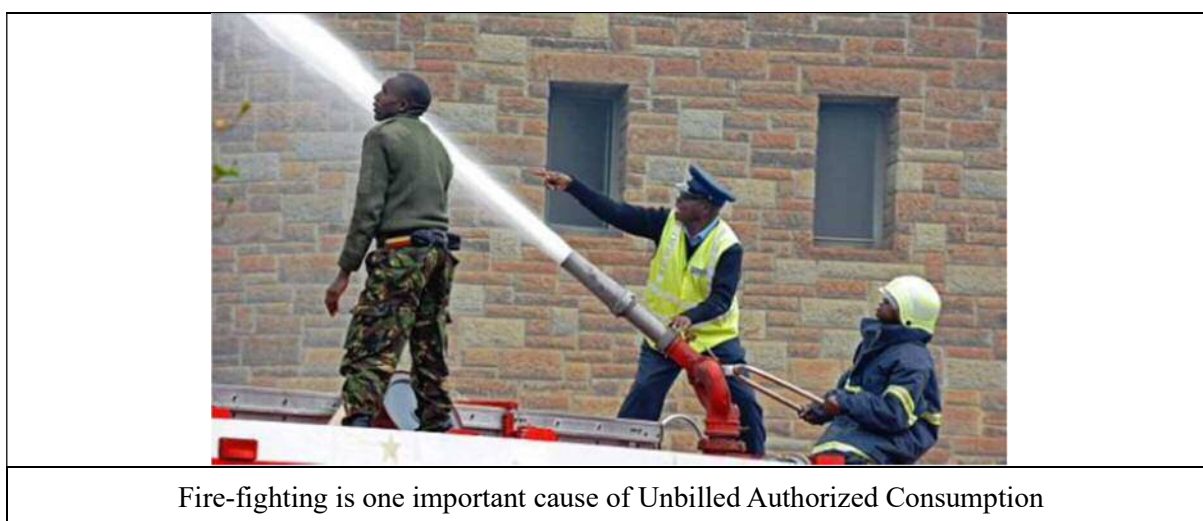


Figure 12: Causes of Apparent Loss

4.3 Causes of Unbilled Authorized Consumption

Unbilled Authorized Consumption is caused by free supply of water by the municipality to municipal uses such as for firefighting, watering of public gardens, cleaning of sewer lines etc. In general, the volume of Unbilled Authorized Consumption is very small and thus not a major contributor to NRW. But it may be significant if governmental and religious institutions are provided free water.



CHAPTER 5. METHODS OF REDUCING NRW

5.1 Practical Approach of NRW Reduction

The figure below summarizes the practical approach of NRW reduction by DMA approach.

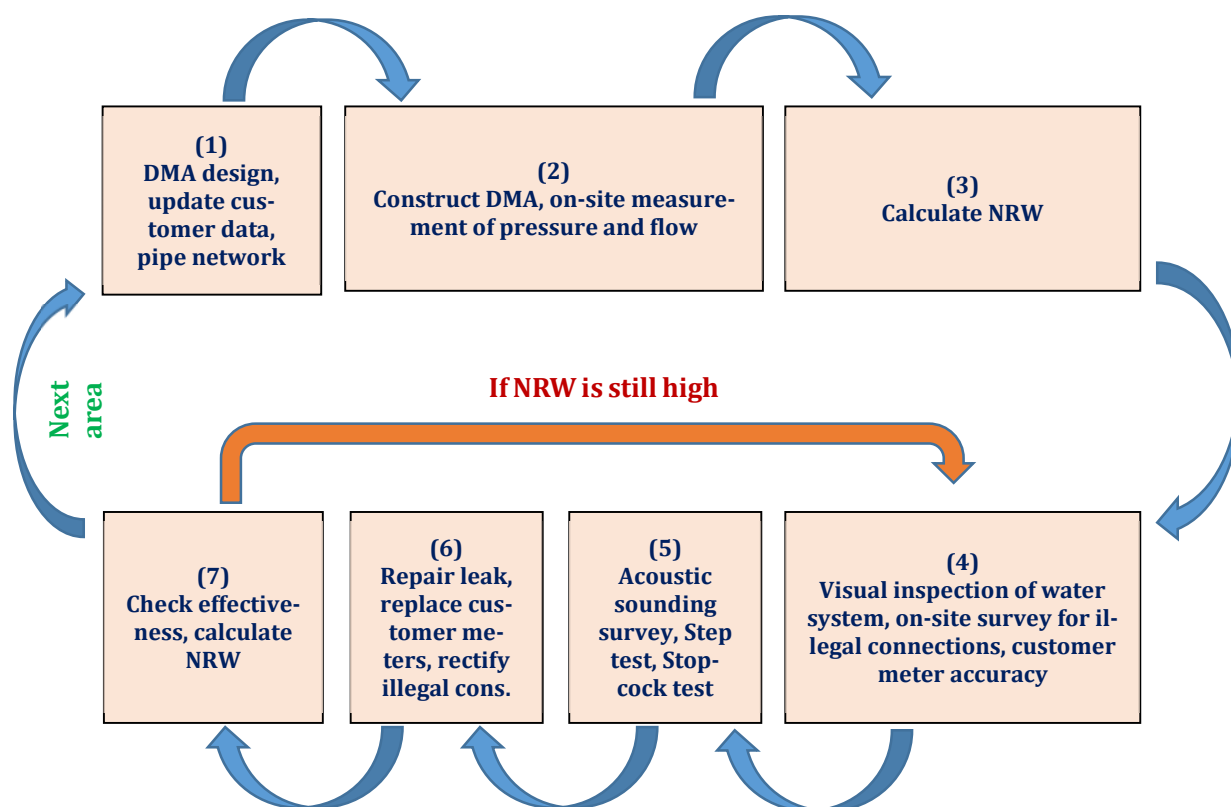


Figure 13: Practical approach of NRW reduction by DMA method

In applying the above-mentioned practical approach various factors need to be considered. These are described in more detail in the following sections.

5.2 Methods of Reducing Real Losses

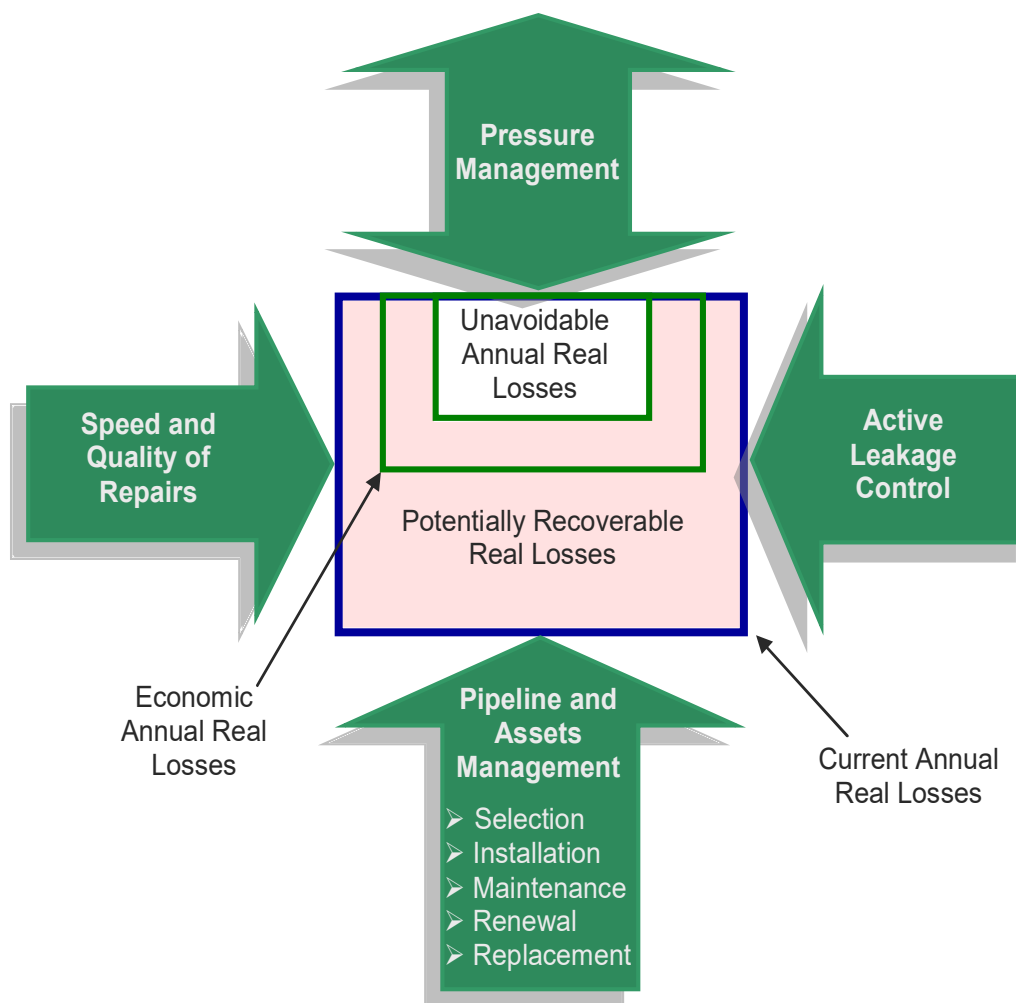


Figure 14: The Four Principal Methods of Managing Real Losses

The methods of reducing real losses can be grouped into four principal methods as shown in the above figure.

5.2.1 Speed and quality of repairs

The amount of water lost due to Physical losses is affected by the time of awareness, location and repair (ALR) of a leakage.

- Awareness time - time required for the utility to become aware of the leak,
- Location time - time required to locate the leak,
- Repair time - time required to repair the leak.

- ✧ Repair the leak quickly. Leak should be repaired as soon as possible. Setting a target to repair any leak within 24-hr is a good practice.
- ✧ Repair the leaks by using quality materials and following a set work standard.

If the quality of repair is not good, more leaks will occur in future either from the same place or in its vicinity because of the disturbance to the surrounding ground and bedding caused by both the initial failure and its subsequent repair.

Example of water loss due to delay in leak repair

Let's assume there is one medium size leak of leakage rate 500 L/hr

- If its repair time is delayed by 1 day, we will lose $500 \times 24 = 12,000$ L
- If its repair time is delayed by 3 days, we will lose $12,000 \times 3 = 36,000$ L

See another example below. Here the leakage is 25 m³/day:

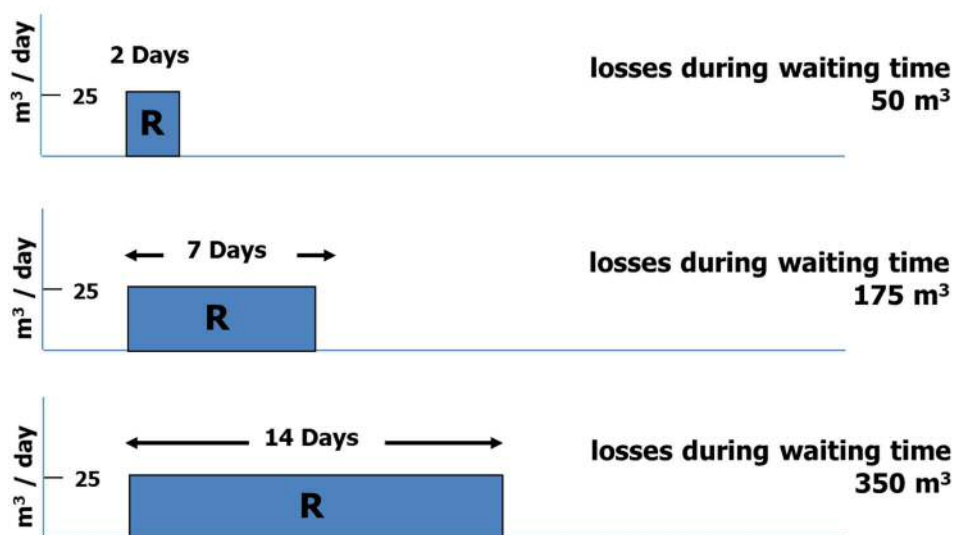


Figure 15: Effect of run time on leakage volume

How to improve speed and quality of repairs?

<ul style="list-style-type: none"> • Clear repair policy and procedures • Efficient organization from leakage report through repair • Availability of equipment and materials • Sufficient funding 	<ul style="list-style-type: none"> • Appropriate standards, specs for materials and workmanship • Committed management and staff • Repair supervision
--	--

5.2.2 Active leakage control

- ✧ Regularly check supply area for any visible leak

- ✧ Conduct underground leak detection surveys regularly in a planned way. Refer to the manual for ‘Underground leak detection’ and ‘Equipment and tools for underground leak detection’ for more details.
- ✧ In the DMAs where the supply is continuous (24hr × 7d) monitor night flow profiles regularly from flow and pressure data loggers. If any sudden increase in flow or decrease in pressure is noticed, it may be due to a new burst. Immediately survey the area for any new leak or illegal water use.

5.2.3 Pipeline and Assets Management

- ✧ Select good quality pipe and fittings when purchasing. Do not use poor quality pipe and fitting materials.
- ✧ Install and join properly. Follow standard specification for laying and jointing of pipes and fittings.
- ✧ Do the maintenance process properly.
- ✧ Renew in time if the pipeline and assets can be used after renewal.
- ✧ Replace when the pipelines burst again and again or the assets reach the end of their useful life and no longer be used by renewing.

How do you know which area of the network has more frequent bursts/leaks?

By keeping record of leak repair and mapping in GIS, it can be seen which area has more pipe burst/more leaks. An example of Jenin is shown in the chapter of leak repair.

5.2.4 Pressure Management

- ✧ Maintain pressure within a good range; as per PWA guideline a range of 20-60 m is acceptable.
- ✧ If pressure is too low, customers do not get enough water, water does not reach roof-top tanks of even one or two story buildings.
- ✧ If pressure is too high, leakage rate and number of pipe-burst increase.

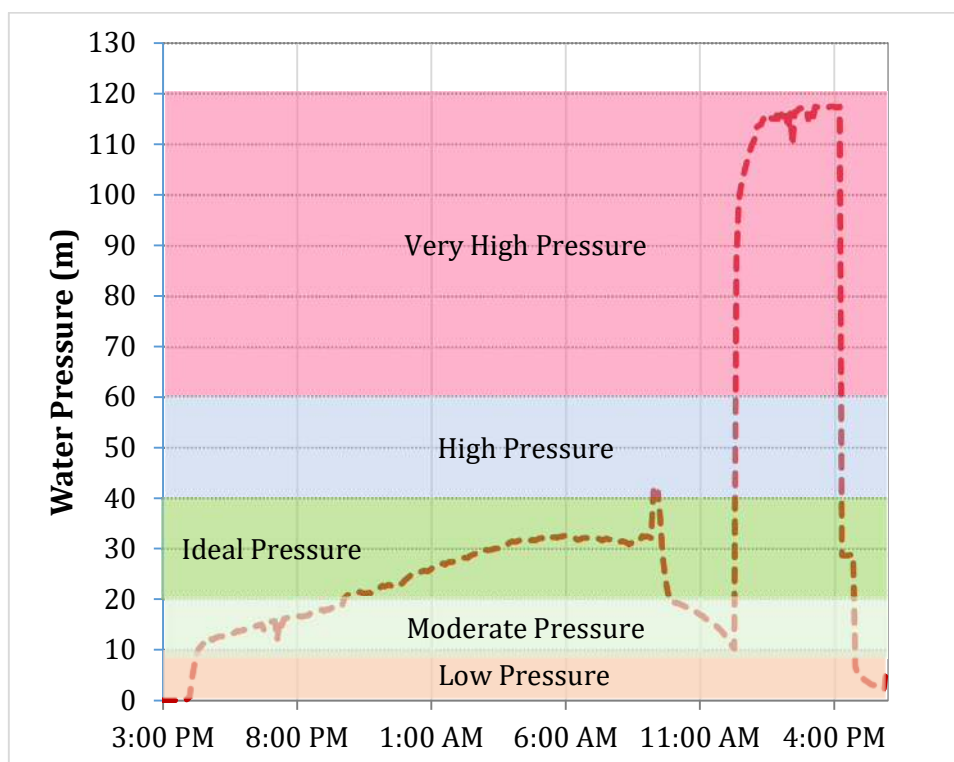


Figure 16: Approximate pressure ranges and situation of actual pressure in one pilot area

Methods to Manage Pressure

- Pressure zoning – create separate zones for high and low elevation areas. It will make easy to keep pressure within a desirable range.
 - Pressure reducing valves – PRVs reduce downstream pressure to set values.
 - Break-pressure tanks – BPTs are small tanks where pressure becomes zero (atmospheric pressure).
 - Proper sizing of distribution pipes – By increasing size of very small pipes it becomes easier to maintain pressure within a desirable range. Otherwise, to push water through these small pipes a high pressure needs to be applied and areas before the small pipe will have very high pressure.
 - Select proper size of booster pumps – Using excessively big (high head and capacity) pumps will cause high pressure.
-
-

The following examples of Jenin shows the pressure was too high.



Figure 17: Examples of a high pressure

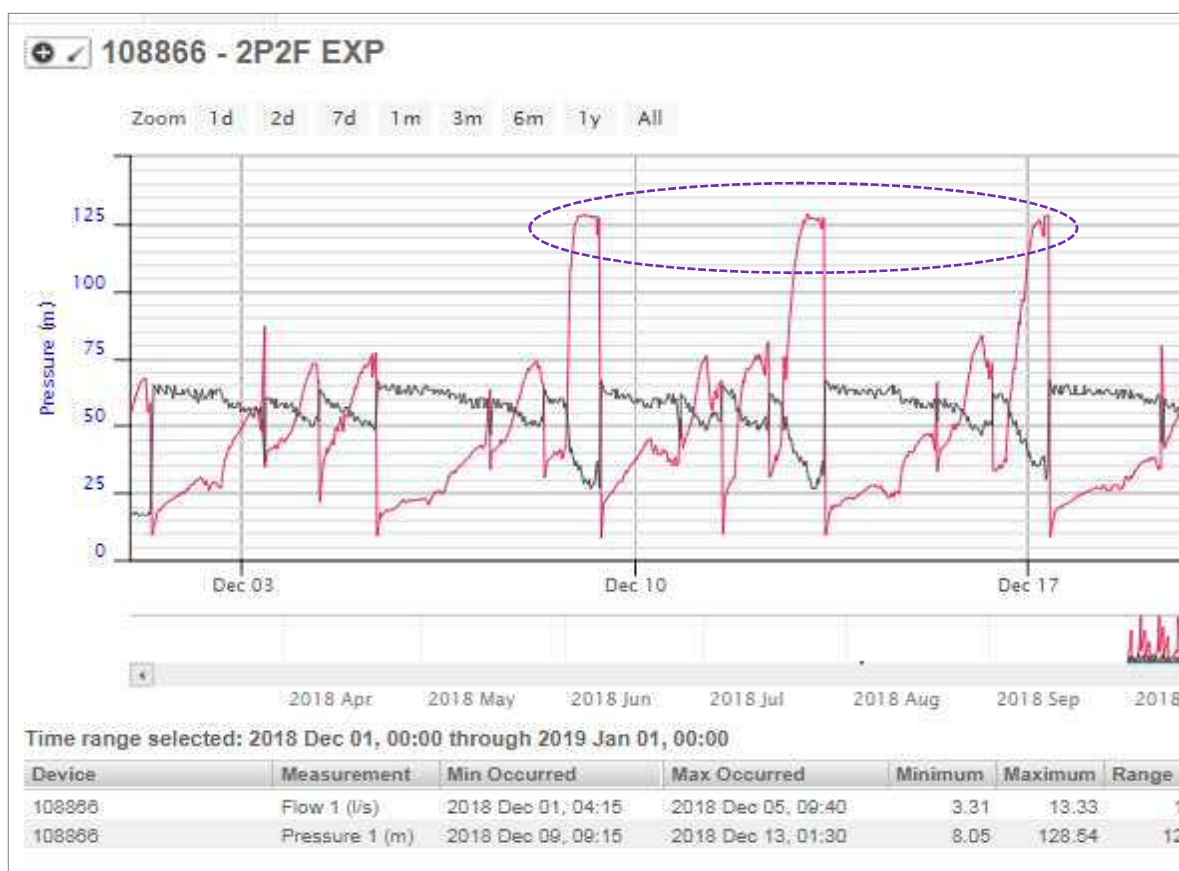


Figure 18: Example of a very high pressure (outlet of Sabah Al Khir PS in Jenin)

Table 4: Causes of Leakage and Methods of Reduction According to the Cause

S.N.	Cause of Leakage	Main tools/methods for leakage reduction
1	Poor installation and workmanship	<ul style="list-style-type: none"> - Standardization - Enforcement of quality control methods - Proper supervision
2	Poor materials	<ul style="list-style-type: none"> - Material quality control (use only materials which conform to established quality standard of PWA)
3	Mishandling of materials prior to installation	<ul style="list-style-type: none"> - Raising awareness of utility staff and contractors' personnel
4	Incorrect backfill	<ul style="list-style-type: none"> - Enforcement of quality standard - Proper supervision
5	Lack of proper scheduled maintenance	<ul style="list-style-type: none"> - Introduction of scheduled maintenance system - Operation and maintenance manuals
6	Environmental conditions such as cold weather	<ul style="list-style-type: none"> - Adequate depth of pipe laying - Protection against frost
7	Vibration and traffic loading	<ul style="list-style-type: none"> - Adequate depth of pipe laying - Thrust blocks
8	Corrosion	<ul style="list-style-type: none"> - Lining (internal/external) of pipe - Use of corrosion resistant pipe and pipe fittings - Corrosion protection
9	Excessive pressure	<ul style="list-style-type: none"> - Pressure reduction - Pressure stabilization
10	Pressure fluctuations including water hammer	<ul style="list-style-type: none"> - Proper operation of pumps and valves - Surge protection methods - Shift to continuous supply system - Better organization of distribution network
11	Internal damage due to frequent contact with air due to intermittent supply	<ul style="list-style-type: none"> - Reduce the times of intermissions - Transform the system to a continuous supply system

Table 5: Type of Leakage and Methods of Reduction According to the Type

	Type of leakage		
	Surface leakage (or reported leakage)	Underground leakage	
		Unreported leakage	Background leakage
Main Characteristics	Comes to surface and reported by the public or utility workers	Does not come to surface but is detectable using traditional acoustic equipment	Does not come to surface and undetectable using traditional acoustic equipment
Reduction Methods	<ul style="list-style-type: none"> - Pressure reduction - Main and service replacement - Optimized repair time 	<ul style="list-style-type: none"> - Pressure reduction - Main and service replacement - Reduction in the number of joints and fittings - Proactive leak detection 	<ul style="list-style-type: none"> - Pressure reduction - Main and service replacement - Reduction in the number of joints and fittings

Big Leaks vs. Small Leaks

Big leaks or bursts are fewer in number, catch attention of people/utility staff and are thus repaired quickly. In contrary, smaller leaks are more in number, are often neglected and run for longer duration. As a result, smaller leaks waste as much or even more water compared to bigger leaks such as mains burst.

Preventive Measures vs. Corrective Measures

The methods for leakage reduction can be also divided into two types; preventive measures and corrective measures. As implied by the names, preventive measures prevent leakage from occurring. On contrary, corrective measures reduce leakage that has already occurred. The saying for diseases “Prevention is better than cure” also applies equally for the leakage. It is better to take preventive measures than finding and repairing leaks after they have already happened.

5.3 Methods of Reducing Apparent Losses

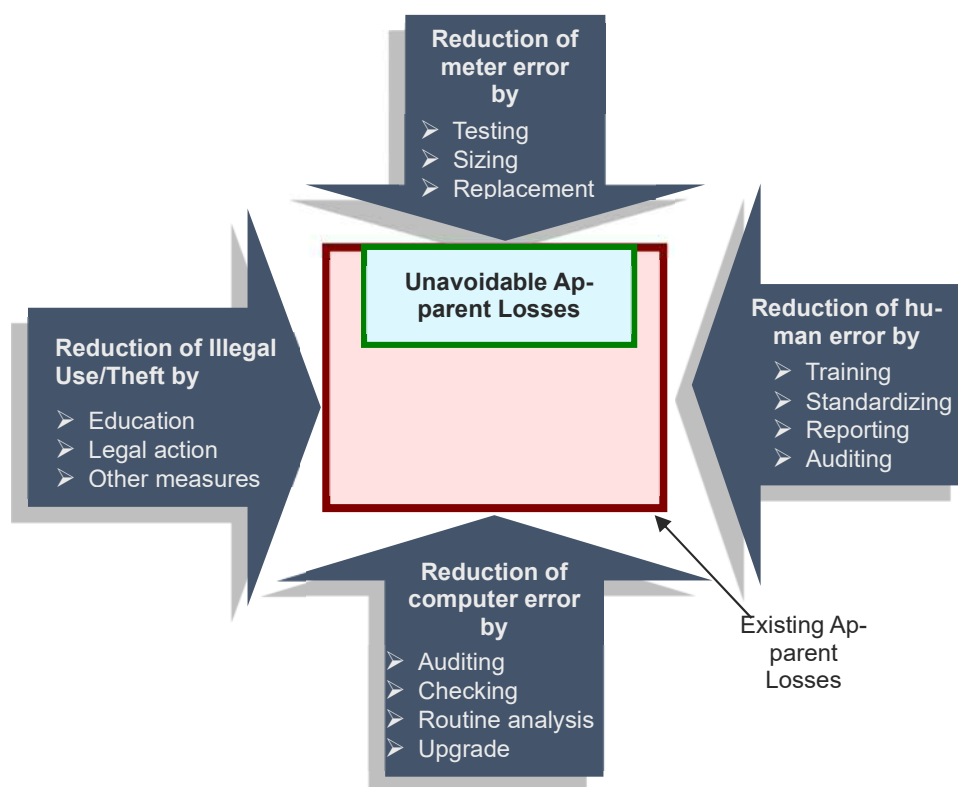


Figure 19: The four components of an active Apparent loss management program

5.3.1 Reduction of meter error

The meters can be divided into two types based on the purpose: (1) Production (or source) meters, and (2) Customer (or revenue) meters.

Both type of meters should be in proper working condition and their errors should be within the acceptable tolerance margin. This margin is generally $\pm 5\%$.

Actions to Reduce Meter Error

- Select more accurate class of meter
 - Install meters properly – as per manufacturer’s recommendation, correct position,
 - Select suitable size of meter – neither too big nor too small size,
 - Maintain and replace meters properly,
 - Check meter accuracy periodically and replace when error exceeds the tolerance limit; for example, when the error is more than $\pm 5\%$,
 - Use the type of meters which are difficult to tamper.
-
-

What happens if the production (source) meters are not accurate?

- The SIV calculation will be wrong,
 - The NRW calculation will be wrong,
 - If the meters show more volume than actual (over-registration), the Municipality will pay more and vice versa.
-
-

What happens if the customer (revenue) meters are not accurate?

- If the meters under-register (show less volume than actual), then the Municipality will lose money
 - If the meters over-register (show more volume than actual), then the customers will lose money
-
-

What is the situation in Jenin?

- Meter of one private well was found to show more volume (over-register). Meter of other sources have not been checked yet.
 - Old mechanical customer meters (before replacement by pre-paid meters) in PA1 were checked and found to have both positive and negative errors (over- and under-registration). But their net effect was almost zero.
-
-

The new meters being used in Jenin are mainly Volumetric Type for post-paid meter and Ultrasonic type for pre-paid type. In general, these meters’ accuracy is good.

5.3.2 Reduction of human error

A significant portion of apparent losses comes from mistakes in the meter reading and billing chains, not only because of poor technology, outdated customer database, and data-handling

errors in the office but also because of fraudulent practices on the part of meter reading staff. To reduce the human error the following actions should be taken:

- Training – of personnel in the chain of meter reading, billing, and collection,
- Standardizing – the process of meter reading, billing, and collection,
- Reporting – periodically, and
- Auditing – periodically.

What is being done in Jenin to reduce human error?

- Mobile Billing System has been introduced. This reduces the chance of error as manual data entry process is minimized.
 - Almost one-third of the customers now have pre-paid meter system. This system is planned to be applied to almost all customers in future. In this system, consumption and payment data will be recorded automatically. Chances of human error will be almost eliminated.
-
-

5.3.3 Reduction of computer error

Modern day computers are less error-prone but still the quality of their outputs depend on the programs used. Thus, a reliable billing system with in-built cross-checking and tamper-proof features should be used. The latest billing software has built-in analysis functions that can identify potential data handling errors and report them for verification.

5.3.4 Reduction of illegal use/water theft

Illegal connections and water theft pose the biggest problem to Jenin Municipality's revenue generation from water.

How to reduce illegal connections/ water theft?

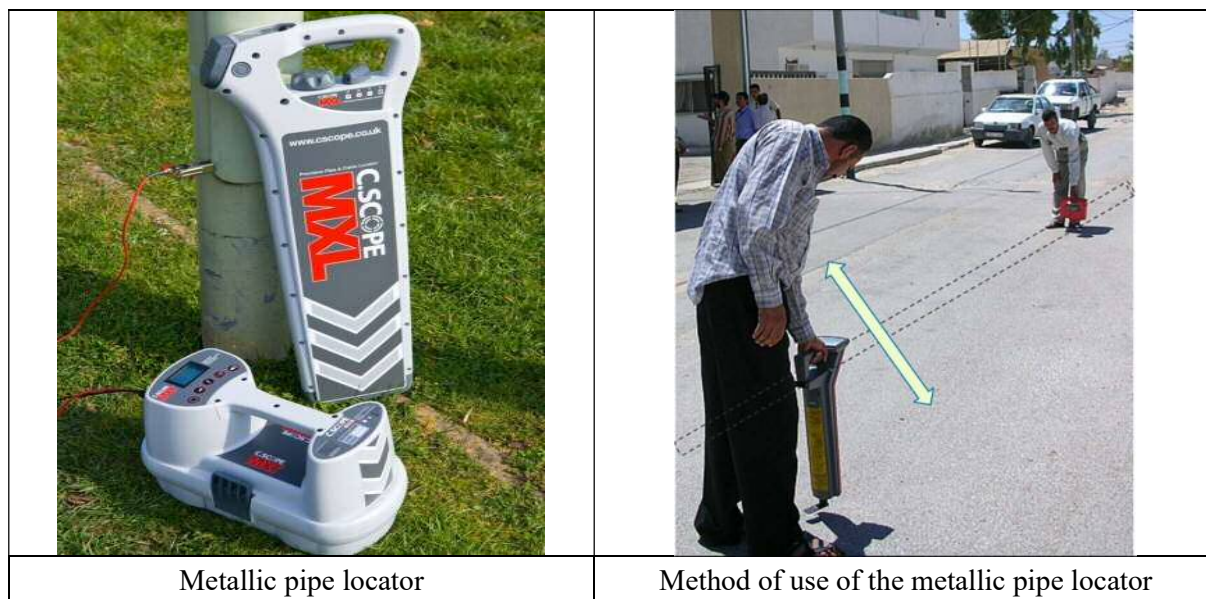
- Organize public awareness programs highlighting the evil of illegal uses and penalties if caught,
 - Find and reduce illegal connections through intensive door-to-door survey,
 - Encourage public to report illegal connections, provide incentive to public,
 - Require meter readers to report suspected cases of illegal connection on each meter reading,
 - Tackle meter bypass by using tamper resistant meters,
 - Inspect meters and house connections of suspicious customers whose consumption is zero,
 - Do not allow illegal use of fire hydrants,
 - Actively check the customer billing system (in case of prepaid water meter system, check consumption pattern from Gateway system) and inspect customers who have suspicious consumption pattern,
 - Watch corrupt meter readers – rotate meter readers, do not always assign the same meter reader to the same area,
 - Enforce the highest penalty to confirmed illegal users to discourage the same by others,
 - Publicize (without revealing name) such illegal users, and so on.
-
-

CHAPTER 6. BASIC EQUIPMENT AND TOOLS IN NRW REDUCTION

The most basic equipment and tools used in NRW reduction are shown in this chapter.

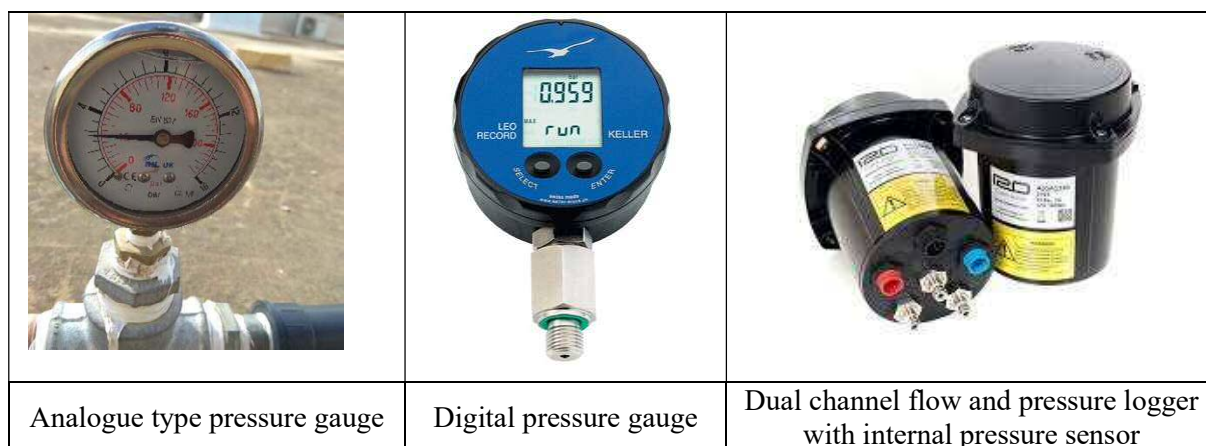
6.1 Pipe Locator

This is used to locate the position of underground metallic pipe.






6.2 Pressure Measurement Equipment

These include pressure gauges and pressure transducers (pressure loggers with internal pressure sensor).



6.3 Flow Measurement Equipment

These include bulk meters (mechanical), ultrasonic and electromagnetic flowmeters.

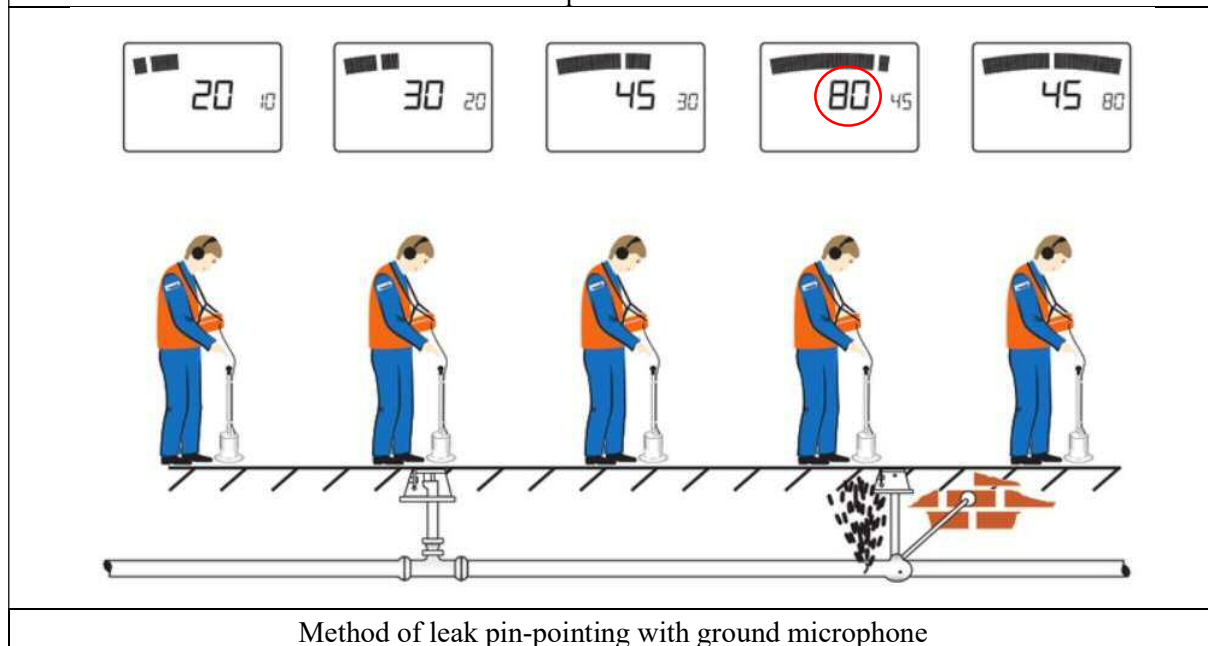
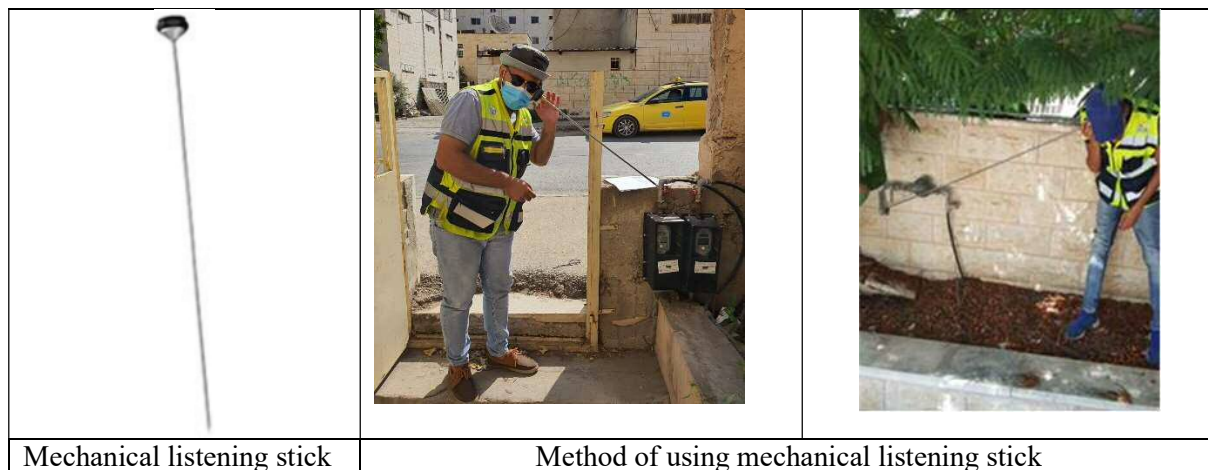
		
<p>Ordinary mechanical bulk meter</p>	<p>Mechanical bulk meter with pulse output to connect with data logger</p>	<p>Electromagnetic flowmeter</p>



Ultrasonic flowmeter and accessories (at the top) and measurement method at the bottom

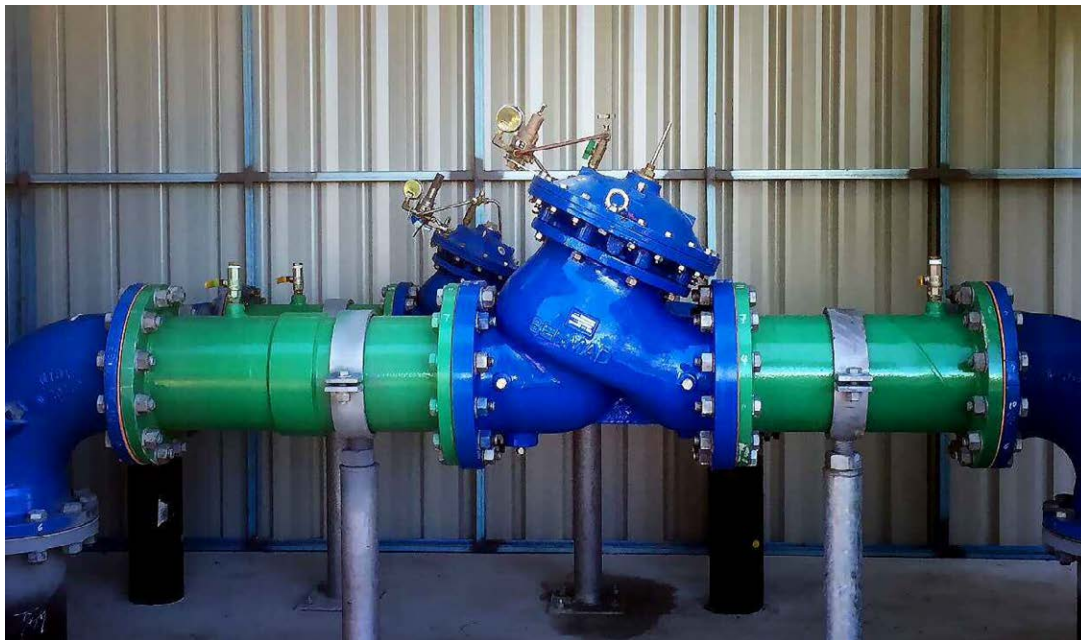
6.4 Leakage Detection and Pin-Pointing Equipment

These include mechanical listening stick, electronic listening stick, ground microphone, leak-noise correlator, and acoustic loggers.

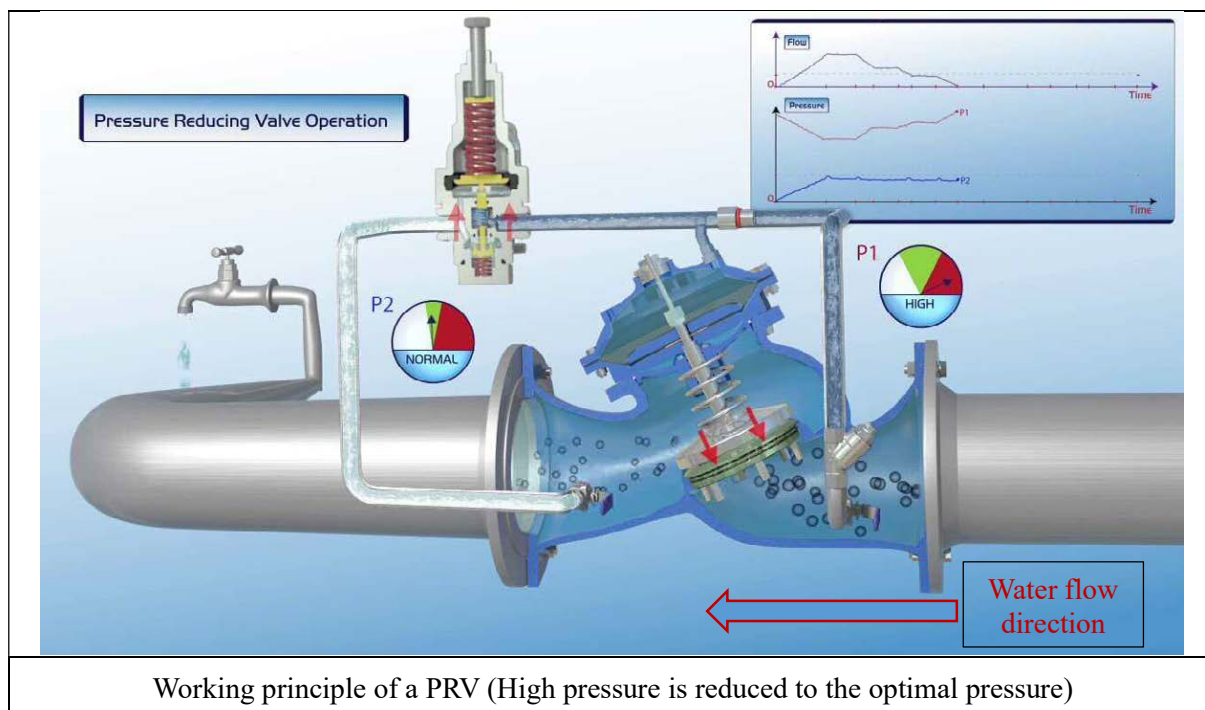


6.5 Pressure Management and Other Equipment

Pressure reducing valve (PRV) is the most important equipment for pressure management.



Example of a pressure reducing valve



Working principle of a PRV (High pressure is reduced to the optimal pressure)

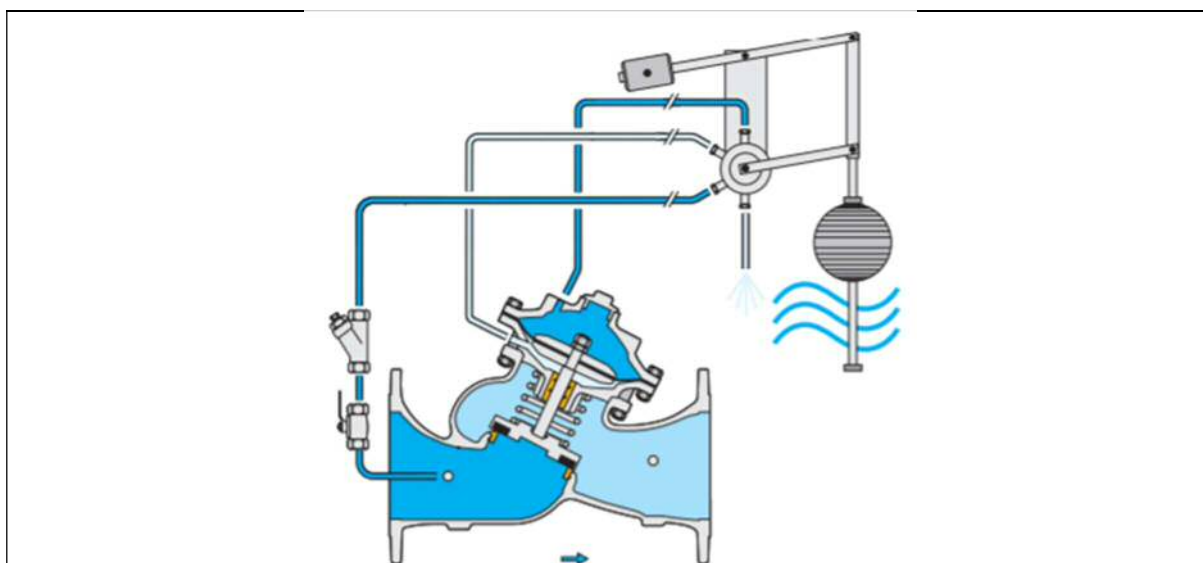
By using PRV high pressure can be reduced to optimal pressure and leakage and pipe burst can be reduced.

Level control valve (altitude valve)

Level control valve stops the inflow to a tank when the tank becomes full and prevents overflow (wastage of water).



Example of a level control valve



Working principle of a level control valve

CHAPTER 7. LEAKAGE DETECTION & PIN-POINTING

7.1 Introduction

Water leakage from pipeline causes a variety of problems:

- ✧ Wastage of precious water,
- ✧ Risk of contamination of water,
- ✧ Risk of land subsidence and property damage,
- ✧ Inconvenience to motorists and pedestrians, and so on.

Therefore, water leakage survey should be carried out as **preventive measures** to sustain the implementation of appropriate O&M activities and the subsequent improved water supply.

The leakage from water pipeline is categorized into:

- ✧ Surface leakage (also called visible leakage), and
- ✧ Underground leakage.

The surface leakage is usually easy to discover and repair within a short period of time while a series of special survey should be done to discover underground leakage. Underground leakage needs a longer period of time to discover, i.e., it runs for a longer duration than surface leakage, thus water leakage is more by underground leakage.

There are various methods to detect and pin-point leakage. The most common methods applicable to the condition of project site are:

(i) Visual survey for surface leakage, (ii) Acoustic survey for underground leakage, (iii) Step test, and (iv) Stop-cock method.

7.2 Visual Survey for Surface Leakage

Surface leakage needs to be found and repaired first, then only we can move to underground leakage. To find the surface leakage, an elaborated site survey including walking some distance should be conducted.

7.2.1 Preparation for surface leakage survey

- ✧ Understand which area is supplied on which day and time. Such a map has been prepared by this project but the schedule might have been changed. So, confirmation of supply areas according to latest supply schedule is required.
- ✧ Prepare a schedule of survey according to the supply day and time of each area.
- ✧ Print out pipe network map of the planned survey area at a scale of about 1:500~1:1000, or alternately, export the shape file of pipe network in to KML file and transfer into your mobile device (if you want to avoid paper map and plan to use your mobile device).

- ✧ A team of two persons is recommended.

7.2.2 Method for surface leakage survey

- ✧ The survey method is nothing but careful watching for any sign of leakage on the road surface.
- ✧ Start walking slowly from a corner of the survey area, one person on each side of road, watching carefully if any sign of water leakage appears.
- ✧ If you find some water on the road or damp patch of soil, investigate further. It may be due to various reasons such as discarded washing water by a customer, overflow from roof-top tanks, water from kitchen, and so on.
- ✧ If such possibilities are not found and you suspect it is from a leakage, mark its location on the paper map or your mobile device. Also take GIS coordinates of the location.

7.2.3 Confirmation survey for surface leakage

- ✧ If the suspected leakage could not be confirmed in the first survey, check the location after one or two days of water supply stoppage in the area. Check if the leakage dried up.
- ✧ Recheck during next supply day. Has the leakage reappeared?
- ✧ If the leakage sign reappears, investigate by using sounding equipment.
- ✧ If it is possible to conduct Stop-cock method in that area, conduct it and investigate further.
- ✧ If necessary, excavate around the suspected area.

7.3 Acoustic (Sounding) Survey to Detect Underground Leakage

This system is based on the hearing of sound generated by leaking water. Underground leak detection is a challenging job and needs considerable resources; time, trained manpower, and equipment. The job is even more challenging when the water supply system is intermittent and customers own big underground tanks to store water for non-supply hours because the sound generated by the tank filling can be similar to the sound of a leak.

7.3.1 Preparation for underground leakage survey

- ✧ Understand which area is supplied on which day and time. Such a map has been prepared by this project but the schedule might have been changed. So, confirmation of supply areas according to latest supply schedule is required.
- ✧ It is necessary to know exact location of the pipelines on the ground. Prepare a pipe network map which shows accurate location of pipes, valves, and other appurtenances. Additional information of pipe such as pipe material and diameters are helpful.
- ✧ It may be necessary to conduct pipe network confirmation survey beforehand if such map is not available.
- ✧ Prepare survey teams. Each team should have well trained three (3) members in it.
- ✧ When checking water meters through house-to-house visits, a check sheet is needed to record the result. Prepare it in advance.

- ✧ Check and prepare the equipment. Check batteries, charge equipment beforehand if necessary.

Pipe network confirmation survey

- Refer to the main NRW Reduction Manual for detail,
- In this survey, exact location of pipe on the ground is identified by using pipe locating tools. Location of the pipe is then recorded in GIS by taking coordinates by a high precision GPS machine.
- The Jenin water and wastewater department owns metal pipe locator and high precision GPS machine as well as the skilled manpower to operate them.
- Pipe network information in Jenin is reasonably accurate for pipes within the pilot areas and new DMAs implemented by JM because pipe network confirmation survey has been conducted there.

7.3.2 Procedure for underground leakage survey

There are two steps for underground leakage survey:

Step (1): Area-Wise Approach

In this step it is necessary to listen to all exposed metal parts (valves, fire hydrants and water meters) within a defined area by using listening sticks and then specify the pipes with real /pseudo leakage sound. As a typical example practiced in August 2018 in Jenin, domestic water meters and correspondingly connected distribution pipes were checked by using listening sticks. This survey is to be conducted during daytime for safety reason. The key steps in this approach are:

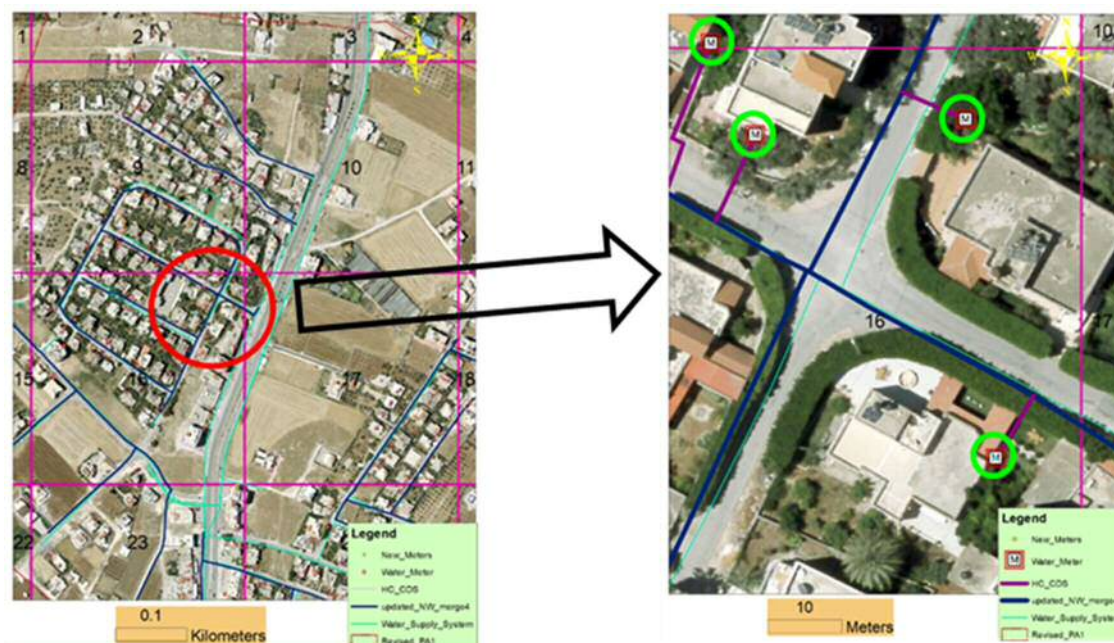


Figure 20: Selected area for survey (left) and zoomed in map of the area

- ❖ Select a grid or an area in the map,
- ❖ Prepare zoomed-in map (scale 1:500-1:1000),
- ❖ Listen to any exposed part of pipe, fittings, hydrants, meters, valves etc,
- ❖ Record the location on the map and fill up the check sheet if any suspicious sound is found,
- ❖ Continue the process until the whole area is covered.

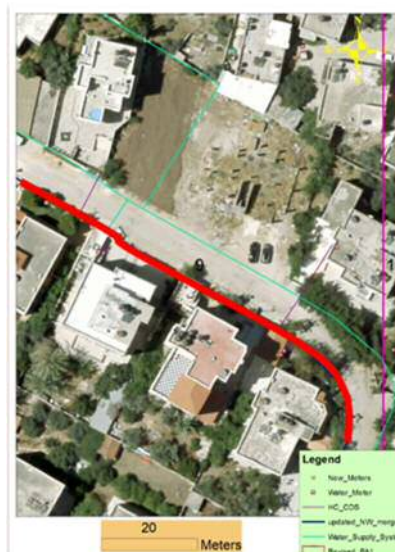


Figure 21: Showing the activities under Step (1) 'Area-Wise Approach'

Step (2): Line-Wise Approach

When a suspected leak sound is found during Step (1) 'Area-Wise Approach', the leak detection survey should continue along the connected distribution pipelines by using ground microphone.

The red line on the right map shows the alignment of distribution pipeline with high possibility of leakage along the pipe and its house connections, according to the result of Step (1) 'Area-Wise Approach' conducted during daytime. In Step (2), a road hearing survey should be conducted along this pipeline using ground microphone during night time when external noise is less.



The sound of pseudo leakage is easily confused with the real leakage sound, since both have the same frequency band. Thus, it is necessary to tell the difference between them through practices.



Figure 22: Line-Wise Survey Using Ground Microphone

7.3.3 Precaution against External Sound Interference (Pseudo Sound)

There is a need to wait before starting the survey because when the water-feed has just begun, there tends to be many noises caused by the running water.

The surveyors record all the detected sound as possible /probable leakage sound while executing leakage survey. The detected sound may include pseudo leakage sound, which is similar to the leakage sound and is a critical obstacle during the survey. In order to differentiate the real from the pseudo leakage sounds, it is necessary to obtain many years of site experience.

Typical examples that may be confused with leakage sound are as follows.

a) Turbulent flow sound inside pipe

When the water passes flow-regulating devices such as gate valves, pressure reducing valves and reducers, it generates vibration-like sound of which frequency is like the leakage sound and which is hard to differentiate especially when the distance is far. When the gate valve is not opened fully, the sound of turbulent water is so similar to the leakage sound. So, at the location where gate valves or other flow-regulating devices are installed, it is necessary to conduct the leakage survey when the valves are fully closed or opened.

b) Circuit sound such as electric power cables

Electric current flow generates low frequency sound of 300 Hz or more by electric dis-charge vibration, from underground cables, transformers on utility poles, streetlights etc.

c) Sound from filling of customer tanks

Sound from filling of customers' water tanks is similar to the leakage sound.

d) Stream sound in drainage

The stream sound in drainage including the fall sound in the manhole is similar to leakage sound and thus hard to differentiate.

e) Sound of running vehicles

The running sound of cars is transitory and easy to distinguish because the volume changes irregularly. However, the friction sound of the tire with the road surface is easily confused with the leakage sound.

f) Noise of wind

Sound of low velocity wind is different from that of leakage but when the velocity of wind increases the sound becomes similar to that of leakage and it becomes difficult to distinguish between the sound of wind and leakage.

g) Town noise

In urbanized area, various sounds such as from air-conditioning equipment and running cars are mixed together, which is similar to the leakage sound.

7.4 Step-Test

Flow step-testing is a method to identify areas of potentially high leakage / unauthorized water use within a DMA or area of a distribution system by sequentially closing and opening sectional valves within the area while monitoring inflow to the area at the same time. If closing some sections (blocks) results in a disproportionately higher drop in inflow, that indicates a potential high leakage / unauthorized water use in that block. This method can be helpful to identify areas of higher leakage when it is difficult to do intensive sounding surveys due to various reasons. But for this method the structure of pipe network should be suitable and there should be enough isolation vales.

Case study of Step-Test conducted in Pilot Area 1

Sub-area 1 of PA1 has continuous (24×7) water supply. NRW measurement of this area showed high NRW ratio (~50% or more) for several months. Surveys conducted for leakage detection and unauthorized connections were not able to find the causes of this high NRW. Thus, the Step-Test was conducted in this sub-area as explained below.

Figure 23 shows the location, network layout and valves prepared for the test.

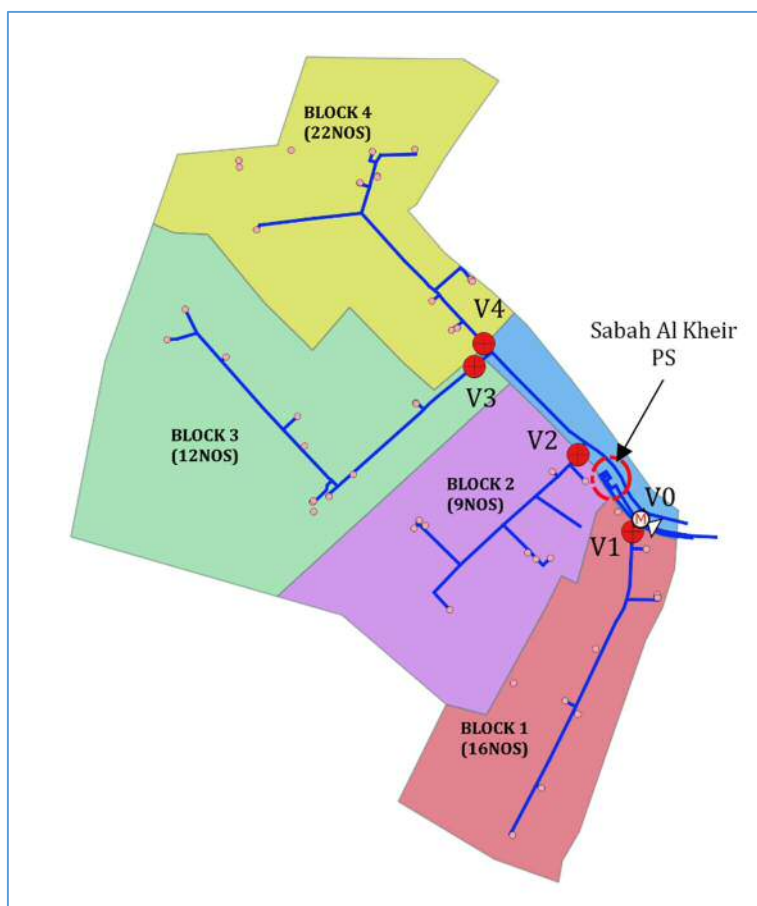


Figure 23: Layout of Step-Testing blocks showing valves and customer numbers

The area is supplied through a single 50 mm inlet. The inlet has a permanently installed mechanical flow meter with pulsar connection for data logger, a valve (marked as V0), and a tapping for pressure measurement. There is also portion of exposed pipe where ultrasonic flowmeter could be installed.

Four isolation (step) valves (V1, V2, V3, and V4) were installed at four branches. By closing these valves, the area was divided into four hydraulically isolated blocks, named as Block 1 through Block 4.

Number of customers in each block:

Block	Block 4	Block 3	Block 2	Block 1	Total
No of customers	22	12	9	16	59
Percentage of customers	37.3%	20.3%	15.3%	27.1%	100.0%

(1) Test procedure

The test was done three times: twice in the day time and once during early morning (minimum night flow time; 03~04 am). Each time the process was:

- ✚ Install portable ultrasonic flowmeter at the inlet pipe and start logging flow data.

✚ Close the valves V4 through V0 sequentially as follows:

Step 1: Close V4 completely, wait until the flow reading becomes stable (2~3 minutes)

Step 2: Close V3 completely, wait until the flow reading becomes stable (~1 minute required in every step)

Step 3: Close V2 completely, wait until the flow reading becomes stable

Step 4: Close V1 completely, wait until the flow reading becomes stable

Inflow became 0 after closing the four valves, so closing V0 was not required.

✚ Now open the valves in reverse order, from V0 through V4:

Step 1: Open V1 completely, wait until the flow reading becomes stable (2~3 minutes required in every step)

Step 2: Open V2 completely, wait until the flow reading becomes stable

Step 3: Open V3 completely, wait until the flow reading becomes stable

Step 4: Open V4 completely, wait until the flow reading becomes stable

(2) Results

Tests were conducted on 23rd and 24th July. The flow values after each step are summarized below.

Date & Time		All open (LPS)	Closing sequence			
			V4 (Block 4) closed	V4 and V3 (Block 4 & 3) closed	V4, V3, & V2 (Block 4, 3, & 2) closed	V4, V3, V2 & V1 (Block 4, 3, 2, & 1) closed
Test 1 23rd July 16:40~17:10	Flow rate (LPS)	1.624	1.521	1.204	0.71	0
	Flow reduction of each block	0	-6.3%	-19.5%	-30.4%	-43.7%
Test 2 24th July 2:18~2:43	Flow rate (LPS)	1.397	1.281	0.996	0.477	0
	Flow reduction of each block	0	-8.3%	-20.4%	-37.2%	-34.1%
Test 3 24th July 3:54~4:15	Flow rate (LPS)	1.332	1.26	0.996	0.475	0
	Flow reduction of each block	0	-5.4%	-19.8%	-39.1%	-35.7%

The flow results for Test 1 and Test 2 are shown graphically below.

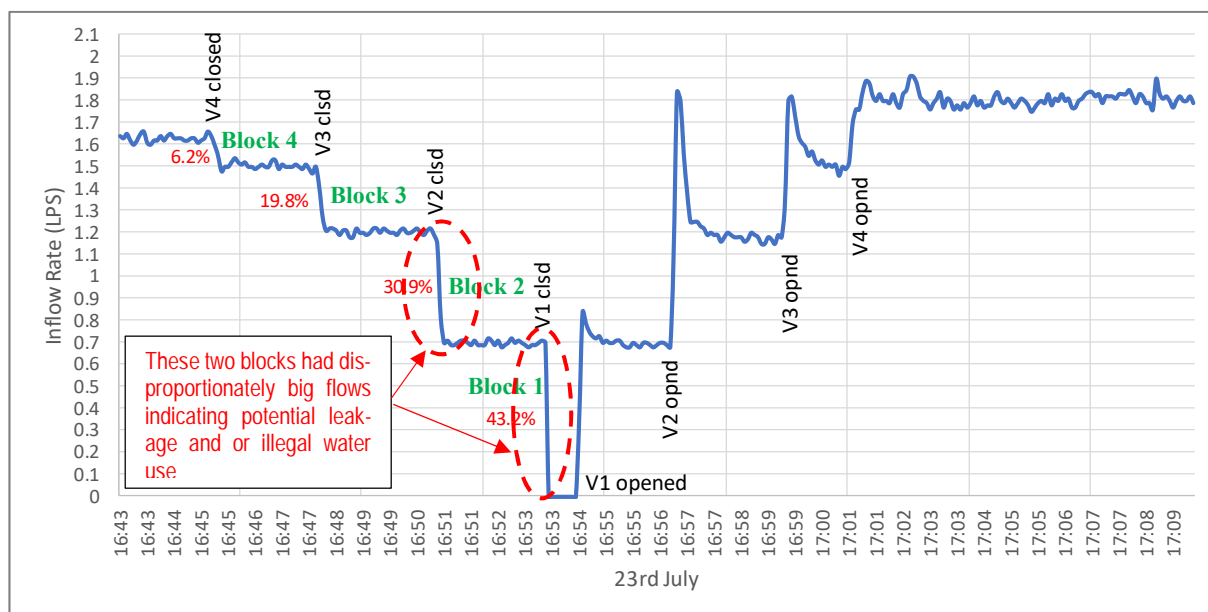


Figure 24: Flow profile of Test 1

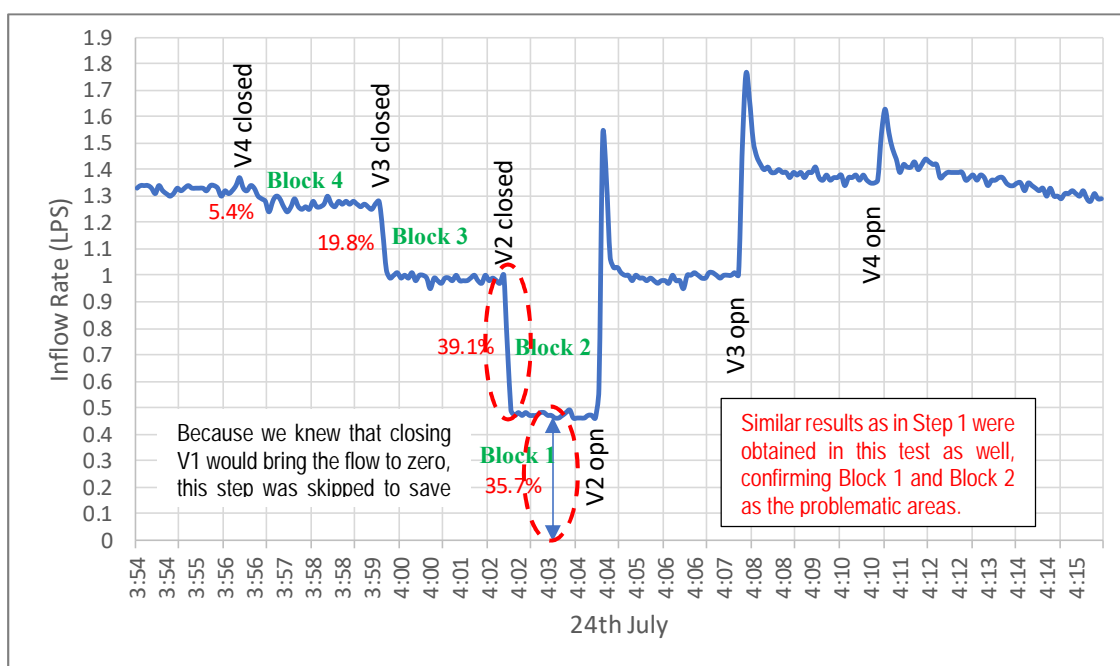


Figure 25: Flow profile of Test 2 (conducted during night time)

The above result clearly showed that Block 4 and Block 3 did not have much problem but the remaining two blocks (Block 2 and 1) had problems.

The Step-Test method is explained in detail in the main NRW management manual.

7.5 Stop-Cock Method

This method is suitable for smaller areas where it is possible to supply water from only one entry point and isolate the area from the surrounding areas. Then water inflow to the area is monitored at the entry point by means of a temporary flowmeter and all customer taps within the area are closed one-by-one. If there is no leakage or unknown (illegal) connections in the area, the water inflow rate should become zero. Otherwise, it indicates either leakage or unknown (illegal) connections in the area. Then sounding survey can be done at each connection to find out leakage or illegal water use. This method is simple and gives more clear result compared to step-testing but is more labor-intensive because it requires closing of all customer taps.

The followings are the basic requirement to apply Stop-cock method:

- ✧ It should be possible to hydraulically isolate the test area from adjoining areas and measure inflow to it by means of an existing bulk meter or by installing a temporary flowmeter,
- ✧ All the customer meters should be easily accessible to the water utility staff,
- ✧ Each customer connection should have a stop-cock. If not, it should be possible to install new stop-cocks before the customer meters without much problem.

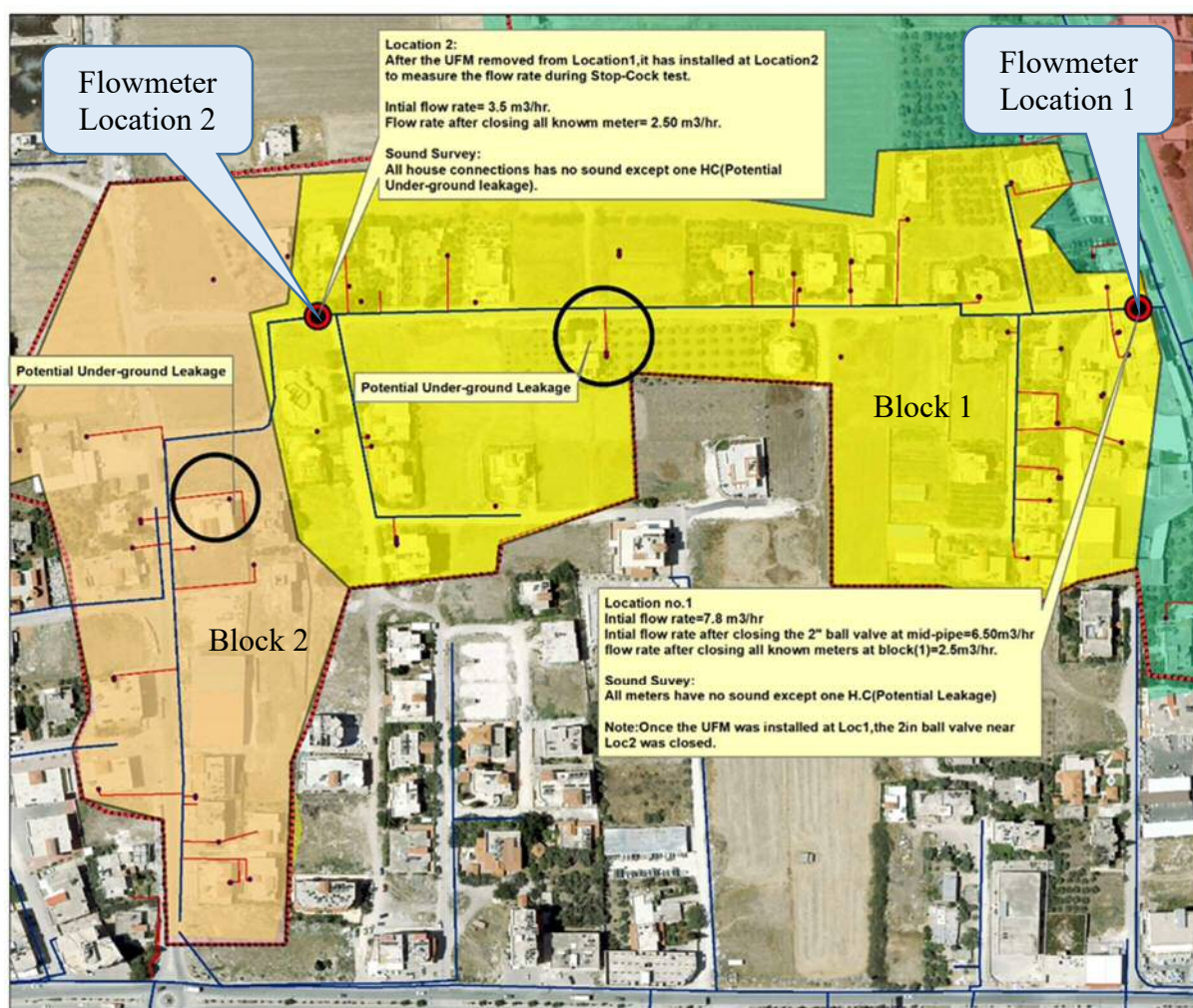


Figure 26: Stop-cock test result conducted in a part of PA1

In the above example:

Block 1

- a) Portable ultrasonic flowmeter installed at Location 1; initial flow rate = 7.8 m³/hr,
- b) Block1 isolated by closing an existing valve at Location 2; flow rate = 6.5 m³/hr
- c) All the house connections in Block 1 were closed manually; the flow rate did not become zero, still 2.5 m³/hr was flowing in,
- d) All the house connections were listened by listening stick for any water flow/leak sound,
- e) Potential underground leakage or illegal water use suspected in one connection.

Block 2

- a) The valve at Location 2 was opened and water supplied to Block 2,
- b) UFM was installed at Location 2; initial flow rate = 3.5 m³/hr,
- c) All the house connections in Block 2 were closed manually; the flow rate did not become zero, still 2.5 m³/hr was flowing in,
- d) All the house connections were listened by listening stick for any water flow/leak sound,
- e) Potential underground leakage or illegal water use suspected in one connection,
- f) After excavation, illegal connection was found at the suspected location.

The Stop-cock method is explained in detail in the main NRW manual.

CHAPTER 8. LEAK REPAIRING WORKS

8.1 Preparation

- ✧ Prepare schedule – prepare priority list on daily basis. Priority should be given to more critical leak considering various factors such as danger to public property, inconvenience to public, volume of water loss, potential of contamination of water supply, availability of repair material in stock, and so on,
- ✧ Get approval for road excavation if required,
- ✧ Arrange equipment such as backhoe, pipe cutter, welding machine, generator, drain pump etc),
- ✧ Arrange repair team members such as backhoe operator, fitter, welder, security guard etc,
- ✧ Arrange safety measures such as sign posts, barricades, reflectors, torch light etc,
- ✧ Estimate and arrange repair materials such as pipe section, fittings, repair clamps, washers etc.

8.2 Repair Work

- ✧ Start from the highest priority leak,
- ✧ Isolate the pipe section by closing upstream and downstream isolation valves if it is not done yet,
- ✧ Install safety barricades around the place of work,
- ✧ Check and confirm the place of work is safe to start work,
- ✧ Repair the leak by following established procedure,
- ✧ Fill the pipe by opening upstream valve,
- ✧ Confirm no leak appears from or around the repaired part,
- ✧ Take pictures and record GIS coordinates with a GPS or mobile phone,
- ✧ Clean the pipeline by open washout valve downstream of the repair location,
- ✧ Reinstate the road surface temporarily,
- ✧ Clean the work site, remove and take back all safety equipment.

8.3 Reporting and Mapping Works

- ✧ Record materials used, total time taken for the repair work, crew members involved etc and fill up the 'Leak repair record' form,
- ✧ Update GIS map of leak repair records. As an example, GIS map of leak repairing points for Nov 2019, Dec 2019 and Jan 2020 is given below.



Leak repair by Repair clamp



Leak repair by cutting and inserting a pipe piece using couplings



Repairing metallic pipe by flanged connector in one side and dismantling joint in another

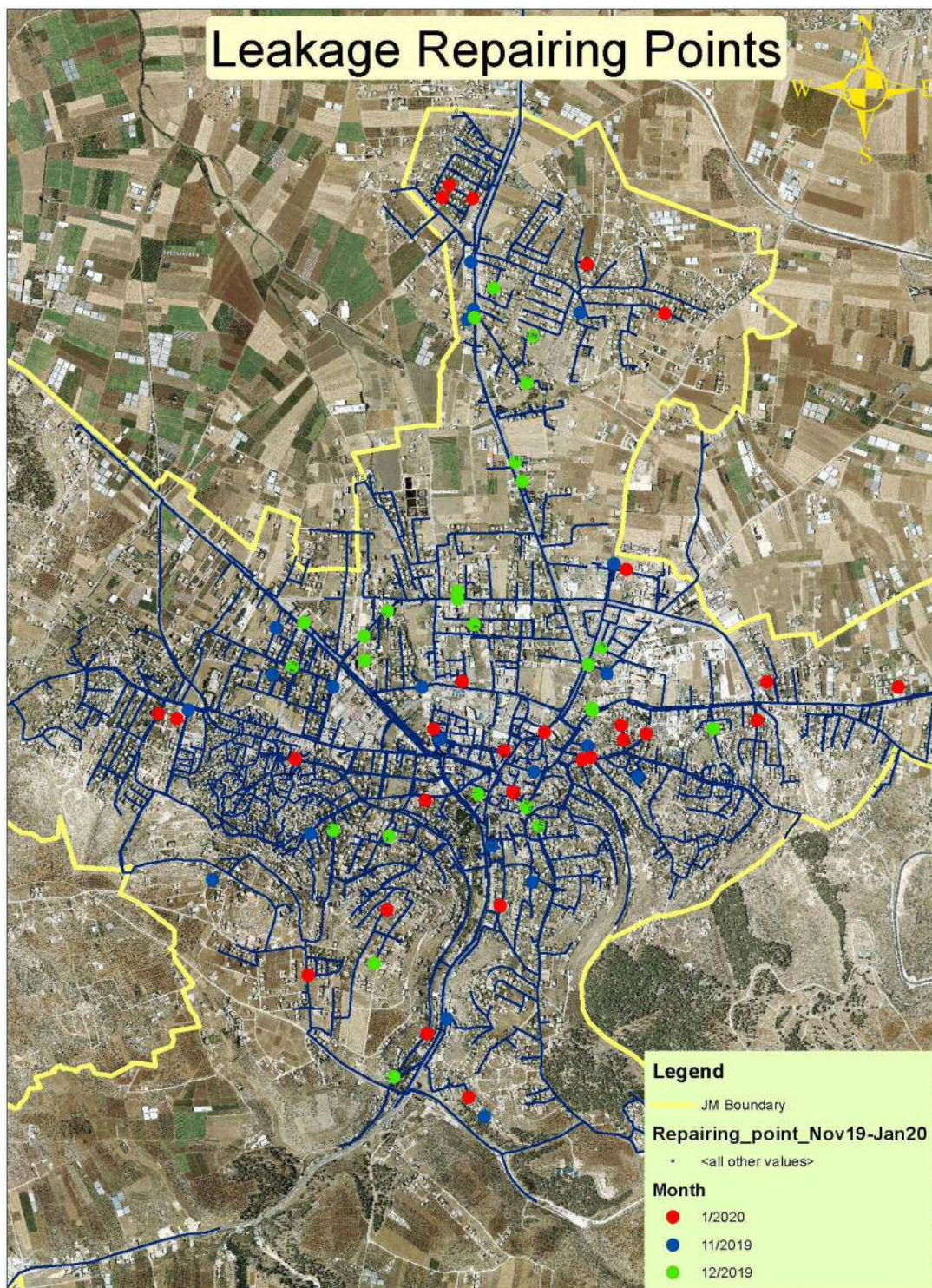


Figure 27: Leak repairing points of Jenin in Nov-Dec 2019 and Jan 2020

CHAPTER 9. HEALTH AND SAFETY PRECAUTION

Prepare and keep first aid box, protective gloves, and gumboots.

9.1 Safety During Night Work



Figure 28: Uniform designed and used in this project (left), night time work (middle and right)

- ✧ Prepare and wear uniform. The uniform for night use should have reflective strips.
- ✧ Always carry a working torch light,
- ✧ Prepare a photo ID and carry it all the time,
- ✧ Prepare and carry a brief introduction of the project, show it in case somebody asks about the work,
- ✧ Be watchful of the surrounding: be attentive to stray dogs, any unknown person lurking into the group,
- ✧ Avoid dispute and argument with unknown people: if such a situation arises, withdraw and back to safety.

9.2 Safeguards During Construction of Chambers and Leak Repair Work

- ✧ Barricades: prepare and use barricades around the construction site. Paint the barricades with easily visible bright colors,



Figure 29: Barricade prepared and used in the project

- ✧ Cautionary notice: prepare and install cautionary ‘Work in Progress’ notice,
- ✧ Coordination with traffic police: inform traffic police (if existing) in advance and obtain their cooperation for traffic management,
- ✧ Always wear safety gear such as protective glass cover while doing welding work.

9.3 Safeguards During Working Inside Chambers

- ✧ Keep ready a drainage pump in case you need to pump more water from the chamber,
- ✧ If the chamber lid was tightly closed before opening, DO NOT ENTER the chamber immediately after opening the lid, allow some time to let go dangerous gas that might have been accumulated in it,
- ✧ Since the working space is generally limited inside chambers, select and bring tools which are suitable for such condition.

別冊資料 CD 1.9

NRW Management Manual (Basic Version)

別冊資料 CD 1.9.2 Arabic Version



سلطة المياه الفلسطينية
PALESTINIAN WATER AUTHORITY



Japan International
Cooperation Agency

سلطة المياه الفلسطينية دراسة تحسين إدارة خدمات المياه في بلدية جنين



دليل الإرشادي لتقليل فاقد المياه (NRW)
(النسخة الأساسية/الموجزة)

أذار 2021

الوكالة اليابانية للتعاون الدولي (JICA)
TEC INTERNATIONAL CO., LTD.
PADECO CO., LTD

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الفصل الأول : أهداف واستخدامات الدليل الإرشادي



يسعى الدليل الإرشادي إلى توفير مفهوم أساسي عن فاقد المياه (NRW) من خلال استخدام مصطلحات بسيطة يسهل فهمها إن قبل المشاركين في أنشطة تقليل الفاقد (NRW). ويأول الدليل المواضيع التالية : تعريف الفاقد (NRW) ومكوناته وأهم تقنيات الشبكات وهربوط خطوطه والمناهج المتبعة لتقليله ، وأيضا يصف كيفية إزاحة الأجهزة والمعدات المستخدمة في أنشطة تقليل الفاقد (NRW) .

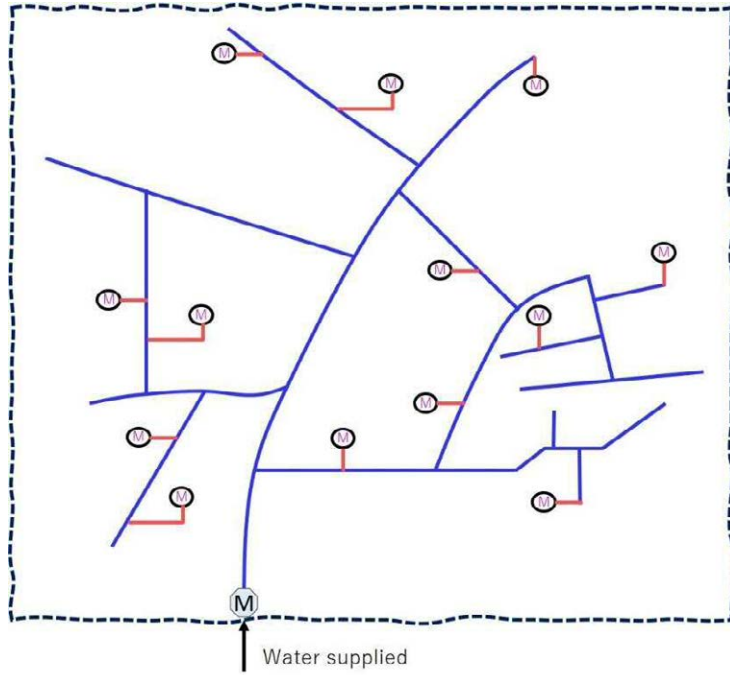
وقد تم إعداد الدليل استناداً إلى الدروس المستفادة والخبرات المكتسبة في تنفيذ الأنشطة الميدانية في المناطق التجريبية في مدينتي غزة . ويقصد بذلك أن يكون مرجعاً لتخطيط وتنفيذ برامج العمل في أجزاء أخرى من المدينتي ومناطق أخرى في فلسطين تتمتع بظروف تزويد المياه مماثلة لظروف التزود في مدينتي غزة .

تم إعداد نسخة الدليل باللغة الانجليزية من هذا الدليل .

الفصل الثاني: مقدمة إلى معادلة توازن النظام المائي والفاقد NRW

2.1 تعريف توازن النظام المائي (Water Balance)

يُوضح الشكل 1 مفهوم توازن النظام المائي لمنطقة معينة يتم عزلها وقياس إجمالي كمية المياه المزودة لها باستخدام عداد الجملة (Bulk meter) (KfWG) تُقاس كمية المياه المستهلكة داخل المنطقة بواسطة عدادات مشتركة.



الشكل 1-1-1 مرسوم توضيح معادلة توازن النظام المائي

سؤال: هل تعتقد بأن كمية المياه المزودة لكم في المنطقة أعلاه (أساسية لمجموع الكميات المستهلكة من قبل مشتركين في المنطقة)؟

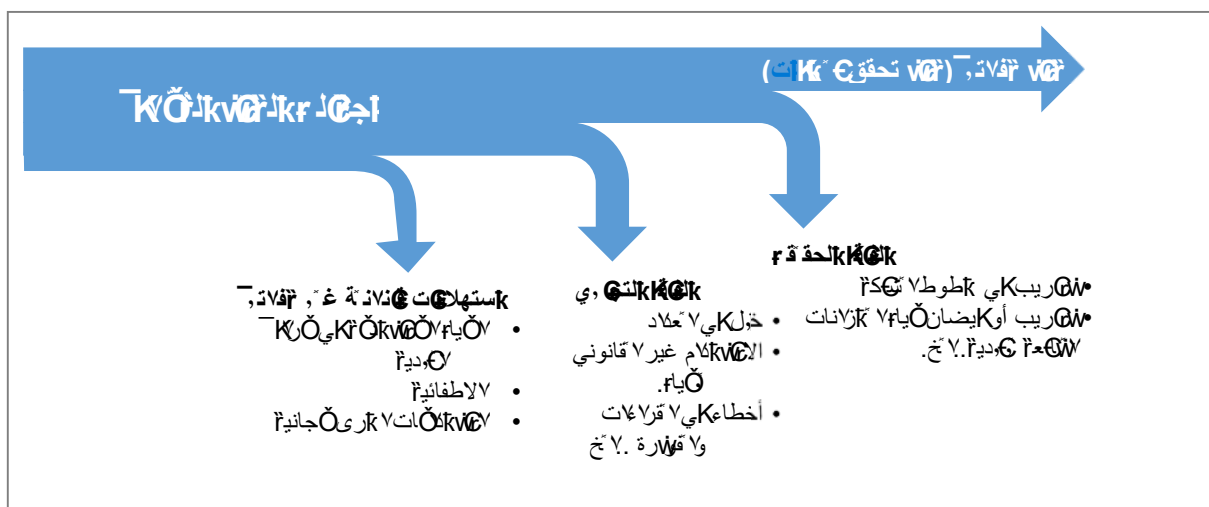


بالتأكيد الإجابة هي لا. $\pm 1/4$ كمية المياه المستهلكة أقل من كمية المياه المزودة ويُعزى ذلك للأسباب التالية:

- ✧ تسرب جزء من المياه من خطوط الشبكة.
- ✧ استخدام غير قانوني للمياه إن قيل بعض المواطنين وبالتالي عدم قياسها وتربتها.
- ✧ خلل في العدادات بحيث تُظهر قراءات غير فعلية أو غير دقيقة.
- ✧ خطأ في ادخال قراءات العدادات أو خطأ في الفواتير الصادرة.

يُطلب مفهوم توازن النظام المائي على حساب كمية المياه التي تم تزويدها لها في الشبكة مقارنة بالكمية المستهلكة والمفقودة والمفوترة.

يوضح الشكل-2 توزيع المياه التي يتم ضخها في الشبكات :



الشكل-2 توضيح توزيع المياه التي يتم ضخها في الشبكات

يعرض الجدول التالي توضيحاً بسيطاً لتوازن المياه (Water Balance) على مستوى المجموع العالمي للمياه (IWA)

Water Exported المياه المصدرة/المزودة للشبكات		المياه المزودة	المياه التي يتم ضخها في الشبكات (SIV)
الاستهلاك القانوني المفوتر (المقاس وغير المقاس) ضمن نظام توزيع المياه (إيراد المياه)			
الاستهلاك القانوني غير المفوتر		فقدان المياه NRW	المياه المفقودة
الفاقد التجاري/أبير الظاهر	الفاقد الحقيقي أو الفيزيائي		
الفاقد الحقيقي أو الفيزيائي			

الشكل-3: توازن النظام المائي بناءً على معايير الجمعية العالمية للمياه IWA

- عادي يتم حساب معادلات توازن المياه بشكل سنوي ولكن لغايات تقديم الإنجاز المحقق wq أنشطت تقليل الفاقد يمكن متابعة توازن النظام المائي بشكل شهري أو كل شهرياً إلى ثلاث شهور.
- يمكن إعداد معادلات توازن النظام المائي لمنطقة معينة ومعزولة أو لكامل الشبكات.
- يتم متابعة كميات المياه في النظام المائي .

وعليه سنحاول إعداد خطة توزيع المياه في المنطقتين المذكورتين من قبل بلدية جبلة :

- تحصل بلدية جبلة على المياه من مصادره مختلفة ألا وهي: آبار البلديات والآبار الخاصة وخطوط دائرة إياه الضخ الغربية (WBWD) (مصادر سلطة المياه الفلسطينية) أو المياه المشتراة من شركة إكروت). لا يوجد عديد من المصانع كميات المياه الموردة من هذه المصادر هو الحجم الإجمالي wq كميات المياه التي يتم ضخها بشكل يومي أو شهري wq

شبكة المياه بلدية كرك ي يطلق على اجمالي كمية المياه الداخلة إلى شبكة مصطلح **System Input Volume (SIV)**.

✧ بعض الأجزاء يتم ضخ جزء من مياه البلدية (SIV) إلى بعض القرى والبلدات المجاورة ؛ في هذه الحالة تسمى الكمية التي يتم ضخها من المياه المصدر **Water Exported**.

✧ كمية المياه المزودة للبلدية **Water Supplied** = صافي كمية المياه المزودة **Water** أخرى = كمية المياه المصدر إلى القرى أخرى

✧ يُطلق مصطلح الاستهلاك القانوني المفوتر **Billed Authorized Consumption** على كمية المياه التي تصل إلى المشتركين ويتم وقرتها.

✧ يُطلق مصطلح الاستهلاك القانوني غير المفوتر **Unbilled Authorized Consumption** على المياه المزودة التي يتم استخدامها من قبل البلدية وبعض المرافق بشكل مجاني.

✧ يتم فقدان جزء من المياه المزودة نتيجة تسرب خطوط الشبكة أو استخدام وصلات غير قانونية أو عطل عدادات المشتركين أو أخطاء في قراءة العدادات المستهلكة وإصدار الفواتير ؛ في هذه الحالة يُطلق على كمية المياه التي يتم خسارتها مصطلح **Water Losses**.

2.2 مفهوم فاقد المياه (NRW)

$$\text{NRW فاقد} = \text{المفوترة (الاستهلاك القانوني المفوتر)} - \text{صافي كمية المياه المزودة Water supplied}$$

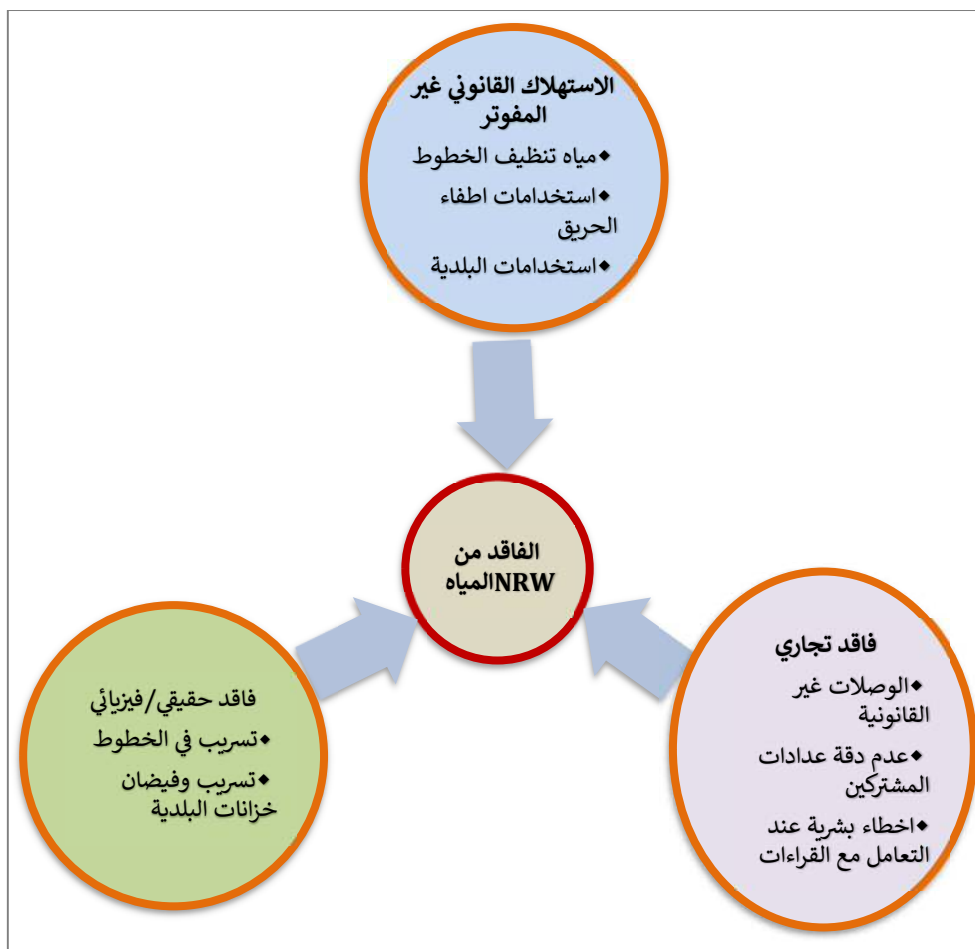
✧ يُعرف فاقد المياه (NRW) بأذن الفرق بين كمية المياه التي يتم ادخالها أو ضخها إلى الشبكة وكمية المياه المفوترة.

يتم حساب نسبة الفاقد من خلال المعادلة التالية:

$$\text{نسبة NRW فاقد} \% = \frac{\text{كمية الفاقد من المياه (m}^3\text{)}}{\text{صافي كمية المياه المزودة إلى الشبكة (m}^3\text{)}} \times 100$$

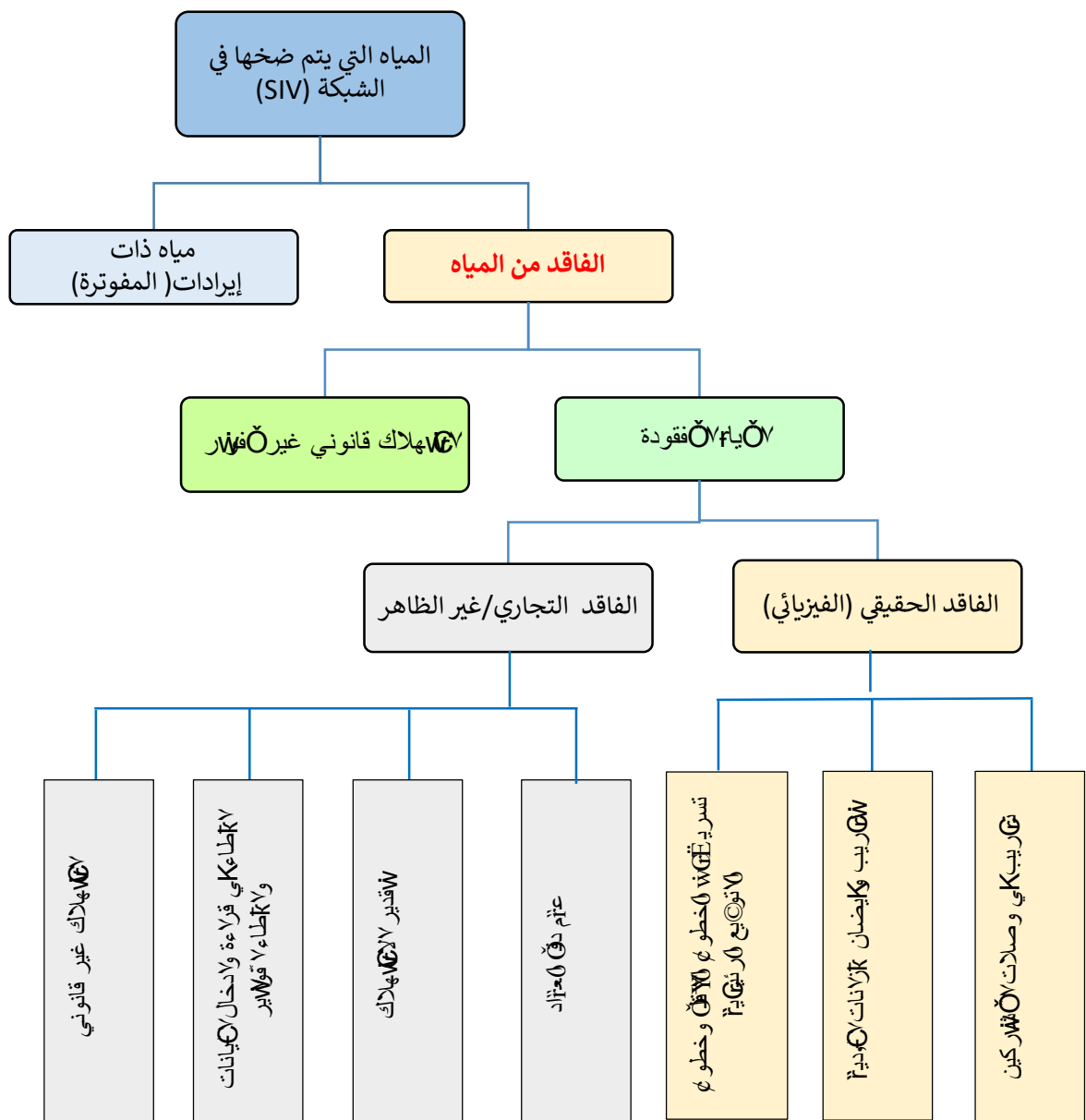
توضح الأشكال 3-6 والتي سيتم تناولها في الأجزاء اللاحقة من الدليل عناصر ومكونات الفاقد

2.3 أسباب ومكونات الفاقد (NRW)



4: استراتيجيات الفاقد

- لا تقسم المياه المزودة إلى قسمين : مياه ذات إيرادات والمياه غير المفوترة NRW
- لا تقسم الفاقد NRW إلى : استهلاك قانوني غير مفوتر وخسائر المياه ..
- لا تقسم خسائر المياه إلى : الفاقد الحقيقي (الفيزيائي) والفاقد التجاري.

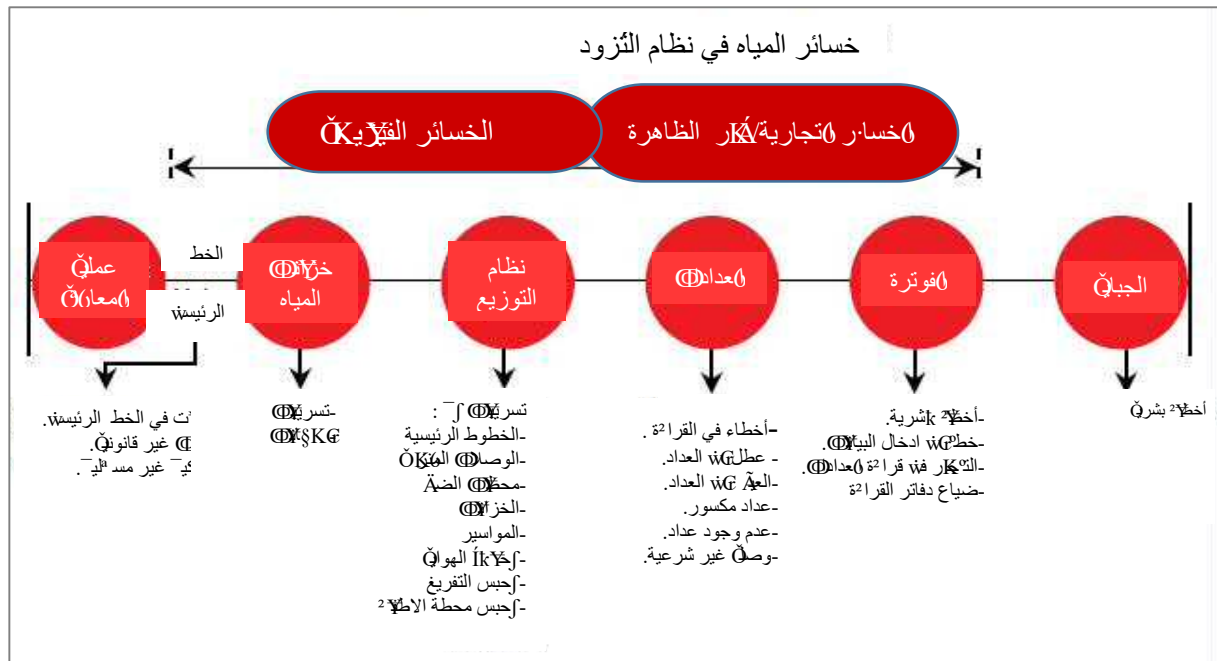


الشكل 5: عناصر ومكونات الفاقد

مثل المياه المستخدم wG لتنظيف خطوط مرافق البلدي وفي ع المدن لإطفاء الحريق		استهلاك قانوني غير افوتر	wG الفاقد من المياه خسائر المي
- الوصلات غير القانوني . - الشبكة على خط المياه مباشرة. - العبث بالعداد.	الاستهلاك غير القانوني	wG فاقد التجاري/غير ظاهر	
- قراءات wG . - خطأ في ادخال القراءات.	اخطاء في قراءة وادخال البيانات واطاء الفواتير		
- تقدير القراءات بشكل لا يعكس الاستهلاك الحقيقي.	تقدير الاستهلاك		
- عداد غير مسجل . - قراءات wG .	عدم دقة عداد المشترك	wG فاقد حقيقي (الفيزيائي)	
التسريع wG (الخطوط) أو خطوط التوزيع الرئيسي.			
تسريب وK ان خزانات مرافق المياه			
التسريع wG الوصلات المقلمة الممتدة إلى عداد المشترك			

الشكل -6 : عناصر فاقد المياه NRW مع أمثلة

يُظهر الشكل التالي مواقع حدوث خسائر المياه:



الشكل -7: نموذج خسائر المياه في نظام التزود

(المصدر: كتاب إدارة الفاقد ؛ 2008)

2.4 تعريف ومصطلحات متعلقة بالفاقد NRW

System Input Volume (SIV)

يُعرف الـ SIV بأنه إجمالي كمية المياه الداخلة إلى شبكة المياه من كافة المصادر البلدية والبار البلدية والخاصة المتعاقد مع البلدية وغيرها من المصادر الخارجية (مثل سلطة المياه).

الاستهلاك القانوني Authorized Consumption

كمية المياه المقاسة و/أو غير المقاسة التي يتم استهلاكها من قبل المشتركين أو مستخدمي أو مؤسسي مخولة لاستخدام هذه المياه. وقد يشمل الاستهلاك القانوني المياه التي يتم استهلاكها بغايات الطهي الحريق وتلك المستخدمة للتدريب على اخماد الحرائق، وتنظيف الشوارع، والصرف الصحي والمجاري وتثبيت الشوارع وري حدائق البلديات ورافير العاين وغيرها. وعليه قد تكون الاستهلاكات آنفة الذكر مفوترة أو غير مفوترة ومقاسة أو غير مقاسة .

الفاقد في المياه Water Losses

الفرق بين كمية المياه الداخلة إلى الشبكة SIV والاستهلاك القانوني authorized consumption .

الاستهلاك المفوتر المقاس (Billed metered consumption).

وهي مجموع كمية المياه المستهلكة والتي يتم قياسها من خلال عدادات المشتركين ويتم وترتها .

الاستهلاك المفوتر غير المقاس (Billed unmetered consumption) .

وهي كافة الاستهلاكات المفوترة التي يتم تقديرها على الاستهلاك المعتاد لمشارك أي لا يتم قياسها عن طريق العداد.

إيرادات المياه Revenue Water

كمية المياه التي تعود لبلدية NRW على البلدية وهي مجموع إيرادات المياه المفوترة المقاسة وإيرادات الاستهلاك المفوتر غير المقاس.

الاستهلاك القانوني غير المفوتر Unbilled Authorized Consumption

أجزاء مكونات الاستهلاك القانوني والذي يتناسب مع الاستخدام الشرعي لكن لا يتم فوترته وبالتالي لا يحقق إيرادات.

الاستهلاك المقاس غير المفوتر Unbilled Metered Consumption

وهو الاستهلاك المقاس وغير المفوتر لأي سبب من الأسباب وقد يشمل على الاستهلاك المقاس لمرافق البلدية نفسها أو المياه المزودة لبعض المؤسسات بشكك مجاني.

الاستهلاك غير المقاس وغير المفوتر Unbilled Unmetered Consumption

وهو أي استهلاك قانوني غير مقاس وغير مفوتر ويشمل كلاً من المياه المستخدمة في دائرة الاطفاء وتلك المستخدمة لتنظيف الخطوط الرئيسية وخطوط الصرف الصحي والشوارع .

فاقد المياه (NRW)

يُعد جزءاً من مكونات الـ SIV (كمية المياه الداخلة إلى الشبكة) ولكن لا يتم وترتها ولا يعود إيرادات على البلدية . وهو عبارة عن مجموع الاستهلاك القانوني غير المفوتر والخسائر الحقيقية والتجارية.

الفاقد التجاري (Apparent Losses)

وتشمل كل ما يتعلق بعدم دقة العدادات والأخطاء المرتكبة عند قراءة العدادات وإصدار الفواتير بالإضافة إلى الاستهلاك غير القانوني الناتج عن السرقة والاستخدام غير الشرعي.

الاستهلاك غير القانوني - Unauthorized Consumption

أي استخدام غير قانوني للمياه ويشمل سحب المياه بشكل غير قانوني من محطات إطفاء الحريق أو استخدامها لأغراض البناء غير المرخص أو الوصل غير القانوني والشبكات مع خط المياه بشكل مباشر أو التلاعب بالعداد.

الوصلات غير القانونية - Illegal Connection

الوصلات الموصولة على الخط الرئيسي لشبكات المياه العامة أو أي خط يزود خدمات دون إذن أو ترخيص من البلدية.

التعامل مع أخطاء القراءات والفوترة - Data Handling and Billing Errors

يمثل الاستهلاك الحقيقي غير المسجل على نظام الفوترة - ويعزى إلى وقوع خطأ في القراءة أو الفوترة مثل الأخطاء المرتكبة في تسجيل القراءات - وكما يشمل استهلاك المؤسسات التي لا تسجل على نظام الفوترة نتيجة أخطاء في الإجراءات الإدارية وتلك التي تسجل بشكل خاطئ مثل تسجيل المبنى على اذنه مهوم وهو لا يزال قائماً.

عدم دقة عداد المشترك - Customer Metering Inaccuracies

قياس القراءة التي تسجل على أنها الاستهلاك الحقيقي للمشارك في وجود شك في العداد (العداد يسجل قيو أقل من القيمة الحقيقية).

الفاقد الحقيقي - (Real losses)

كميات المياه التي يتم خسارتها على شكل تسريبات بأنواعها المختلفة وانفجارات في الخطوط الخزانات.

تسريب وفيضانات خزانات المرافق - Leakage and Overflows from Utility Storage Tanks

المياه التي يتم خسارتها نتيجة تسريب جسم الخزان أو مشاكل تشغيل أو مثل فشل التحكم في منسوب المياه في الخزان أو تسريب في تمديدات الخزان.

تسريب في الوصلات الممتدة إلى عداد المياه

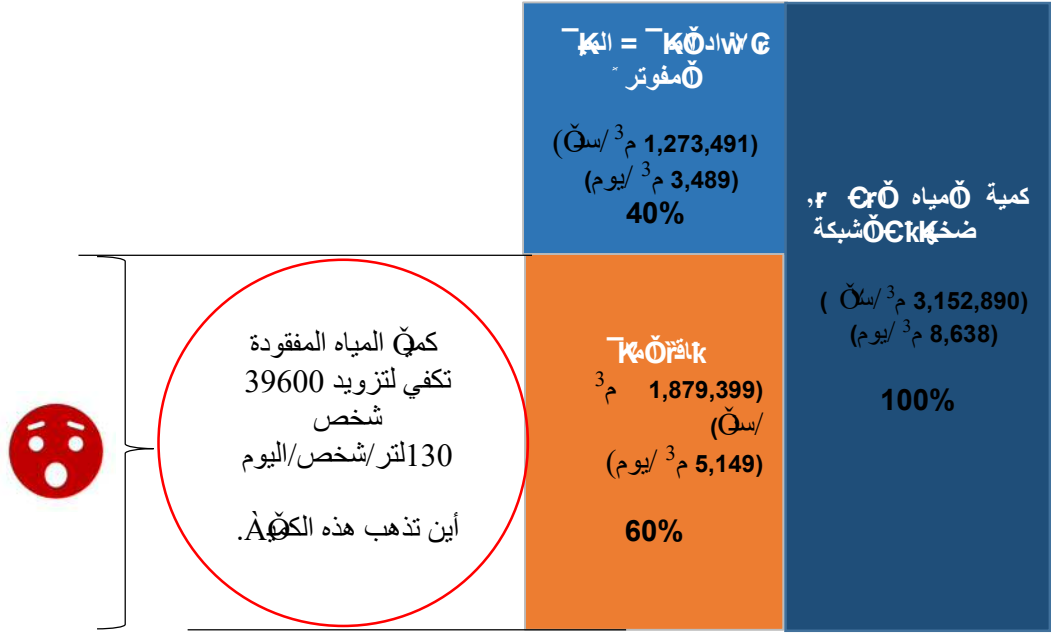
خسارة المياه نتيجة تسريب أو جسر في الوصلات الممتدة إلى عداد المياه بقية نقاط ربط عداد المشترك (التسريب الحاصل بين خط التوزيع الفرعي وعداد المشترك).

التسرب في الخطوط الناقلة وخطوط التوزيع الرئيسية.

خسارة المياه الناتجة عن تسريب أو جسر في الخطوط الرئيسية وخطوط التوزيع الرئيسية وملحقاتها.

2.5 أهمية وفوائد تقليل الفاقد NRW

يوضح الشكل 8- كمّي المياه المزودة والمفقودة في المدينة للعام 2018 .



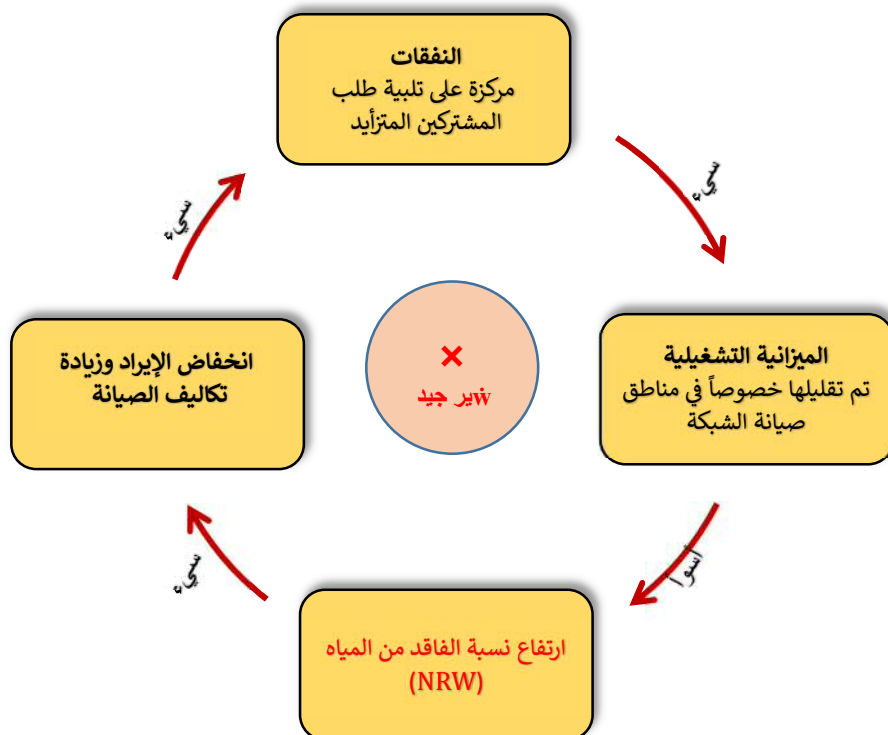
الشكل- 8 : كمّي المياه الداخلة إلى الشبكة وكمّي المياه المفقودة في مدينة كركوك للعام 2018

تتأثر متابعي المياه المفقودة NRW وحسابها بسعر البيع المتبع في البلدي (4.6 شيكل /م³ ¼) في كمّي المياه المفقودة تعادل 8.64 مليون شيكل .

أي أن بلدي جنين خسرت 8.64 مليون شيكل من إيرادات المياه المتوقع للعام 2018

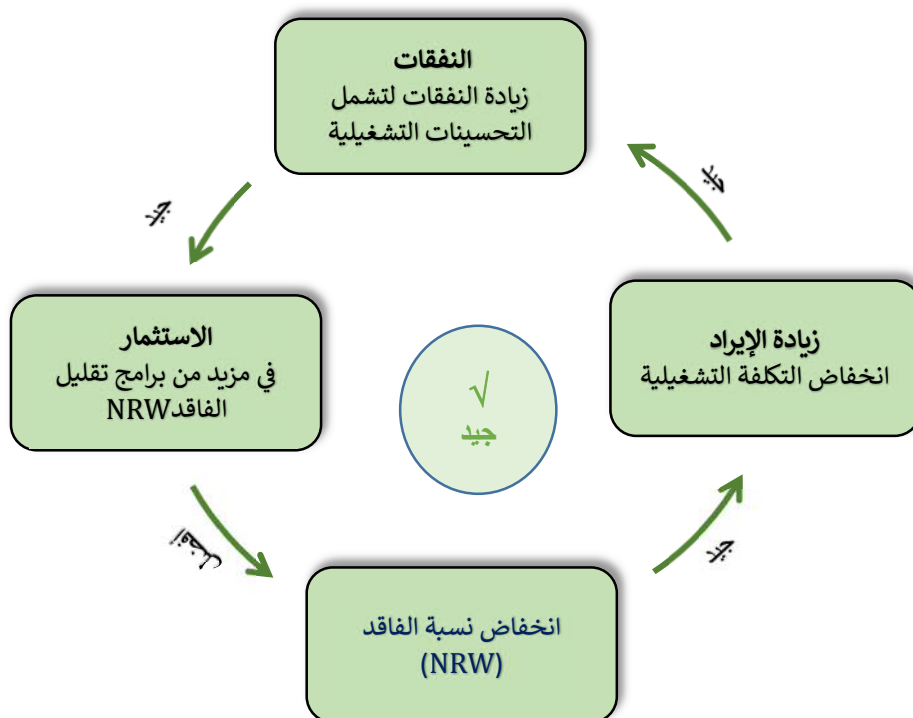
2.5.1 فوائد تقليل الفاقد NRW

تؤثر نسبة الفاقد العالي إلى وجود عدة مشاكل في النظام المائي القائم؛ وقد تكون هذه المشاكل إما ادارية أو كلاهما. فمع استمرار ارتفاع نسبة الفاقد في الشبكة ¼ وضع النظام المائي سيستمر بالتدهور تدريجياً في «الفرع» دون أي تحسين يذكر.



الشكل-9: حلقة مفرغة لتقليل الفاقد

وأي نواحي أخرى؛ فإن انخفاض نسبة الفاقد يؤدي إلى زيادة الإيرادات التي يمكن استثمارها في تحسين عمليات الصيانة و التشغيل وتقليل الفاقد أكثر؛ الأمر الذي يخلق حلقة مفرغة زاخرة بالمشاكل.



الشكل 10 @ إيجاب الفائد

يساعد تقليل نسب الفائد على إيجاد حلول K تعود بأثر ± على عمل الصيال وتشغيل.

فوائد تقليل الفائد الحقيقي (الفيديسي):

1. حفظ المياه من الهدر.
2. خفض التكاليف التشغيلية؛ تقليل المواد والمعدات اللازمة لعمل الصيال؛ تقليل الدورات المالية اللازمة لإصلاح التسريبات وانفجار الخطوط.
3. زيادة حصص المياه المتوفرة والإيصال المزيد من المياه للاستهلاك وبالتالي زيادة الإيراد الذي من الممكن استثماره لإصلاح المزيد من التحسينات على النظام المائي.
4. تحسين موثوقية نظام الإمداد بالمياه بسبب انخفاض فترات انقطاع المياه K لانخفاض إصلاح التسريبات في الشبكات.
5. المحافظة على جودة ونوع المياه؛ بحدوثه يتم تقليص فرص دخول المياه العكرة إلى خطوط المياه أثناء عمل إصلاح التسرب أو من خلال ثقب التسرب أثناء فترة عدم الإمداد.
6. تحسين الصورة العامة لدائرة المياه؛ وخلق انطباع K لدى الجمهور اتجاه الجهود المبذولة من قبل دائرة.
7. تأجيل الحاجة لاستحداث إمداد مياه جديدة.

فوائد تقليل الفائد التجاري :

1. تتمثل الفائدة الرئيسية من تقليل الفائد التجاري بزيادة الإيراد الذي يمكن توظيفه لتحسين خدمات الإمداد بالمياه واستحداث حلول K تعود بنتائج ممتازة على النظام المالي.
2. تقليل الوصلات غير القانونية K خلال متابعة وتقليل الفائد التجاري نظراً لقيام بعض المواطنين باستخدام المياه بشكل غير قانوني وإستهتر.
3. فصل وصلات المياه غير القانونية؛ الأمر الذي سيعكس Oة البلديات wG التعامل مع المشتركين Y إضافة إلى زيادة ثقة المجتمع بالبلدية.

الفصل الثالث. طريق «سا» فاقد المياه NRW

يتم حساب الفاقد من خلال طرح كمية المياه المفوترة من كمية المياه المورد.

$$\text{كمية المياه المزودة Water supplied} - \text{المفوترة (الاستهلاك) المياه} = \text{فاقد المياه (NRW)}$$

لذلك نحن بحاجة إلى توفير بيانات كمية المياه المزودة والمياه المفوترة أو

3.1 الاطار الزمني لحساب فاقد المياه NRW

يتم عادة حساب الفاقد بعد كل دورة فوترة بشكل يومي؛ w(6) «±» كانت عملي الفوترة تتم كل شهرين أو كل اربع اشهر يتم حساب الفاقد بشكل مواعلي لعملية الفوترة w(6) كلا الحالتين أي كل شهرين وكل اربع أشهر على التوالي. كما يتم حساب الفاقد لكل سن.

3.2 طريقة حساب المياه المزودة

جمع كمية المياه المزودة للبلدي من مختلف مصادر المياه :

(أ) آبار خاص البلدي.

1. بئر السعادة بئر بلدي رقم 1
2. بئر الميكانيك-بئر بلدي رقم 2
3. بئر بلدي
4. بئر جنزور (قيد الانشاء)

(ب) آبار خاص تم التعاقد معها

لغاية 2021؛ في بلدي حكا ك شراء المياه من الآبار الخاصة التالي :

1. بئر فراحتي
2. بئر القصر اوي
3. بئر تركمان
4. بئر ابو سمير
5. بئر ابو حطب رقم 1
6. بئر ابو حطب رقم 2
7. بئر اشرف
8. بئر علاوي
9. بئر الجرار
10. بئر علاء السعدي

(ج) المياه المزودة من خلال وصلات دائرة مياه الضفة الغربي WBWD :

1. وصلة الجليل
2. وصلة السويطات
3. بئر أبو عرب

وكمثال؛ يظهر أدناه كمية المياه المزودة خلال كانون الأول 2020:

جدول 1-1: كمية المياه المزودة خلال شهر 2020-12

رقم مصدر المياه	اسم مصدر المياه	كمية المياه (م ³ /شهر) (كانون الأول 2020±)	ملاحظات
أ	كار خالص البلدي		
1	بئر السعادة - بئر بلدي رقم 1	75,035	
2	بئر الميكانيك - بئر بلدي رقم 2	13,370	
3	بئر بلع	1,219	
4	بئر جنزور (قيد الانشاء)	-	قيد الانشاء
	المجموع	89,624	
	الآبار الخاص المتعاقد معها		
1	بئر فراحتي	11,036	
2	بئر القصر اوي	18,817	
3	بئر تركمان	18,476	
4	بئر ابو سمير	9,575	
5	بئر أبو حطب رقم 1	15,751	
6	بئر ابو حطب رقم 2	4,196	
7	بئر اشرف	3,848	
8	بئر علاو	1,554	
9	بئر الجرار	8,723	
10	بئر علاء السعدي	9,903	
	المجموع	101,879	
Ó	المياه المزودة من خلال وصلات دائرة مياه الضف		
	WBWD الغربي		
1	وصلة الجبل	25,547	
2	وصلة السويطات	68,200	
3	بئر أبو عرب	28,148	
	المجموع	121,896	
	المجموع الكلي	313,398	

شرح توضيحي

هذا الرسم - نحتاج إلى قراءة جميع العدادات في اليوم الأول من كل شهر. أما بالنسبة للمياه المزودة من مصادر خارجي؛ لا يمكن الوصول إلى العدادات لقراءتها. نحن بحاجة إلى حساب المياه الشهرية من فواتير المياه الخاص بمصادر الخارج.

في وقت إعداد هذا التقرير؛ يتم تقدير كمية المياه المزودة على قراءات الأشهر السابق.

3.3 طريقة حساب المياه المفوترة أو الاستهلاك الفاتوري

الاستهلاك القانوني المفوتر (BAC) = قراءات العدادات (ميكانيكي) (برنامج الشامل) + الاستهلاك الشهري لعدادات الهوائي المسبق (يتم جمعه من خلال اللاقط الهوائي Gateway)

شرح توضيحي

يجب أن تكون الفترة الزمنية لكل فاتورة مصدر المياه وفواتير عدادات المشتركين متماثلة على سبيل المثال: إذا كانت فترة التزويد بالمياه 31 يوم أي من 1 إلى 31 كانون الأول وحتى 1 كانون الثاني، فواتير المياه يجب أن تكون لنفس الفترة الزمنية.

يمكن جمع أو استخراج قراءات عدادات الدفع المسبق PPWM لأي فترة من خلال اللاقط الهوائي Gateway؛ لكن قد يختلف الفاصل الزمني لقراءات عدادات الدفع المسبق المؤجل بحيث يتم قراءة العدادات أقل من 31 يوم؛ فيتم قراءة الأجزاء الأخرى من العدادات أكثر من 31 يوم. استناداً إلى المثال السابق وفي مثل هذه الحالة يجب تعديل قيمة الاستهلاك بالتناسب مع فترة التزويد وهذا يعرف بتعديل الكمية الناتجة عن فروق الوقت في قراءة العدادات.

قد يكون هناك مشتركين لهم استهلاكات غير مقاس نتيجة مشاكل العداد أو لسبب آخر من هذه الحالة إذا تم إصدار فاتورة لمستخدمين يجب تقدير الاستهلاك بناءً على استهلاك الأشهر السابق أو على حجم الأسرة.

اجمع كافة الاستهلاكات التي تم فوترتها تحصل على كمية المياه المفوترة.

وعليه قم بحساب الفاقد بتطبيق المعادلة المذكورة أعلاه.

على حساب الفاقد لمنطقة التجريب الأولى PA1 والمناطق الفرعية فيها كما هو موضح في الجدول أدناه

جدول 2: حساب الفاقد لمنطقة الدراسة الأولى PA1 والمناطق الفرعية فيها لشهر 12/2018

المنطقة	الكمية المزودة (م ³)	الكمية المفوترة (م ³)	الفاقد (م ³)	تعديل المياه المفوترة للمعادلة المتأخر قرائتها (م ³) *	تعديل الفاقد (م ³)	تعديل الفاقد (%)
كمية المياه من وصلة وصل	31,126					
الكمية المزودة لخزان ومحطة ضخ صباح الخير	30,326					
الفاقد في الخط (من وصل الجلمة حتى محطة ضخ صباح الخير)			800		800	2.1%
المنطقة التجريبية الأولى PA1	27,365	11,637	15,728	11,193	16,172	59.1%
منطقة فرع 1 - (صباح الخير) ± 24 ساعة	1,392	714	678	645	747	53.7%
منطقة فرع 2 - (صباح الخير)	5,343	3275	2,068	2918	2,425	45.4%
منطقة فرع 3 - (خروج)	7,411	4113	3,298	4016	3,395	45.8%
منطقة فرع 4 - (خروج اصرة)	13,219	3535	9,684	3614	9,605	72.7%
منطقة البساتين (خارج PA1)	2,961					

لمزيد من التفاصيل «ول كيم» اجراء تعديل @الناج عن فروقات الوقت wقراءات عدادات المشتركين يجب الرجوع إلى دليل الرئيسي للفاقد.

الفصل الرابع، أسباب الفقدان NRW

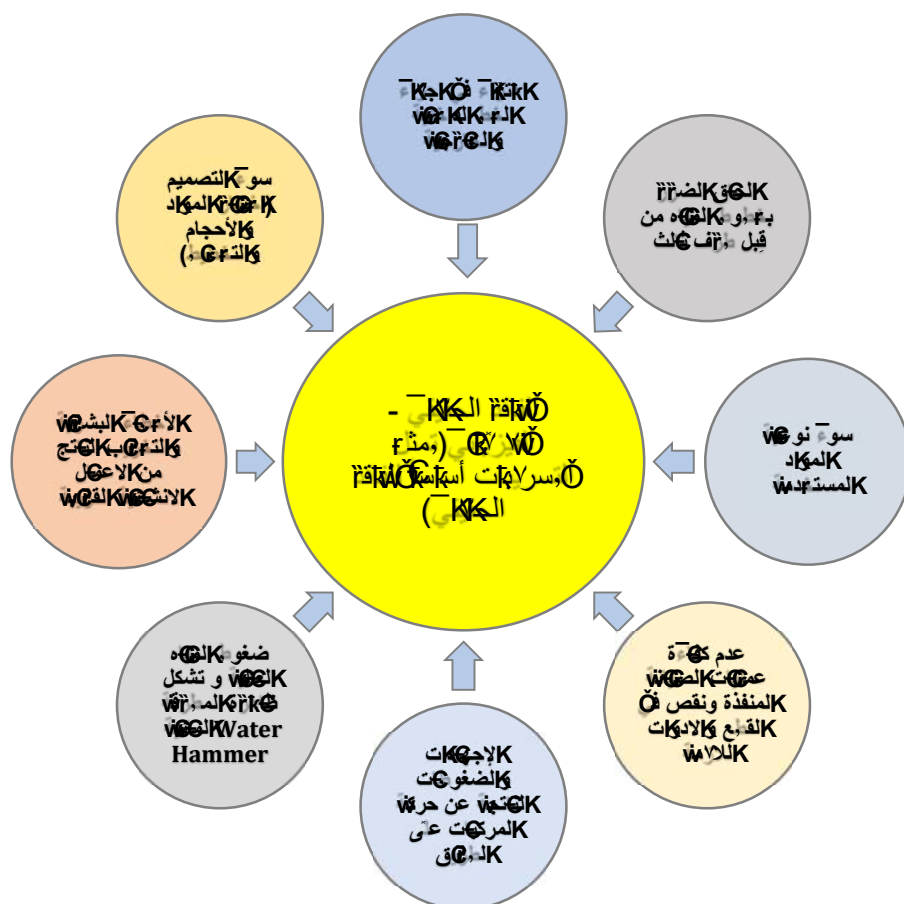
4.1 أسباب الفقدان الحقيقي (الفيزيائي) (w).
 تستعرض الأوراكل المسببات المختلفة للفقدان الحقيقي (فيزيائي) كما تتضمن الأقسام القادون شرحاً مفصلاً لها .
 أمثل على مستوي الفقدان الحقيقي (الفيزيائي):

<p>اهتراء جسم الخط الناقل الرئيسي (من وصلة الجملة وحتى محطة -صباح الخير)</p>	<p>صدأ واهتراء قطع وتركيبات الخط (تم إيجادها في منطقة البساتين)</p>	<p>صدأ واهتراء جسم الماسورة (تم إيجادها في وسط المدينة)</p>

<p>غط عالي (بالقرب من دوار البطيخة)</p>	<p>ضغط عال (منطقة المخيم الجديد)</p>	<p>غط مياه عالية</p>

	
<p>تسريب من خط موصل بشكل غير صحيح</p>	<p>تسريب من خط مياه ملغوم بـ @ غير صحيحة</p>

		
<p>تسريب بسبب عدم صيانة المحابس بالشكل الصحيح.</p>	<p>فيضان خزان أحد مرافق المياه</p>	<p>تسريب من المحابس في منطقة صباح الخير</p>



الشكل -11: أسباب تسريب خطوط المياه (الفيزيائي)

جدول -3: شرح تفصيلي أسباب تسريب خطوط المياه

العوامل	أسباب التسرب
<ol style="list-style-type: none"> 1. قوة تحمل غير كافية (جسم الخط، المرابط، المحابس..الخ). 2. ضعف ملازمة عوامل التعرّب. 3. سرعة تقدم عمر الخط. 	<p>سوء نوع المواد المستخدمة WF تصنيع أنابيب المياه والقطع اللازم للصيانة</p>
<ol style="list-style-type: none"> 1. الحاق الضرر أثناء عملي نقل الخطوط وملحقاتها. 2. سوء التخزين والتكديس. 3. الحاق الضرر في جسم الخط الخارجي وتتشير طلاء الخط. 4. تشقق الخطوط أثناء تحميلها وتكديسها بشكل عشوائي. 5. تأثيرات الطقس المختلفة من وجود ظروف غير ملائم. 6. الخلط بين الخطوط بأصنافها المختلفة والقطع التابعة لها. 	<p>سوء التعامل مع المواد وسوء التخزين</p>

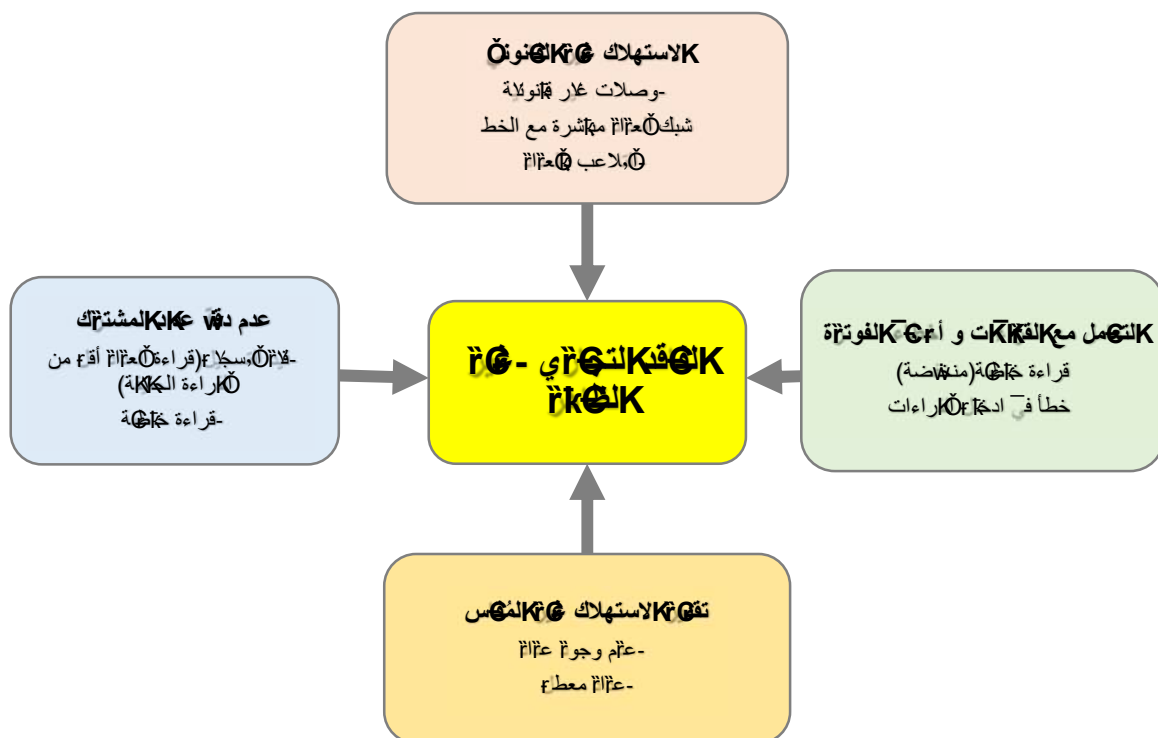
العوامل	أسباب التسرب
<ol style="list-style-type: none"> 1. عدم الالتزام بإجراءات التمديد الصحيح لخطوط المياه . 2. عدم ملائمة طبقة الاساس - (السمسون ، الرمل ..) الموجودة تحت الخط . 3. انزلاق جوانب الخندق (u) يحتوي على انابيب المياه . 4. هبوط التربة أسفل الخط بعد عملية التمديد . 5. رداءة نوعية المواد المستخدمة (wG الردم (الطمم) . 6. عدم ملائمة عملية الـ (Compacting) لخطوط الطمم ، مما يؤدي إلى هبوط تدريجي wG طبقات المواد المستخدمة . 7. وجود ضعف أو كسر في الخنادق التي تحتوي انابيب المياه نتيجة اهمال هذه المراحل أثناء مرحلة التصميم . 8. وجود قوى ضغط على جسم الخط نتيجة طبقات الطمم . 9. خلل في جودة المواد المستخدمة wG عملية تركيب 10. قلة خبرة الأيدي العاملة wG تمديد الخط . 	<p>ظرو عدم تمديد غير ملائمة واستخدام wG الخاطئ .</p>
<ol style="list-style-type: none"> 1. ضغط المياه عالي 2. ظاهرة المطرقة Water hammer 3. عوامل التعرق . 4. التغير السريع في درجة حرارة الماء . 5. اهمال التسريبات القائل وعدم إصلاحها . 	<p>عدم ملائمة إرواف التزود ونوع المياه</p>
<ol style="list-style-type: none"> 1. زيادة الضغط الناتج عن حركة السير . 2. رطوبة التربة حول الخط (تجميد - اضطراب .. الخ) 3. ظاهرة تآكل التربة (تآكل طبقات الردم) . 4. تغير درجات الحرارة . 	<p>الظروف المختلفة وتأثيرها على الخطوط الممددة</p>
<ol style="list-style-type: none"> 1. أضرار عرضية ناجمة عن الأعطال الإنشائية القريبة . 2. الأضرار الناجمة عن الكوارث الطبيعية مثل الفيضانات ، انزلا ؛ التربة ، الهزات الارضية . 	<p>اثر وجود أعمال إنشائية بالقرب من الخط واثار الكوارث الطبيعي .</p>

4.2 أسباب لفقدان التجار 2

تظهر الصور المرفقة أدناه نموذجاً عن الأسباب 3/4 الرئيسية لفقدان التجار:

أمثلة على أخطاء لفقدان التجار 2 :

			
وصلة غير قانونية (تم ازالة العداد قبل المشترك)	وصلة غير قانونية (وصلة تحت الأرض قبل العداد)	وصلة غير قانونية (وصلة قبل العداد)	عداد معطل غير مقروء (عدم wG القراءة)



الشكل -12: أسباب الفاقد التجاري²

4.3 أسباب الاستهلاك القانوني غير المفوتر

يتشكل الاستهلاك القانوني غير المفوتر نتيجة تسخير مياه البلديات لتلبية احتياجات O&M وبشكل أساسي لتوفير مياه إطفاء الحريق، وسقي الحدائق العامة، وتنظيف خطوط الصرف الصحي وما إلى ذلك. بشكل عام يكون الاستهلاك القانوني غير المفوتر صغير جداً وبالتالي يعد سبباً رئيسياً لفاقد NRW المياه. تزويد المؤسسات الحكومية والبلديات بشكل مجاني.

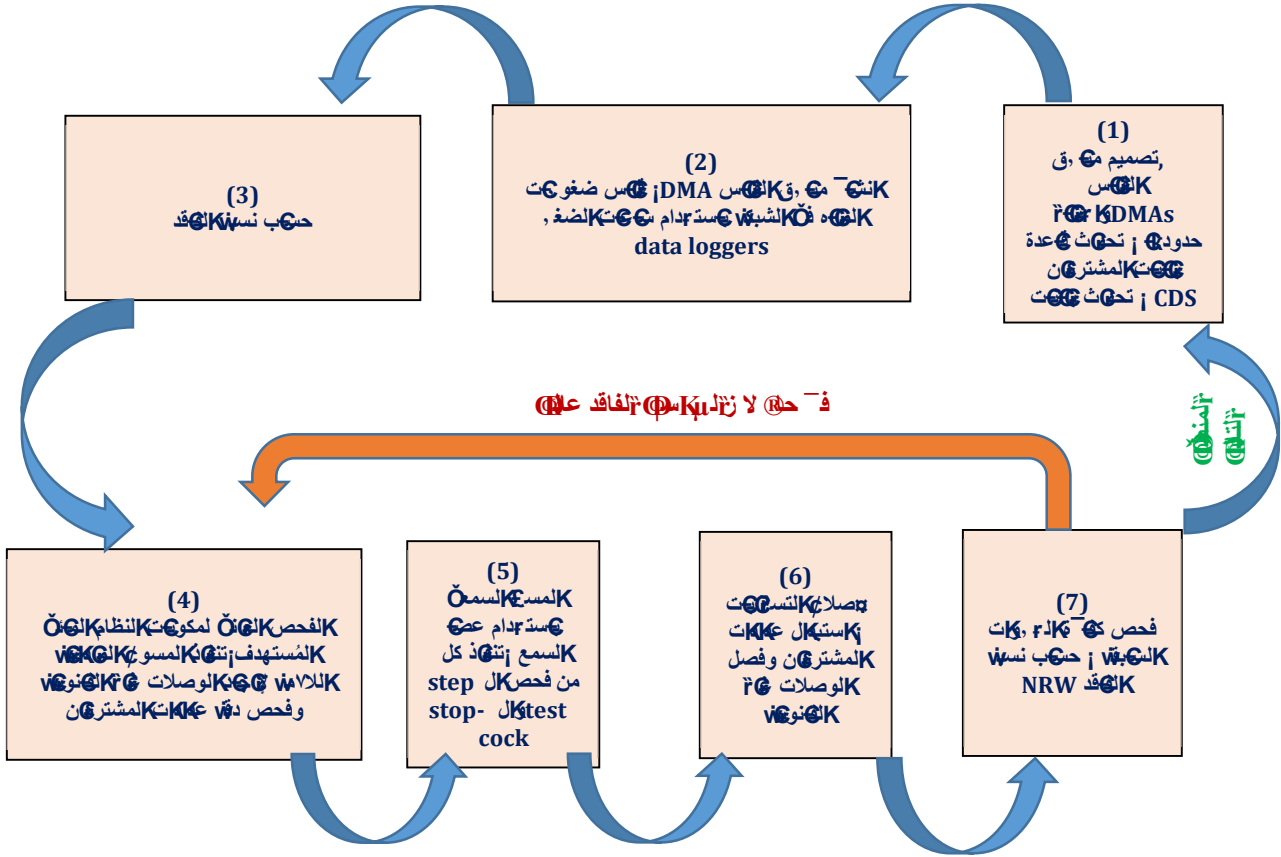


مياه الاطفاء: أحد أهم الاستخدامات المهمة للاستهلاك القانوني غير المفوتر

الفصل الخامس . طرق تقليل الفاقد

5.1 المنهج العملي لتقليل نسبة الفاقد NRW

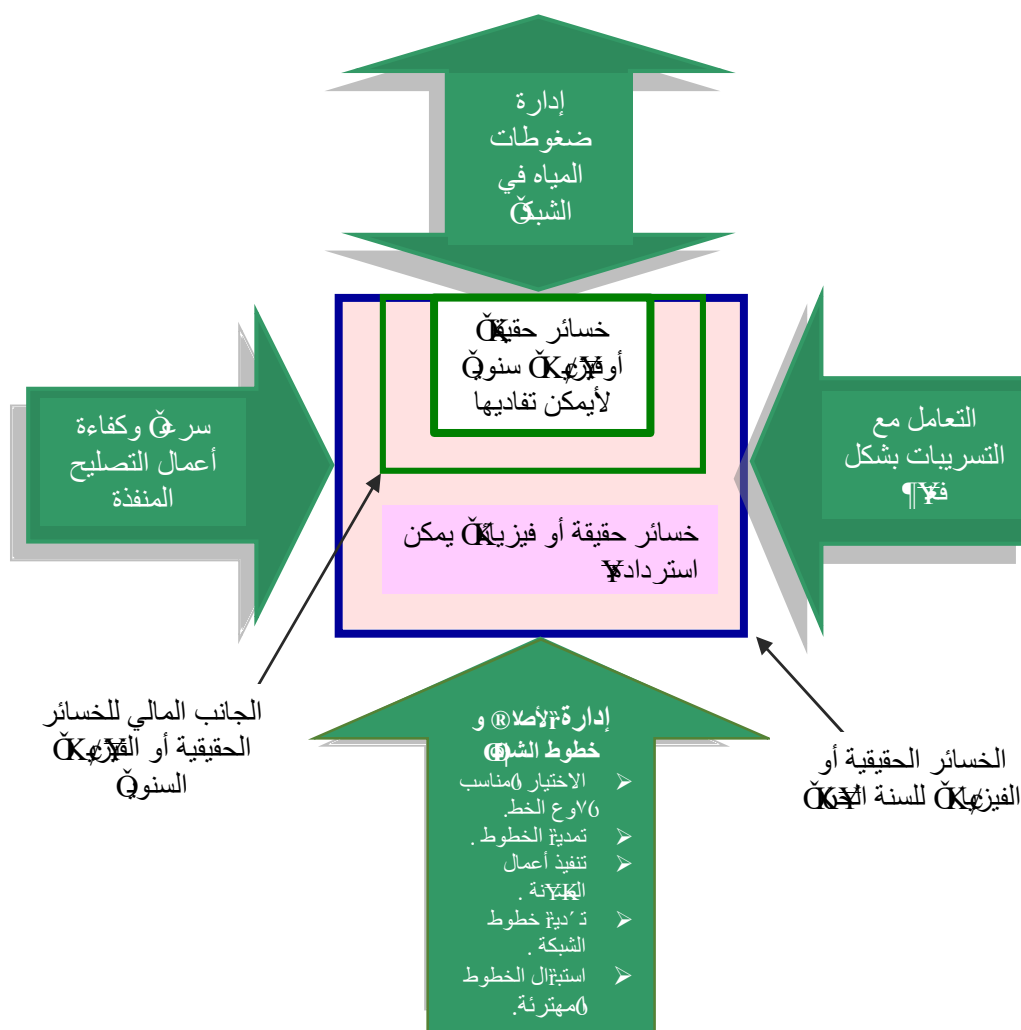
الشكل -13 يوضح الملخص المنهج العملي المتبع لتقليل نسبة الفاقد من خلال انشاء مناطق القياس (District metering DMA (area .



الشكل-13: المنهج العملي لتقليل نسبة الفاقد عن طريق انشاء مناطق القياس DMAs

و خلال تطبيق المنهج العملي المذكور سابقاً، مراعاة العديد من العوامل التي قد يكون لها التأثير على مخرجات المنهج المتبع؛ سيتم تلخيصها بشكل مفصل في الأقسام القادمة.

5.2 أساليب تقليل الفاقد الحقيقي (الفيزيائي)



الشكل-14: طرق ومبادئ إدارة الخسائر الحقيقية

تصنف وسائل إدارة الخسائر الحقيقية أو الفيزيائية في المياه إلى أربع فئات رئيسية كما هو موضح في الشكل أعلاه.

5.2.1 سرعة وكفاءة أعمال التصليح المنفذة.

تتأثر كميات المياه المفقودة والتصريف كفاءة تحقيق العوامل التالية: وقت الإبلاغ عن التسريب، موقع التسريب، سرعة التصليح.

- وقت الإبلاغ عن التسريب والوقت من حدوث التسريب وحتى الإبلاغ عنه.
- موقع التسريب: الوقت اللازم لتحديد موقع التسريب.
- وقت التصليح: الوقت المطلوب لإصلاح التسريب.

✧ سرعة إصلاح التسريب: يجب إصلاح التسريب بأسرع وقت ممكن وكخطوة أولى المستحسن وضع ± 24 ساعة.

✧ استخدام مواد ذات نوعية جيدة واتباع خطة عمل محددة عند إصلاح التسريبات.

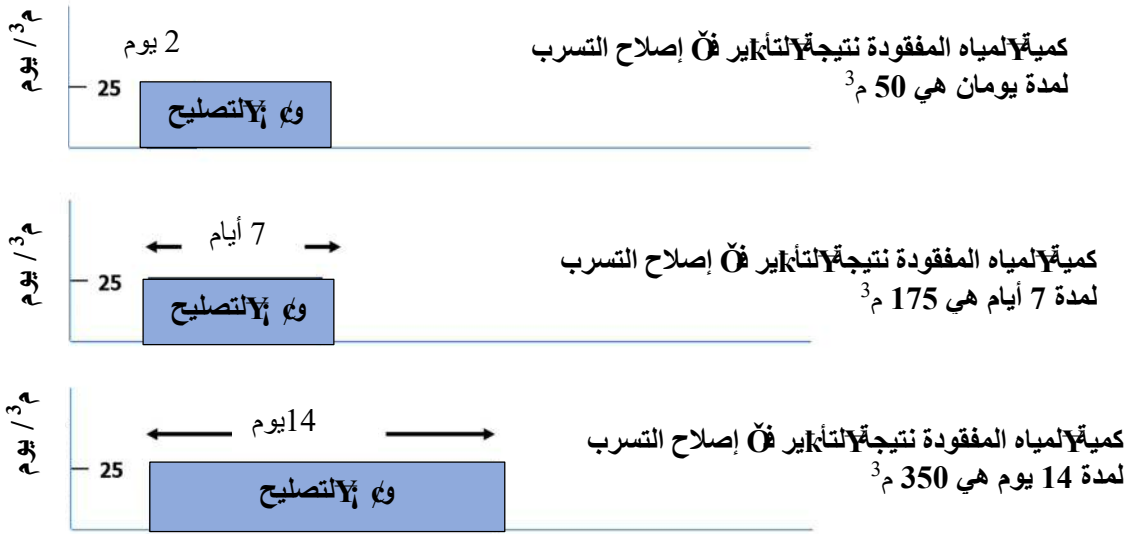
إذا كانت كفاءة عمال التصليح غير جيدة، فإن مزيداً من التسريبات ستحدث في المستقبل إما في نفس المكان أو المناطق المجاورة لذلك وذلك نتيجة الاضطرابات في المساح المحيطة بمكان التسريب وتحرك طبقات الأسفلت التي تغطي الخط الذي يحتوي على التسريب .

K على كميات المياه التي يتم إصارتها نتيجة التأخير في إصلاح التسريب

لنفرض وجود تسريب متوسط الحجم بمعدل 500 لتر/الساعة

- إذا تأخر الطاقم الأمامي عن إصلاح التسريب لمدة يومين E^a ككل المياه المفقودة تحسب كالتالي $24 \times 500 = 12000$ لتر/اليوم
- إذا كان التأخير لمدة ثلاث أيام؛ تحسب ككل المياه المفقودة كما يلي $3 \times 12000 = 36000$ لتر

آخر؛ التسريب هنا بمعدل 25 م³/يوم.



الشكل-15: أثر التأخير في وقت إصلاح التسريب على كمية المياه المفقودة

كيف نطور من سرعة وكفاءة أعمال التصليح المنفذة؟؟

<ul style="list-style-type: none"> • وضع سياسات واضحة لإجراءات وأعمال تصليح التسرب. • توفير المعدات والمواد اللازمة . • توفير التمويل الكافي . 	<ul style="list-style-type: none"> • وضع معايير مناسبة للعمل وتوفير الأيدي العاملة. • التزام الطواقم الفنية والإدارة . • الإشراف على عمال التصليح .
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5.2.2 التعامل مع التسريبات بشكل فعال.

✧ الكشف المنتظم عن أي تسريب ظاهر في خطوط المياه.

✧ مسح الكشف عن التسريب ©رضي بشكل منتظم وفوري. لمزيد من التفاصيل يرجى الإشارة إلى "دليل الكشف عن التسريب الأرضي" و"معدات وادوات الكشف عن التسريب الأرضي".

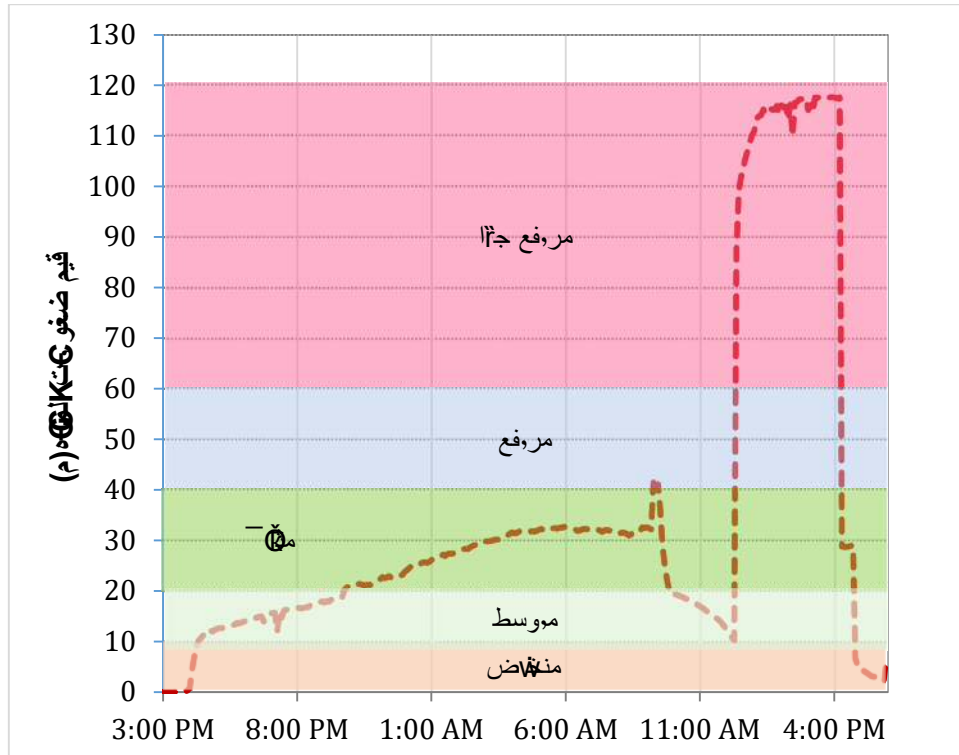
✧ أرقام إحصائيات الضغط والتدفق بشكل منتظم ومتابعة المعدل الأدنى للتدفق الليلي (WQNF) طبق القياس DMAS التي تتمتع بتزود مياه فتواصل (24 ساعة / 7 أيام) ملاحظ وجود ارتفاع مفاجئ لتدفق المياه أو انخفاض في قيم الضغط قد تعني وجود تسريب في أحد خطوط المنطقة الأمر الذي يتطلب إجراء مسح للمنطقة لكشف أي تسرب ممكن أو استخدام غير قانوني.

5.2.3 إدارة الأصول وخطوط الشبكة .

- ✧ عند عملي الشراء قم باختيار المواسير والقطع ذات النوع الجيدة . لا تختار المواد ذات الجودة السيئة .
 - ✧ قم بتمديد وربط الخطوط بالشكل الصحيح واتبع المواصفات والمعايير المعتمدة لتمديد وربط الخطوط والقطع .
 - ✧ نفذ عملي الصيانة بشكل ملائم .
 - ✧ تجديد فترة استخدام الأصول والخطوط إذا مست امكاني استخدام ما أعد انتهاء عمرها الانتاجي .
 - ✧ استبدل الخطوط التي تتعرض للتسرب بشكل متكرر أو استبدل الاصول التي تنتهي فترة استخدامها .
- كيف تعرف أي جزء من شبكة المياه يتعثر للتسريبات بشكل متكرر؟؟؟
- يساعد الاحتفاظ بتقارير إصلاح نقاط التسرب وتسجيلها على كرنال GIS على سهولة تحديد اوقع اكثر منطوق تعاني خطوطها من وجود تسريبات . لاحقاً سيتم فصل إصلاح التسريبات عن بلدية جنين .

5.2.4 إدارة غوطات المياه في الشبكة

- ✧ الحق على قيم الضغط ضمن المعدل الطبيعي ؛ وفقاً لمعايير سلطة المياه الفلسطينية يعتبر معدل الضغط المتراووم (6-2 بار) مقبولاً .
- ✧ إذا كان الضغط منخفضاً يحصل المشتركين على حصة أقل من المياه ولن تصل المياه إلى الخزانات الموضوع على أسطح المباني المتكووم من طابقين وأكثر .
- ✧ إذا كان الضغط مرتفع جداً معدل التسريبات في الخطوط سيرتفع .



الشكل -16: معيار تقريبي لقيم الضغط والوضع الفعلي لقيم الضغط في أحد مناطق الدراسة

طرق إدارة ضغوط المياه في الشبكات

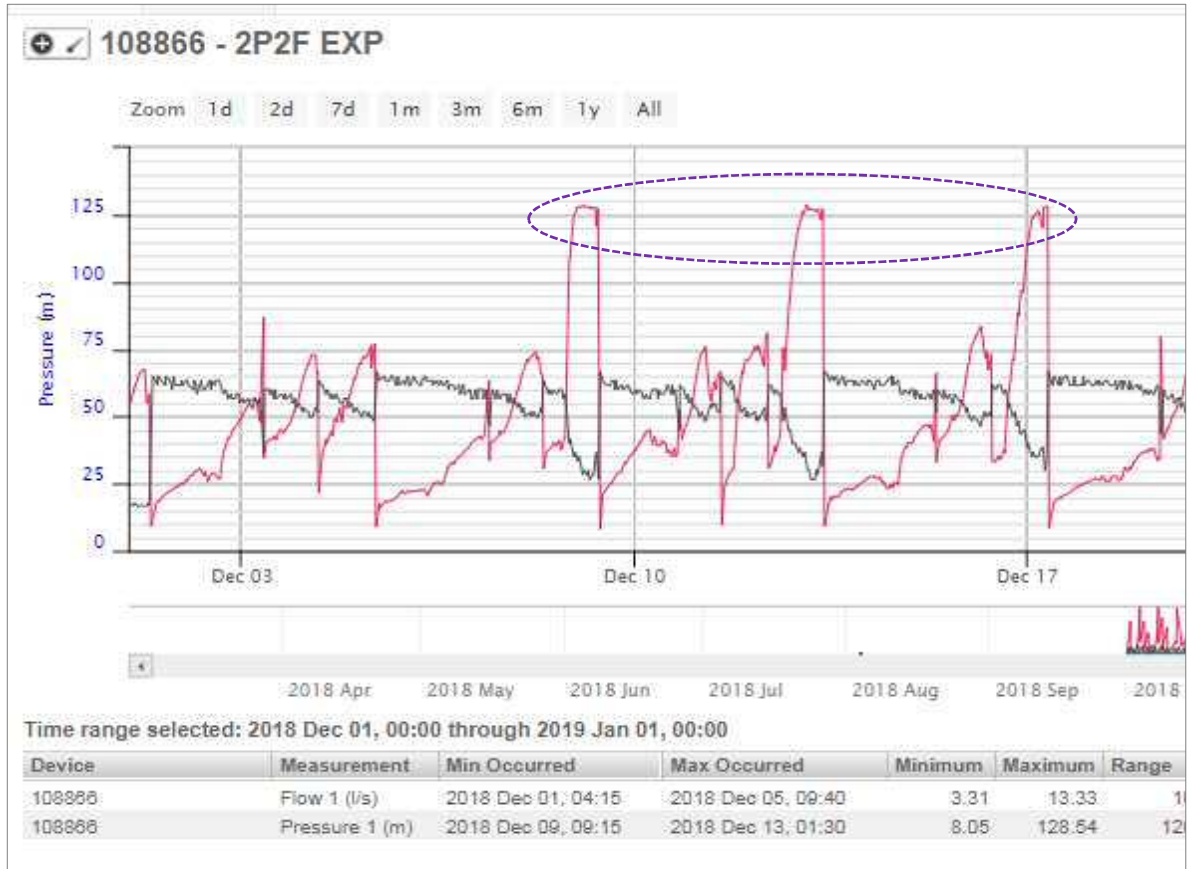
- تقسيم مناطق الضغط-انشاء مناطق فصل للضغوط المنخفضة والمحافظة لبقاء قيم ضغوط الشبكة ضمن المعدل الطبيعي.
- تركيب إخمفات الضغط PRVs على خطوط شبكات المياه تساعد على تقليل قيم الضغط (downstream pressure) إلى القيم المطلوبة.
- استخدام خزانات تخفيف الضغط (Break-pressure tanks DBPTs) وهي خزانات كمرية الحجم يكون الضغط فيها 0 أي يعادل قيمة الضغط الجوي.
- اختيار الحجم المناسب لأنابيب خطوط التوزيع لزيادة حجم أقطار المواسير الصغيرة - إسهل الحفاظ على قيم الضغط ضمن المعدل المطلوب. على خلاف ذلك نحتل إلى وجود ضغط عال لدفع المياه داخل الأنابيب الصغيرة الأمر يؤدي إلى وجود ضغط عال في خطوط المناطق التي تقع قبل المنطق التي تحتوي على خطوط "غيره".
- اختيار الحجم المناسب للمضخات الدافعة (booster pumps) استخدام الحجم الكبير ل هذه المضخات (آات القدرة) يؤدي إلى توليد ضغط عال في شبكات.

يوضح المثال التالي وجود ضغط عال في شبكات مياه بلدية جنين.



الشكل-17: أمثلة على الضغط المرتفع في خطوط الشبكة

الشكل-18: أمثلة على الضغط العالي (مخرج مضخة Ø300 الخلية wC جنين)



جدول 4: أسباب التسريب وطرق تقليله

S.N.	سبب التسريب	الطريقة الرئيسية@صلاح التسريب
1	سوء كفاءة التركيب و ضعف كفاءة الأيدي العاملة	- وضع معايير محددة للعمل - تحسين جودة وطرق إدارة العمل. - تنفيذ الإرفاق بشكل مناسب.
2	استخدام مواد ذات نوع سيئ	- التحكم بنوع المواد المستخدمة (استخدام المواد التي تطابق مواصفاتها مع تعليمات ومعايير سلطات المياه الفلسطينية (PWA)).
3	النقل السيء للمواد المستخدمة قبل عمل التركيب	- رفع وعي موظفي الدائرة والمقاولين.
4	وضع الطمء بشكل خاطئ	- تحسين جودة المعايير المتبعة في العمل. - تعزيز الإشراف بشكل مناسب.
5	عدم توفر جدول وخطط مناسبة للصيانة	- اتباع نظام معين لجدولة عمليات الصيانة. - استخدام كتيبات ذات إجراءات عمليات الصيانة والتشغيل.
6	الظروف الجوية مثل الطقس البارد/ الماطر	- مراعاة تركيب الخطوط على عمق كافي. - اتخاذ إجراءات الحماية من الصقيع أو التجمد.
7	الاضطرار (الاهتزازات) وحمولة المركبات المؤثرة على الطريق	- مراعاة تركيب الخطوط على عمق كافي. - استخدام كتل التثبيت «الخرسانية» (thrust blocks)
8	التآكل Corrosion	- استخدام خطوط عازلات بطون (خارجي/داخلي) مثل بطون الملاط الاسمنتي. - استخدام قطع وأنابيب تتمتع بمقاومة للتآكل. - استخدام مواد مقاومة للتآكل.
9	الضغط العالي جدا	- تقليل الضغط. - استقرار/تثبيت «الضغط».
10	التغيرات المفاجئة في الضغط و حدوث تسرب المياه (water hammer)	- التشغيل السليم للمضخة والمحابس. - استخدام جهاز الوقاية من الارتداد (water surge protection) - التحول إلى نظام التزود المستمر. - إدارة أفضل لشبكة توزيع المياه.
11	أضرار داخلية في خطوط الشبكات ناجمة عن وجود هواء في الخط بسبب تزويد المياه بشكل متقطع	- تقليل فترات التزود المتقطع. - التحول إلى نظام التزود المستمر.

جدول 5: أنواع التسريب وطرق تقليل كل نوع

نوع التسريب		التسريب السطحي (التسريب المبلغ عنه)	الصفات الرئيسية
التسريب الأرضي (underground leakage)	التسريب السطحي (التسريب المبلغ عنه)		
Background leakage تسريب أرضي ليس من السهل إيجاده	تسريب أرضي يمكن إيجاده	يظهر على السطح ، ويتم التبليغ عنه من قبل المواطنين والمواطنين المتأثرين.	يظهر على السطح ؛ لكن لا يمكن الكشف عن استخدام الأجهزة والمعدات التقليدية للكشف عن التسريب .
- تقليل الضغط.	- تقليل الضغط.	- تقليل الضغط.	يظهر على السطح ؛ لكن لا يمكن الكشف عن استخدام الأجهزة والمعدات التقليدية للكشف عن التسريب .

<ul style="list-style-type: none"> - استبدال الخط الذي يحتوي على التسريب. - تقليل عدد المرابط والقطع. 	<ul style="list-style-type: none"> - استبدال الخط الذي يحتوي على التسريب. - تقليل عدد المرابط والقطع. - تنفيذ مسح الكشف عن التسرب بشكل مكثف. 	<ul style="list-style-type: none"> - استبدال الخط الذي يحتوي على التسريب. - تحسين سرعة الإستجابة لأعمال الإصلاح. 	
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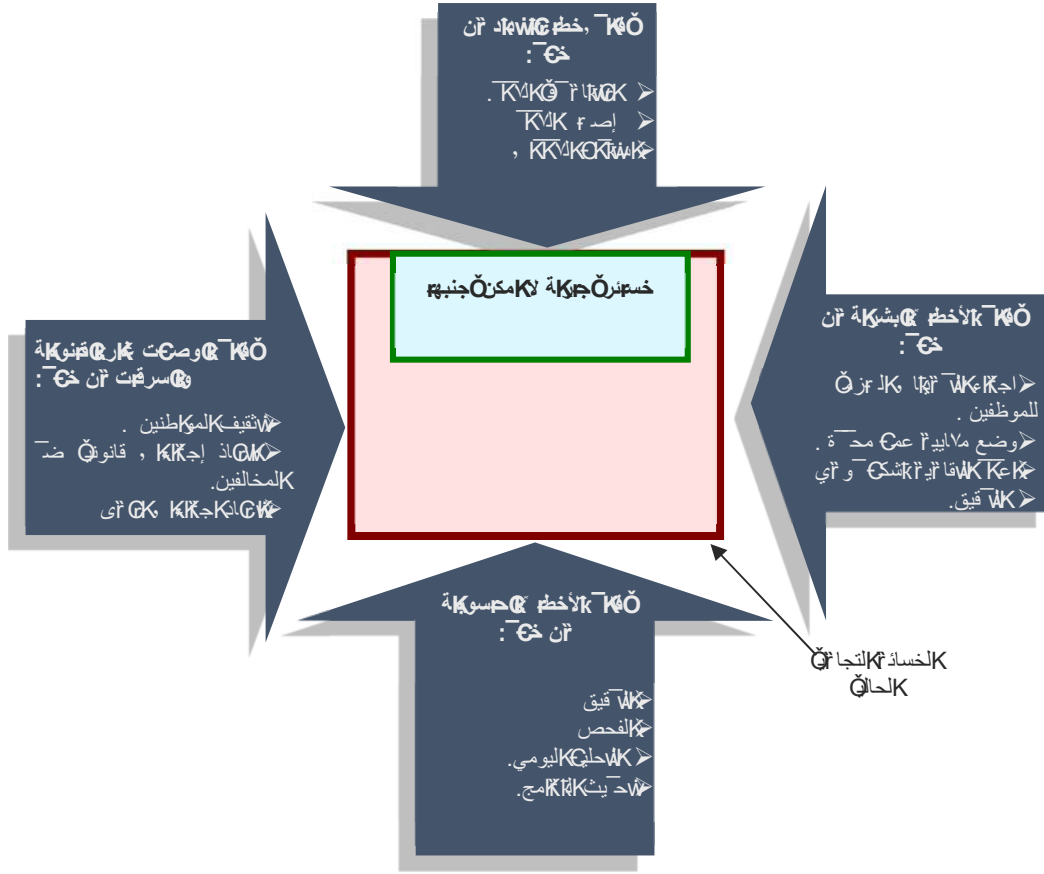
التسريبات الكبيرة مقابل التسريبات الصغيرة.

تعتبر التسريبات كبيرة الحجم أو YjY أو انفجار خطوط المياه قليلة العدد، ومن السهل ملاحظتها في قبل الم KM أو موظفي مرافق المياه، wYk يتم إصلاحها بسرعة. على العكس - (G - «التسريبات الصغيرة تكون أكثر عدداً، و YjY يتم إهمالها وتركها دون تصليح لمدة أطول. ونتيجة لذلك، فإن التسريبات الصغيرة تهدر أكثر أو YjY يعادل كمّي المياه التي يهدرها التسريبات الكبيرة مثل انفجار خط توزيع مياه رئيسي.

التدابير الوقائيّة مقابل التدابير التصحيحيّة.

يمكن أيّ تقسيم طرق تقليل التسريب إلى نوعين؛ التدابير الوقائيّة والتدابير التصحيحيّة. كما تدل المفاهيم المذكورة أن الإجراءات الوقائيّة تمنع حدوث التسرب. على خلاف ذلك تعمل الإجراءات التصحيحيّة على تقليل التسرب الذي حدث بالفعل. وهنا أيضاً تنطبق فحوى قول "الوقاية خير من العلاج" على تدابير التقليل من التسريب. وعلى الأقلّ الأفضل اتخاذ الإجراءات الوقائيّة فور العثور على التسريبات وإصلاحها بعد حدوثها بالفعل.

5.3 طرق تقليل الخسائر التجمعيّة KRCW



الشكل 19: المكونات الأربعة لبرنامج إدارة الخسارة التجارية بشكل فعال.

5.3.1 تقليل أخطاء العداد

تُصنف العدادات $\hat{A}K\bar{C}f$ غرض الاستخدام إلى نوعين: 1- عدادات مصادر المياه (إنتاج) 2α - عدادات المشتركين (الهدف منها جني الإيرادات).

يجب أن تتمتع العدادات بمختلف أنواع $\hat{A}K\bar{C}f$ بظروف عمل مناسبة وأ a تكون نسبة الخطأ w قراءتها ضمن حدود المعدل المقبول والذي يكون عادة $\pm 5\%$.

إجراءات تقليل أخطاء العداد

- اختيار صنف العدادات الأكثر دقة.
- تركيب العداد بالشكل والموقع الصحيح ووفقاً لتعليمات المصنع .
- اختيار الحجم المناسب للعداد- كبير جداً ولا صغير جداً.
- صيانة العداد والعدادات بطريقة مناسبة.
- فحص دقة العداد بشكل دوري واستبدال العداد إذا تجاوزت نسبة الخطأ w الحدود المقبول والذي يكون عادة $\pm 5\%$.
- اختيار نوع عداد يصعب التلاعب بأجزائه!

ماذا يحدث إذا كانت عدادات مصادر المياه غير دقيقة ؟

- خطأ في حساب كميات المياه الداخلة إلى الشبكة (SIV).
- خطأ في حساب نسبة الفاقد NRW.
- إذا أظهرت العدادات قراءات أكثر من القيمة الحقيقية المزدوجة «البلد» ستدفع من هذه القيمة والعكس صحيح.

ماذا يحدث إذا كانت عدادات المشتركين غير دقيقة ؟

- إذا سهل العداد كميات أقل من الاستهلاك الفعلي «البلد» ستخسر ثمن كميات المياه التي لم يسجلها العداد.
- إذا سهل العداد كميات أكثر من الاستهلاك الفعلي «المشارك» سيخسر من كميات المياه التي سجلت عليها ولم يستهلكها.

ما هو الوضع الحالي في بلدية جنين ؟

- أظهر عداد أحد مصادر المياه (مزدوجة) بلدين جنين (بئر خا E) تسجيل قيم أعلى من كميات المياه الفعلية K لم يتم فحص عدادات المصادر الأخرى.
- قبل البدء ببرنامج استبدال عدادات المشتركين الميكانيكيين بعدادات الدفع المسبق w المنطق التجريبي الأولى؛ تم فحص دقة العدادات الميكانيكية . وأظهرت نتائج الفحص تسجيل قراءات K أو منخفضة على السواء، لكن كانت لخصائص تأثيرها تساوي صفراً.

بدأت بلدية K استخدام أنواع عدادات مياه جديدة وهي عدادات مجمعة لعدادات J (العدادات التقليدية) وعدادات الدفع المسبق J نوع التراسونيك . وبشكل «A» دقة العدادات المستخدمة جيدة.

5.3.2 الأخطاء البشرية

- يرجع السبب w جزء كبير من الخسائر التجارية إلى الأخطاء المرتكبة V ، عمل القراءة وخطو الفوترة ؛ ويعزى - إلى عدة أسباب . تقتصر فقط على ضعف استخدام التكنولوجيا و عدم تحديث قاعدة بيانات المشتركين القديين وأخطاء معالجة البيانات في المكتب بل قد تتوسع الأسباب لتشمل الممارسات الاحتمالية من جانب بعض قارئ العدادات.
- لتقليل الأخطاء البشرية ، يجب اتخاذ الإجراءات التالية:
- تدريب الموظفين على قراءة العدادات والفوترة والجباة.
- وضع معايير عمل محددة لكل من قراءة العدادات والفوترة والجباة.
- إعداد التقارير بشكل دوري.
- تدقيق القراءات بشكل دوري.

ما هي الطرق المتبعة لتقليل الأخطاء البشرية في بلدية جنين؟

- إدخال أجهزة الفوترة المحمولة (MBS) . الأمر الذي يقلل من حدوث الخطأ البشري K يتم تقليل عمل إدخال البيانات بشكل يدوي.
- يستخدم ثلث المشتركين عدادات الدفع المسبق و مستقبلًا سيتم تركيب عدادات الدفع المسبق لجميع المشتركين تقريبًا من خلال هذا النظام سيتم تسجيل بيانات الاستهلاك و الدفع K وأيضًا سيتم القضاء على فرص ارتكاب الأخطاء اليدوية.

5.3.3 تقليل الأخطاء الحاسوبية.

تمتاز أجهزة الكمبيوتر الحديثة بأنها أقل عرضة للخطأ ؛ ولكن ؛ تزال جودة مخرجات العمل تعتمد بشكل أساسي على نوعية البرامج المستخدمة . وبالتالي يجب استخدام برامج موثوقة يتحلى بميزة الفحص المتقاطع ويصعب التلاعب بها . تحتوي برامج الفوترة الحديثة على وظائف تحليل مضمون يتم تحديد الأخطاء ، المحو w معالجة البيانات والإبلاغ عنها و التحقق V.

5.3.4 تقليل الوصلات غير القانونية والسراقات

تؤثر الوصلات غير القانونية وسراقات المياه بشكل كبير على إيرادات البلدية لخدمة المياه.

كيف نقلل الوصلات غير القانونية وسراقات المياه؟

- تنظيم حملات توعية تسلط الضوء على مشكلات استخدام المياه بشكل غير قانوني والعقوبات المفروضة عليها.
- البحث عن الوصلات غير القانونية وتقليلها خلال المسوحات الميدانية المتمثلة بزيارات الممثلين المشتركين والكشف عن وصلاتهم لإيجاد الوصلات غير القانونية.
- تشجيع وتحفيز المواطنين على الإبلاغ عن الوصلات غير القانونية والسراقات.
- مطالبة قارئ العدادات بالإبلاغ عن حدوث السرقة المشبوهة والتي يتم ملاحظتها أثناء كل عملية قراءة.
- معالجة مشكلة التلاعب بالعدادات من خلال استخدام عدادات يصعب العبث باجزئها.
- فحص العدادات والوصلات المنزلية للمشاركين المشبوهة والذين قيد استهلاكهم صفر (مسح القراءات الصفرية).
- عدم السماح باستخدام محطات التعيين الخاصة لإطفاء الحريق بشكل غير قانوني.
- المراجعة والفحص الدوري لبيانات نظام الفوترة وفحص الاستهلاك المشبوهة (بالنسبة لمشاركة الدفع المسبق يجب التحقق من نمط الاستهلاك من خلال نظام ال Gateway).
- مراقبة قارئ العدادات المشبوهة واتباع سياسات تدوير قارئ العدادات مع الحرص على تعيين نفس القارئ لنفس المنطق دائماً.
- إيقاع أقصى العقوبات على أصحاب الاستخدام غير القانوني (يكونوا مثلاً لغيرهم لخدمة المشتركين المخالفين).
- نشر استخدام غير القانوني والسراقات (دون الكشف عن الاسم).

الفصل السادس الأجهزة والأدوات الرئيسي لتقليل الفاقد NRW .

يتناول الفصل التالي الأجهزة والأدوات الرئيسي لتقليل الفاقد NRW.

6.1 جهاز تحديد موقع الخطوط (pipe locator).

يستخدم الجهاز لتحديد موقع الخطوط المعدنية Metallic pipe تحت الأرض.

	
<p>جهاز تحديد موقع الخطوط المعدنية (Metallic pipe locator)</p>	<p>طريقة استخدام جهاز تحديد مواقع الخطوط المعدنية (Metallic pipe locator)</p>




6.2 أجهزة قياس الضغط .

وتشمل ساعات قياس الضغط ومحور الضغط (ساعات ضغط تحتوي على حساسات داخلية).

		
<p>ساعة Analogue قياس الضغط (ساعات الضغط التقليدي "الزئبق")</p>	<p>الساعة الرقمي قياس الضغط (Digital pressure gauge)</p>	<p>مسجل الضغط والتدفق مع حساسات داخلية Dual channel flow and pressure logger with internal pressure sensor</p>

6.3 أجهزة قياس التدفق (Flow Measurement)

تتضمن كلاً من : عدادات الجملة الميكانيكية (bulk meters (mechanical)) وعدادات الألتراسونيك (ultrasonic) وعدادات التدفق الالكترومغناطيسي (electromagnetic flowmeters).

		
<p>عداد جملة ميكانيكي عادي Ordinary mechanical bulk) meter (</p>	<p>عداد جملة ميكانيكي مع كابل نقل البيانات Mechanical bulk meter with) pulse output to connect with (data logger</p>	<p>عداد مياه الكترومغناطيسي () Electromagnetic (flowmeter</p>

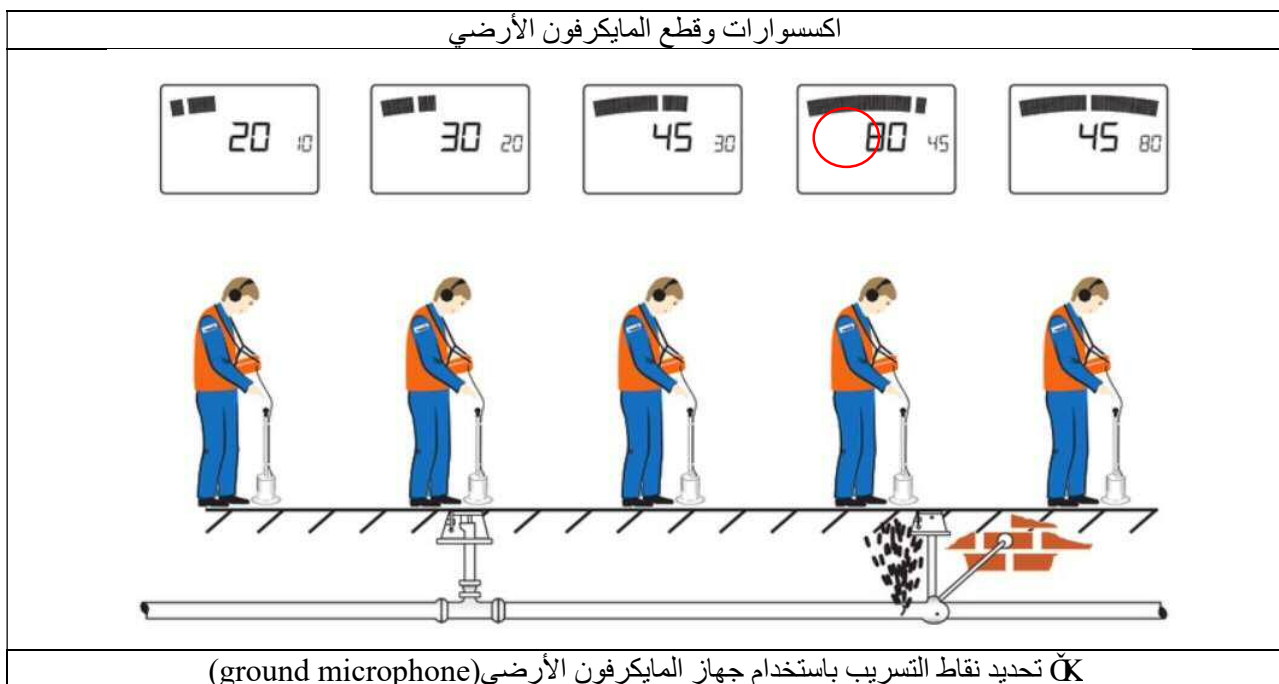




6.4 معدات الكشف عن التسرب وتحديد نقاط التسرر^a.

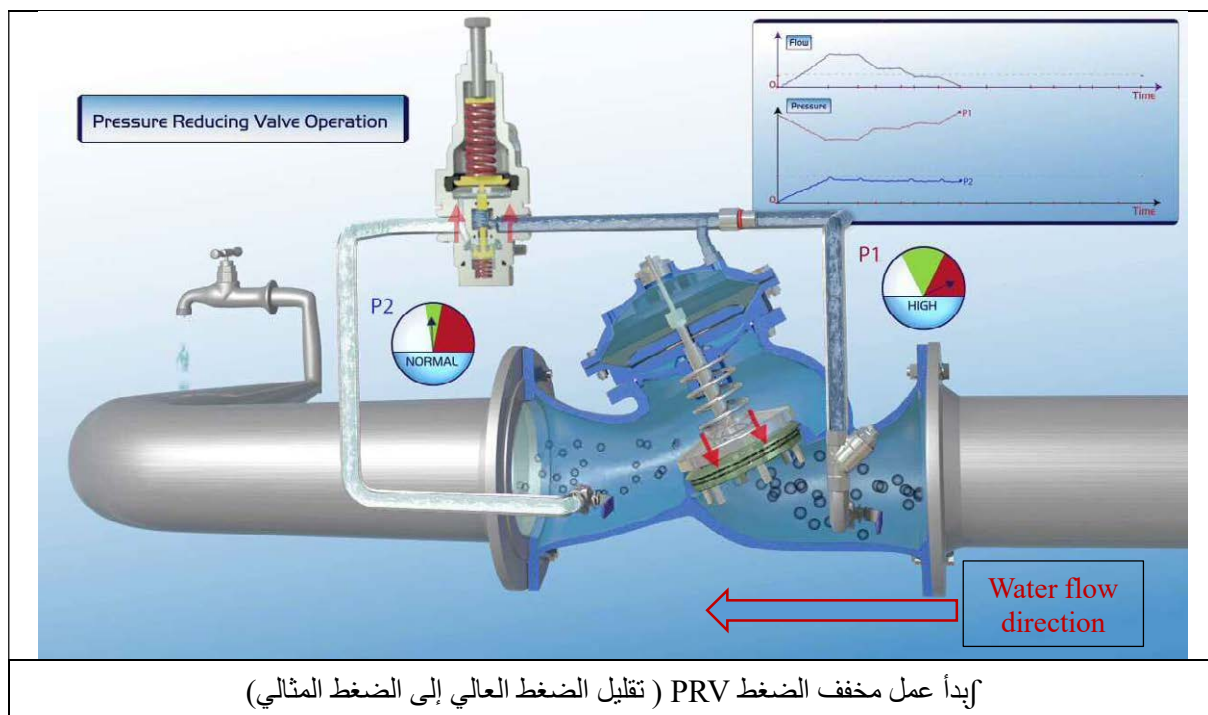
وتشمل كل لـ: عصا السمع الميكانيكي (mechanical listening stick) وعصا السمع الإلكتروني (electronic listening stick) والميكروفون الأرضي (ground microphone) وأداة كشف التسرر (leak-noise correlator) ومسجل التدفق الصوتي (acoustic loggers).





6.5 إدارة ضغط المياه في الشبكة والمعدات المستخدمة .
 يعتبر مخفف الضغط (PVR) من أهم الأدوات المستخدمة في التحكم بضغط المياه في الشبكة .





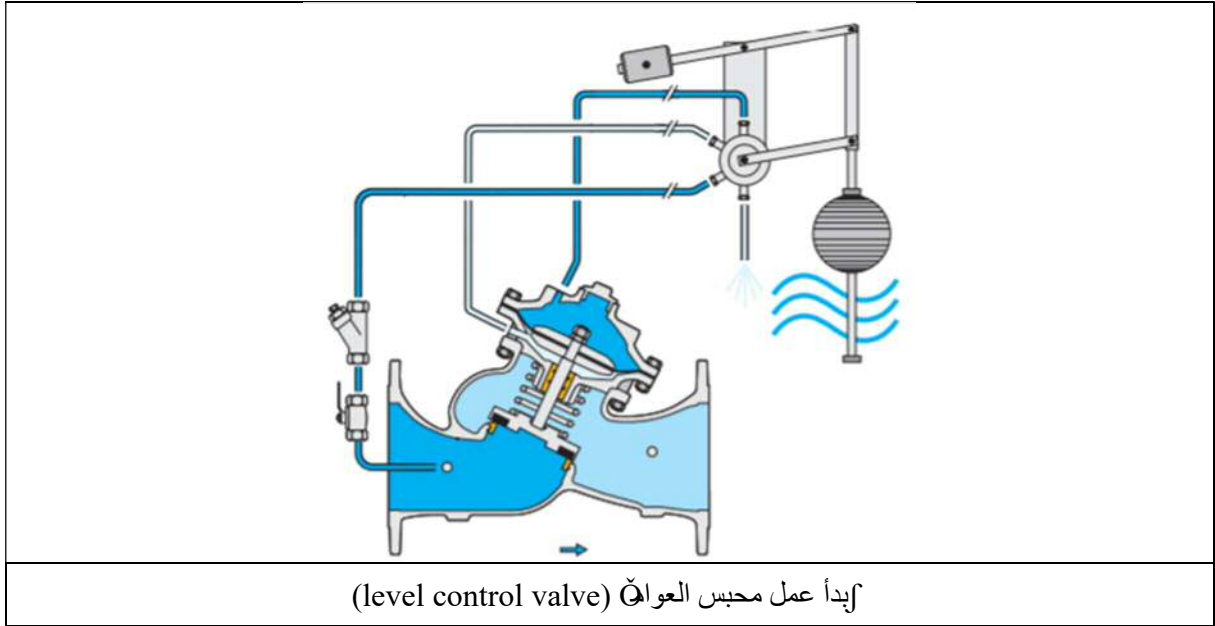
يستخدم مخفف الضغط (PVR) يتم تقليل الضغط العالي، يصل إلى قِيَمِ الضغط المثالي وتقليل فرص حدوث انفجارات خطوط المياه.

محبس العوامة (Level control valve)

يقوم فبدأ عمل محبس العوامة على إيقاف تدفق المياه إلى الخزان عندما يصل منسوب المياه إلى أعلى مستوى وكذلك تقادي المياه من الخزان.



محبس العوامة (level control valve)



الفصل السابع. مسح التسريبات (تحديد مواقعها)

7.1 مقدمة

تُسبب التسريبات (تحديد مواقعها) من خطوط الشبكة العديد من المشاكل :

- ✧ هدر المياه .
- ✧ تلوث المياه .
- ✧ هبوط الطريق وتلف الممتلكات .
- ✧ ازعاج المشاة وسائقي المركبات الآلية.

لذلك ، يجب الحرص على تنفيذ مسح الكشف عن تسرب المياه باعتباره جزءاً من الإجراءات الوقائية المُتبّية للحفاظ على تنفيذ أنشطة أعمال التشغيل والتشغيل بالشكل الملائم؛ مما سينعكس ايجاباً على تحسين وضع التزود بالمياه .

يُصنف التسريب في خطوط المياه إلى قسمين :

- ✧ التسريب السطحي (يعرف أيضاً بالتسريب المرئي).
- ✧ التسريب الأرضي (الخفي).

تتّـيّـ صـعـوـبـ الكـشـفـ عـنـ تسـريـبـاتـ خطـوطـ المـيـاهـ بـتـلـيـ أنواعها؛ فبالعادة يكون من السهل اكتشاف التسريب السطحي (surface leakage) وإصلاحه خلال فترة زمنية قصيرة كما يجب إجراء سلسلٍ من المسوحات الخاصة لاكتشاف التسريبات الأرضية (underground leakage) التي تستغرق فترة زمنية طويلة كما تم اكتشافها . لذلك من المهم المياه المفقودة نتيجة التسريب السطحي.

يمكن الكشف عن تسريبات المياه وتحديد مواقعها بطرق متنوعة، والطرق التالية هي الأكثر شيوعاً وملائمة لظروف التزود بالدراسة المختارة :

- I. المسح العيني (visual survey) (مسح الكشف عن التسريب السطحي) لعين المجردة).
- II. المسح السمعي (Acoustic) (لاكتشاف التسريبات الأرضية).
- III. فحص الـ stop test.
- IV. فحص الـ stop-cock.

7.2 المسح العيني (Visual survey)

الهدف من تنفيذ مسح إيداني يتمثل بالسير في جميع الأماكن وخصوصاً تلك التي يوجد بها تسريب المياه والظاهر وإصلاحها حتى تتمكن من الانتقال إلى مرحلة البحث عن التسريب الأرضي.

7.2.1 التحضيرات اللازمة لتنفيذ مسح الكشف عن التسريب السطحي

- ✧ إعداد جدول التسريبات للمناطق المراد مسحها خلال اعداد خارطة توضح ذلك من مراعاة التغييرات الحاصّة على مواعيد ضخ المياه (التي تتراوح بين 3/4 و 4/3) وارتفاع المتقطع في المدين ، لذلك « تسريبات » التأكد من جدول التسريبات للمناطق المستهدفة بشكل دوري .
- ✧ اعداد الخطّ اللازمة لتنفيذ المسح وفقاً لأيام التزود بالمياه ومواعيد الضخ لكل منطقة .

- ✧ طباعة خارطة شبكة المياه المخطط مسحها ضمن المقياس 1:500 ~ 1:1000 أو جـ الممكن تحويل ملف الخارطة إلى الـ KML وتنزيلها على الهاتف المحمول في حال استخدام البرنامج.
- ✧ من الأفضل أن يتكون الفريق جـ شخصين.

7.2.2 آلية تنفيذ مسح الكشف عن التسريب السطحي

- ✧ البدء بالمشي البطيء من زاوية المسح المسبقة، بحيث يقوم شخص واحد فقط بالسير على كل جانب من الطريق، ومرافق المسح على جـ تدل على وجود تسريب.
- ✧ إذا وجد بعض الإحساس على الطريق أو يقف رطب التربة، فتحري أكثر. عن مصدرها؛ فمن الممكن أن تكون المياه الظاهرة نتيجة تسرب مياه مختلفة مثل مياه الغسيل التي تم التخلص منها قبل المشترك والكهرباء الخزانات الموجودة على السطح والمياه الجارية المطبخ، وما إلى ذلك.
- ✧ إذا يتم العثور على الاحتمال السابق وكنت تشك في التسرب، حدد موقعها على الخريطة الورقية أو بـ المسجل أي الـ GIS للموقع.

7.2.3 مسح تأكيد التسريب السطحي.

- ✧ إذا تعذر تأكيد التسريب المشتبه، خلال المسح الأولي، فتتحقق جـ الموقع بعد مرور يوم أو يومين جـ توقف المياه في المنطقة و تحقق مما إذا كان التسرب قد جف أو ..
- ✧ قم بإعادة الفحص خلال اليوم اللاحق من جدول الضيق. هل عاد التسريب إلى الظهور؟
- ✧ إذا ظهرت علامة التسريب مرة أخرى، فتتحقق باستخدام عصا السمع.
- ✧ إذا كان من الممكن تنفيذ فحص الـ stop-cock تلك المنطقة، فقم بتنفيذه وتحقق أكثر من دفع الموقع التسريب.
- ✧ إذا لزم الأمر، قم بالحفر حول المنطقة المشتبه.

7.3 المسح السمعي (Acoustic survey) لكشف التسريب الأرضي

ترتكز هذه المسح على سماع الأصوات المتولدة عن تسريب المياه؛ ويُعتبر اكتشاف التسريب الأرضي مهمة صعبة تحتاج إلى توظيف العديد من الموارد المتمثلة بالوقت والقوى المدربة والمعدات. وتسلك الخطوات تحديد موقع التسريب الأرضي اتجاه أكثر عند إجراء المسح. المياه المنقطعة وعند امتلاك المشتركين خزانات أرضية كبيرة لتخزين المياه في فترات توقف الأمر الذي يولد صوتاً لصوت التسريب.

7.3.1 التحضيرات اللازمة لتنفيذ مسح الكشف عن التسريب الأرضي

- ✧ معرفة جدول ضخ المياه للمنطقة المراد مسحها؛ من خلال اعداد خارطة توضح ذلك مع مراعاة التغيرات الحاصفة على مواعيد ضخ المياه نظراً لارتفاع التزود المتقطع في المديين، لذلك «جـ التأكد من جدول المياه للمنطقة المسبقة بشكل دوري.
- ✧ جـ الضروري معرفة المواقع الدقيقة لخطوط المياه لذلك؛ يجب اعداد خارطة دقيقة توضح مواقع خطوط المياه والمضخات والعدادات المركبة على الشبكات جـ يمكن اضاف معلومات تفصيلية عن إوع الخطوط واقطارها.
- ✧ جـ توفر الخارطة، جـ الأفضل تنفيذ مسح أولي لتأكيد مواقع الخطوط في الشبكات.
- ✧ تشكيل فرق مسح مدرجة بـ يكون كل فريق جـ فرد.
- ✧ اعداد نموذج تقرير لتسجيل نتائج فحص العدادات خلال زيارة منازل المشتركين.
- ✧ فحص وتجهيز المعدات المراد استخدامها جـ اثن البطاريات وتفقد الأدوات إن لزم الأمر.

مسح تأكيد خطوط شبكة المياه

- لمزيد من التفاصيل يُرجى الإشارة إلى دليل تقليل الفاقد التفصيلي NRW .
- في هذا المسح ، يتم استخدام جهاز الكشف عن المواسير Pipe locator لتحديد الموقع الفعلي لخطوط المياه بشكل دقيق ، ثم يتم رصد احد الخطوط باستخدام أجهزة ال GBS وتسجيلها على برنامج ال GIS .
- تمتلك دائرة المياه والصر 2 الصحي w وبلدية كـ كـ فـ أجهزة ال GBS و أداة ال Pipe locator والأجهزة العاملة المترق على إدارة هذا المسح.
- تم تنفيذ مسح تأكيد خطوط الشبكة w مناطق المشروع التجريبي ومناطق القياس الجديدة DMA^a لذلك تعتبر احد الخطوط الشبكية في هذه المناطق دقيق إلى حد كبير .

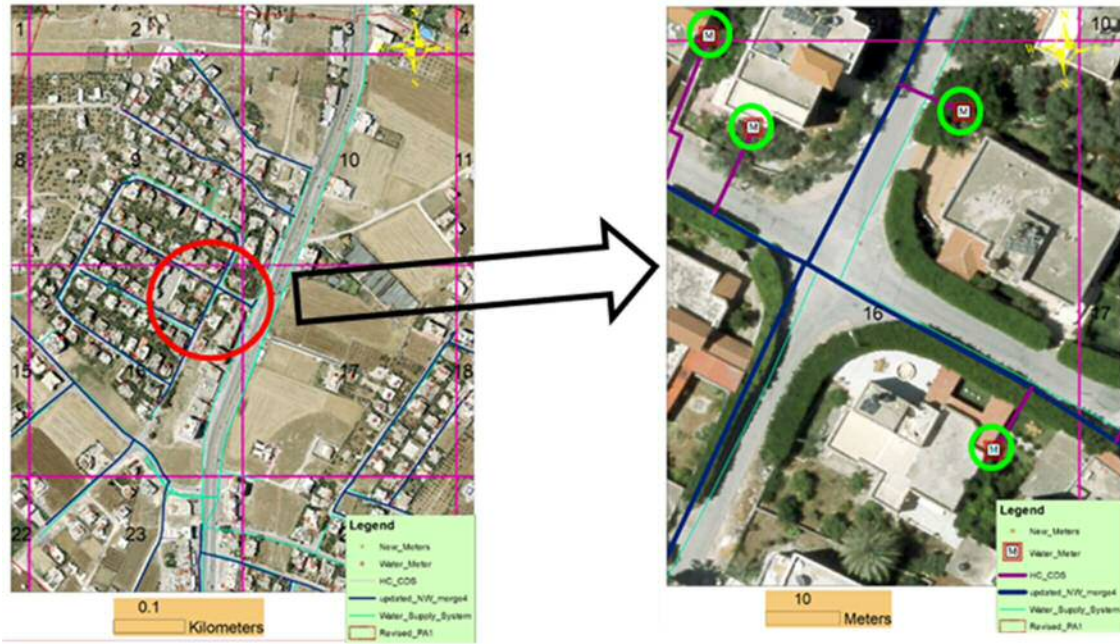
7.3.2 آلية تنفيذ مسح التسريب الأرضي.

يوجد خطوتان لتنفيذ مسح التسريب الأرضي :

الخطوة (1) "مرحلة تحديد المنطق (العمل ضمن منطق معين)" .

يتمثل مبدأ "مرحلة تحديد منطق التسرب" بـ "استماع إلى كافة الأجهزة والقطع الموصولة على الشبكة ضمن حدود منطق معين عن طريق استخدام عصا السمع ؛ وذلك لتحديد المواسير التي قد تحتوي على اصوات التسريب أو الأصوات المصاحبة له . ونموذج تطبيقي لمرحلة طواقم دائرة المياه w شهر أغسطس 2018م تنفيذ فحص وصلات المياه المنزلية الموصولة على خطوط التوزيع a في اعادة تنفيذ المسح خلال ساعات النهار لأسباب تتعلق بسلامة العاملين .

الخطوات الأساسية لمرحلة تحديد المنطق:



الشكل -20: منطقة المسح (الجانب الأيسر) وتكبير المنطقة على الخارطة.

- ✧ اختيار منطق كـ كـ على الخارطة .
- ✧ اعداد خارطة كبيرة للمنطقة المستهدفة (مقياس 1:1000-1:500).
- ✧ تنفيذ المسح السمي على محابس والقطع والعدادات .. الخ.

- ✧ تسجيل موقع صوت التسرب المحتمل على الخريطة وتعبئة الاستمارة الخاصة بالمسح W.G. وجود أي أصوات كشيء.
- ✧ استكمال الخطوات السابق إلى أن يتم تغطية المنطق بشكل كامل..



الشكل 21: الأنشطة المنفذة خلال مرحلة تحديد المنطق

الخطوة (2) مرحلة تحديد الخط (الفحص ضمن خط مواسير معينة لتحديد نقطة التسرب).

تتمثل في استكمال مسح خطوط التوزيع التي لوحظ وجود صوت تسرب على خريطة المرفق عند تنفيذ "مرحلة تحديد المنطق" وذلك باستخدام جهاز المايكروفون الأرضي (ground leakage).

يتمثل نتائج المسح المرفق في مرحلة تحديد المنطق حيث يشير اللون الأحمر في الخريطة المرفق على يسار الصفحة إلى خط توزيع والوصلات المنزلي التي يُحتمل وجود تسرب. ونظراً لتأثير الضوضاء الخارجة على كفاءة المسح المايكروفون الأرضي فمن الأفضل تنفيذه في ساعات الليل.

يتقاطع صوت التسرب الحقيقي و الأصوات المشابهة W.G. الخصائص و التردد لذلك يجب التفريق بينهما أثناء التدريب على المسح.





الشكل 22: مسح تحديد الخط باستخدام المايكروفون الأرضي (Ground Microphone)

7.3.3 الوقيية من تأثير الاصوات الخارجية (أصوات تشابهة لصوت الاسريب).

يؤثر صوت تدفق المياه wG خطوط الشبكات wG فترات الضيق على مخرجات مسح الكشف عن التسريبات وعليه «فك» التريث قبل بدء تنفيذ المسح لمرعاة الملابس الناجمة عن جريان المياه في الخطوط.

خ- تنفيذ مسح الكشف عن التسريب؛ يقوم المساحون بتسجيل جميع الأصوات المكتشفة على Y§ وت تسريب محتمل. وقد تتضمن الأصوات المسجلة على اصوات مشابة Q§وت التسريب (pseudo) والتي بدورها تشكل عن Y§سD§ المسح. يحتاج التمييز K§ أصوات التسرب الحقيقية والزائفة إلى خبرة ميدانية كبيرة.

كما يلي §ف§ نمودج يمكن الخلط Y§K§ وت التسرب الحقيقي .

أ. صوت جريان تيار المياه داخل الخط.

ينتج عن حركة تيار المياه داخل الخط أو عند مرورها Y§ أجهزة تنظيم التدفق مثل محبس البواب (Gate Valve) و مخفف الضغط (PRV)§ والنق§ (reducers) اذبذبات صوتية قريبة من صوت التسرب تزداد ببعده المسافة في Y. عدم فتح محبس البواب (Gate Valve) بشكل كامل؛ يكون صوت تدفق المياه Q§وت التسرب؛ لذلك من الضروري تنفيذ مسح التسرب عند إغلاق أو فتح§جهاز لايم التدفق بشكل كامل لأن هذه الأصوات تشكل عائقاً في مسح السمع.

ب. صوت الدارة الكهربائية مثل الصوت الناتج عن كوابل الكهرباء.

ويقصد K§ الأصوات الناتجة عن سر§ التيار الكهربائي wG الكوابل الممددة تحت الأرض و المحولات الموجودة على أعمدة الكهله و أعمدة الإنارة... إلخ. ل الإشارة إلى§§ الأمور السابق ذكرها تعمل على توليد تردد منخفض يصل إلى 300 هيرتز أو أكثر نتيجة التيار الحثي والاهتزاز.

ت. صوت تعبئة خزانات المشتركين بالمياه.
يتشابه صوت تعبئة خزانات المشتركين بالمياه مع صوت التسرب.

١. صوت تسرب المياه الصحي

يتمثل صوت تدفق المياه في الصرف الصحي (بمقاييس ذلك) صوت المياه التي تصب في المناهل) في صوت التسرب وعليه، فإن الصعب التمييز بينهما.

٢. صوت المركبات على الطرق.

يؤلف صوت تشغيل السيارات، صوتاً متقطعاً (بمقدار فترة وجيزة في الزمن) سهل تمييزه، إذ أن حجم الصوت يشكل غير منتظم. ومع ذلك، فإن صوت احتكاك إطارات المركبات قد يكون دون القدرة على تحديد صوت التسرب.

٣. صوت الرياح.

عادةً، يختلف صوت الرياح في خفض السرعة عن صوت التسرب لكن زيادة سرعة الرياح تؤدي إلى صوت مشابه لصوت التسرب ويصبح من الصعب التمييز بينهما.

٤. ضوضاء المدينة.

تتضمن العديد من الأصوات التي تحدث في تكوينها، بعض الأصوات الناتجة عن أجهزة التكييف وأصوات حركة السيارات. فباتحاد الأصوات المذكورة يتكون صوتاً مشابهاً لصوت التسرب.

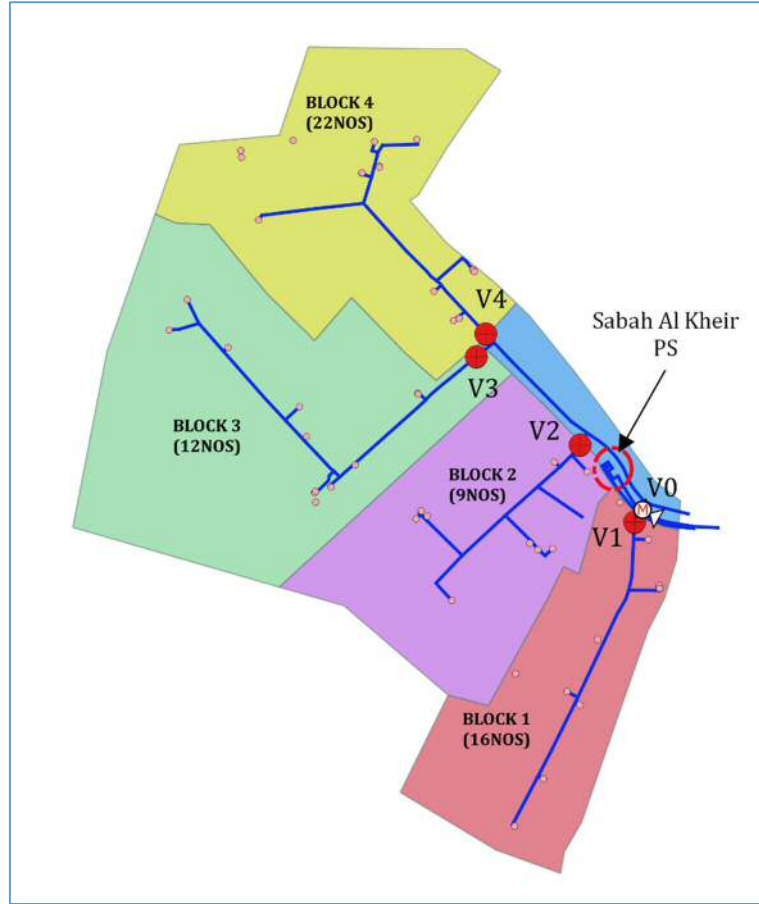
7.4 © حصص الأدرج step-test

وهي أداة لتحديد المناطق ذات التسرب العالي المحتمل أو الاستهـاد غير القانوني للمياه من منطقة قياس معينة أو ضمن المنطقة. توزيعها معين، وذلك عن طريق إغلاق وفتح المحابس الفردية في مناطق المستهدف بشكل متسلسل وبالتزامن مع مراقبة قيم تدفق المياه في المنطقة.
إذا أدى إغلاق محابس بعض المقاطع إلى انخفاض كبير في كمية المياه المتدفقة، فهذا يشير إلى احتمال وجود تسرب عالٍ أو استخدام غير قانوني للمياه في ذلك المقطع. ويمكن أيضاً أن تكون هذه الطريقة عملاً في تحديد المناطق ذات التسرب الأعلى في خطوط عندما يتعذر إجراء مسوحات مكثفة للكشف عن التسرب نتيجة أسباب مختلفة. ولكن هذه الطريقة، يجب أن تكون شبكة خطوط المياه مناسبة ويجب أن يكون عدد كوابل من كل عقدة العزل.

حالة دراسية/مثال على تنفيذ step test لمنطقة التجريبية الأولى (PA1).

ولغاى تنفيذ فحص الـ step test تم اختيار إحدى المناطق الفرعية التي تتمتع بـ 3 آيا متواصل (ساعة 24×7) في المنطقة التجريبية الأولى. وقد أظهرت إناج حساب نسبة الفاقد لهذه المنطقة وجود نسبة عالية في الفاقد المياه تصل إلى 50% أو أكثر، وعلى الرغم من تنفيذ مسوح كشف التسرب وإيجاد الوصلات غير القانونية في هذه المنطقة إلا أنه يمكن من تحديد أسباب نسبة الفاقد العالي في الشبكة. لذلك تم تنفيذ فحص الـ step test لهذه المنطقة كمنهجية لمعالجة نسبة الفاقد المرتفعة.

يوضح الشكل 23 موقع المنطقة وترتيب خطوط الشبكة ومواقع المحابس التي تلزم لإجراء الفحص.



الشكل 23: مخطط مناطق فحص ال step test وعدد محابس © ومشاركي كل منطقة

يتم تغذية المنطقة المختارة بمياه الجـ خلال خط توزيع واحد بقطر "2" ، و يقوم مقياس الفحص على تركيب القطع التالي على مدخل المنطقة :عداد مقياسي بقطر "2" جـ كابل لنقل البيانات إلى مسجل الضغط (data logger) (يتم تركيب العداد على مدخل المنطقة بشكل دائم) ومحبس (مشاري 6) (V0) ووصلة لقياس الضغط (فتحة الأنبوب على فـدخل المنطقة لتركيب جهاز ال data logger) إضافة إلى تركيب عداد الألتراسونيك على الجزء المكشوف من الخط.

وتتمثل الخطوة التالية بتركيب أربع محابس عزل (V1, V2, V3, V4) على التفرع الأربـ لخطوط المنطقة. من خلال اغلاق هذه المحابس يمكن تقييم المنطقة إلى اربـ مناطق معزولة هيدروليكية ويشمل (Block 1,2,3,4) .

عدد مشاركي كل منطقة :

المجموع	Block 1	Block 2	Block 3	Block 4	المنطقة
59	16	9	12	22	عدد المشاركين
100.0%	27.1%	15.3%	20.3%	37.3%	نسبة المشاركين

(1) خطوات تنفيذ الفـ

تم تنفيذ الفحص 3 مرات اثنتان خلال ساعات النهار وواحد في وقت الصباح الباكر (فترة ٠٠:٠٠-٠٠:٠٠) بعد تعديل التدفق الأدنى MNF " جـ الساعة ال 3:00-4:00 صباحاً".

وفي كل مره تم اتباع الخطوات التالي :

تركيب عداد الألتراسونيك المحمول على خط "2" في مدخل المنطقة جـ البدء بقياس التدفق.

➡️ ١-٣ المصفاة ©k V0, V1, V2, V3, V4 بشكل متسلسل كما يلي :

الخطوة الأولى- : اغلاق V4 بشكل كامل والانتظار لمدة 2-3 دقائق حتى تصبح قراءة تدفق المياه ثابتة.
الخطوة الثانية : اغلاق V3 بشكل كامل °f الانتظار حتى تصبح قراءة تدفق المياه ثابتة (يجب الانتظار لمدة 1 دقيقة wG كل من الخطوات الفاقدة).
الخطوة الثالثة : اغلاق V2 بشكل كامل °f «انتظار قليلا حتى تصبح قراءة تدفق المياه ثابتة» .
الخطوة الرابعة : اغلاق V1 بشكل كامل °f «انتظار قليلا حتى تصبح قراءة تدفق المياه ثابتة» .
 بعد اغلاق المحابس الأربعة يصبح تدفق المياه داخل المنطق 0 ، لذلك « يوجد حاجة لإغلاق المحبس الرئيسي المتحكم بالمنطق (V0).

➡️ الآن قم بفتح المصفاة ©k V4, V3, V2, V1, V0 بشكل تصاعدي ومتسلسل وكما يلي:

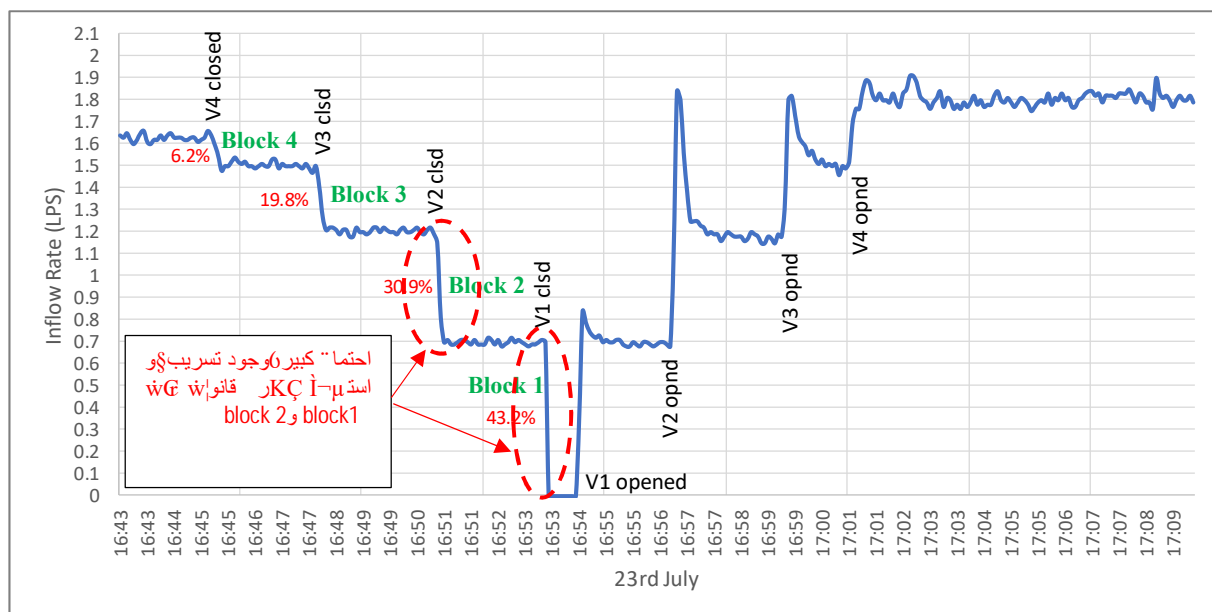
الخطوة الأولى: فتح V1 بشكل كامل والانتظار لمدة 2-3 دقائق حتى تصبح قراءة التدفق على جهاز الألتراسونيك ثابتة.
 الخطوة الثانية: فتح V2 بشكل كامل والانتظار لمدة 2-3 دقائق حتى تصبح قراءة التدفق على جهاز الألتراسونيك ثابتة.
 الخطوة الثالثة : فتح V3 بشكل كامل والانتظار لمدة 2-3 دقائق حتى تصبح قراءة التدفق على جهاز الألتراسونيك ثابتة.
 الخطوة الرابعة: فتح V4 بشكل كامل والانتظار لمدة 2-3 دقائق حتى تصبح قراءة التدفق على جهاز الألتراسونيك ثابتة.

(2) نتائج الفحص.

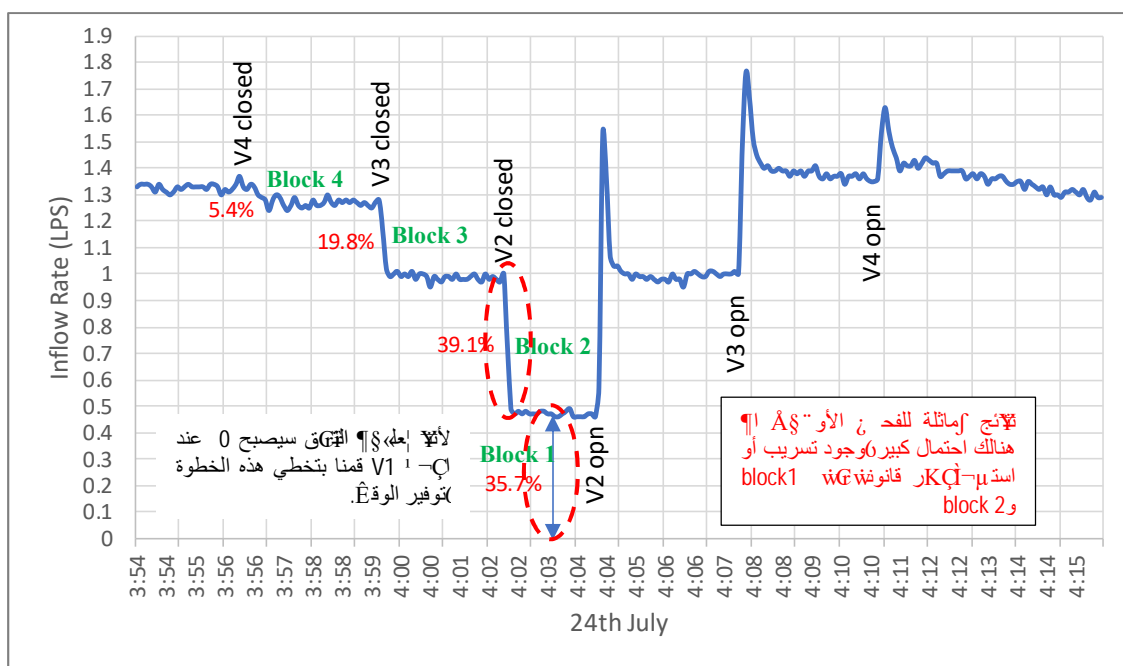
يلخص الجدول التالي قيم تدفقات المياه بعد تنفيذ فحوصات ال wG step test الثالث والعشرين والرابع والعشرين °f 1/2 لهم تموز على التوالي.

تسلسل الإغلاق				قيمتين التدفق عند فتح جميع المصفاة ©k لتر/ك	اليوم والتاريخ
V4, V3, V2 & V1 (Block 4, 3, 2, & 1) مغلق	V4, V3, & V2 (Block 4, 3, & 2) مغلق	V4 and V3 (Block 4 & 3) مغلق	V4 (Block 4) مغلق		
0	0.71	1.204	1.521	1.624	الفحص الأول 7/23 16:40~17:10
-43.7%	-30.4%	-19.5%	-6.3%	0	قيمتين الهبوط في التدفق لكل block
0	0.477	0.996	1.281	1.397	الفحص الثاني 7/24 2:18~2:43
-34.1%	-37.2%	-20.4%	-8.3%	0	قيمتين الهبوط في التدفق لكل block
0	0.475	0.996	1.26	1.332	الفحص الثالث 7/24 3:54~4:15
-35.7%	-39.1%	-19.8%	-5.4%	0	قيمتين الهبوط في التدفق لكل block

توضح الرسوم البيانية التالية قيم تدفقات المياه بعد تنفيذ الفحص الأول و الثاني.



الشكل 24: نتائج قيم التدفق بعد الفحص الأول



الشكل 25: قيم تدفق المياه بعد الفحص الثاني (تم تنفيذه في الليل)

تشير نتائج الفحوص المنفذة إلى ان وضع تدفق المياه Block 3 و 4 طبيعي $wG \cdot K$ تدل فروقات تدفق المياه wG block 2 و 1 على وجود تسرب أو استهلاك غير قانوني wG .

في 4.0: يحتوي دليل إدارة الفاقد على شرح لفصل لفحص "Step test".

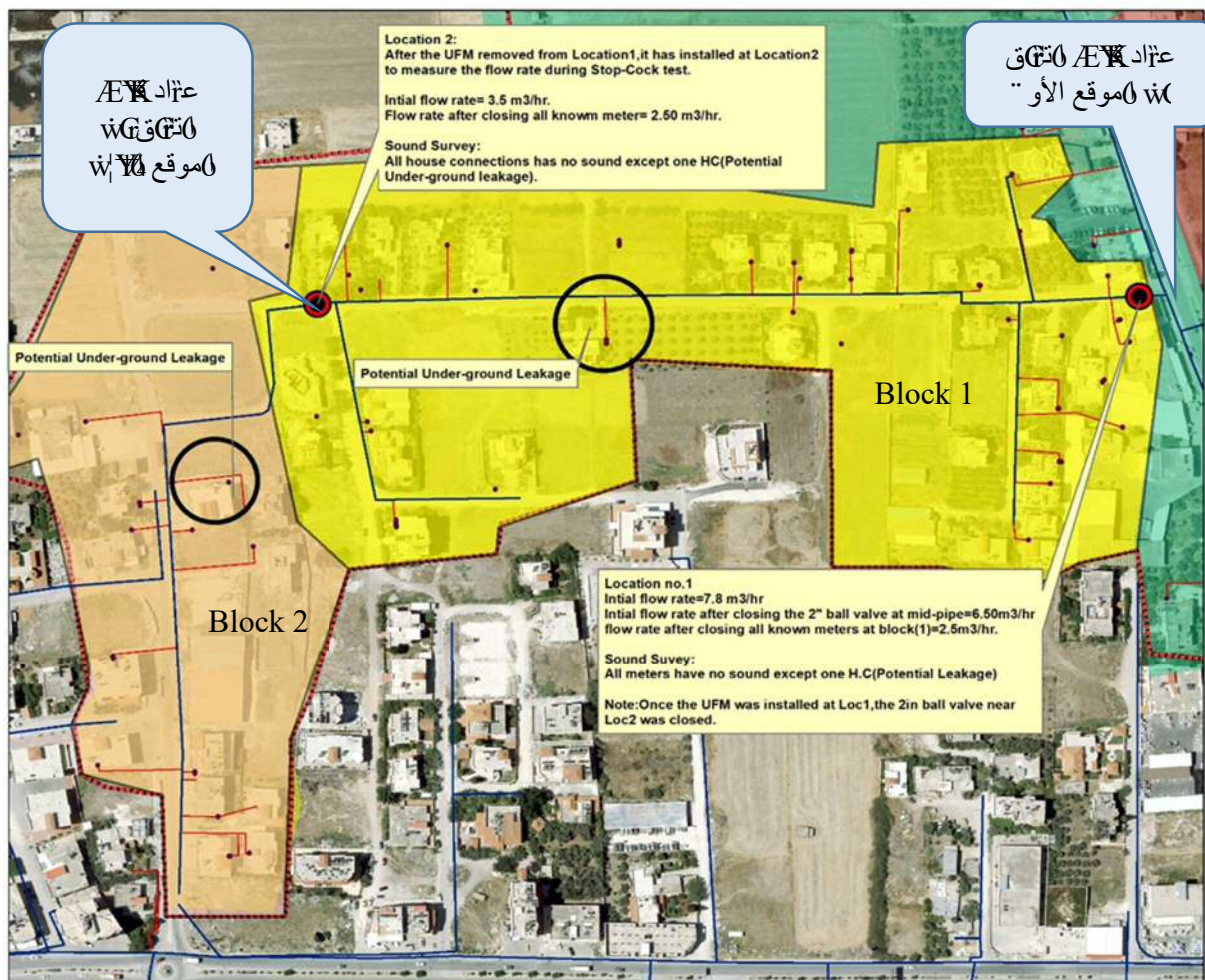
7.5 © حصص ال Stop-Cock

تتناسب هذه الطريقة في المناطق ذات المساحات الصغيرة؛ حيث يمكن ± المياه إلى المنطقة في خط توزيع واحد وعزلها عن المناطق المحيطة. مما يسهل عملية مراقبة كميات المياه المتدفقة إلى المنطقة عن طريق التركيب المؤقت (عداد قياس التدفق (التراسونيك) على الخط (مغذي) للمنطقة وإغلاق جميع مفاصل المنطقة بشكل يدوي. أصبح مع تدفق المياه في المنطقة صفرًا هذا يعني أن المنطقة خالية من التسريب أو وجود تسريب أو صدق غير طبيعي أو إذا أشار جهاز الأتراسونيك إلى قراءة كمية التدفق على صفر فهذا يدل على وجود تسريب أو صدق غير قانوني، وعليه يجب تنفيذ مسح سمعي (باستخدام عصا السمع) لكافة الوصلات المنزلية بالمنطقة.

تمتاز هذه الطريقة بسهولة التنفيذ ووضوح النتائج مقارنةً بفحص step test، يتطلب جهدًا مكثفًا لإغلاق جميع مفاصل العدادات المشتركة.

تتطلب فحص ال stop cock:

- ✦ العزل الهيدروليكي للمنطقة الفحص عن المناطق المصابة وقياس كمية المياه المتدفقة باستخدام عداد الحجم الموجود وتركيب المؤقت (عداد الأتراسونيك).
- ✦ سهولة وصول طواقم دائرة المياه إلى كافة العدادات المشتركة.
- ✦ تطبيق فحص ال stop cock على وصلات جميع المشتركين في المنطقة. ذلك في تنفيذ فحص ال stop cock على الوصلات قبل العداد أو التسبب في مشاكل (العمل على تجزئة المنطقة إلى عدة أجزاء واستخدام محابس قبل وصلات المشترك المشكوك فيها).



الشكل 26: نتائج فحص ال stop-cock على أحد مناطق الدراسات الأولى

ففي المثال السابق:

Block 1 المقطع الاول

- §. تركيب جهاز الألتراسونيك المحمول في الموقع الأول : القراءة الألية للتدفق = $3\text{A}7.8$ / الساعة.
- f. عزل منطف block1 من خلال اغلاق المحبس الموجود في الموقع Y: القراءة الألية للتدفق = $3\text{A}6.5$ / الساعة.
- Ⓣ. تم اغلاق جميع محابس عدادات المشتركين بشكل يدوي block1 w: ولم يصبح مقدار التدفق 'فرا لكذا' أصبح 2.5 3A / الساعة.
- ث. تم فحص جميع الوصلات المنفصلة باستخدام Y: السمع لإيجاد A: تسرب محتمل أو استهلاك غير قانوني .
- ج. تم إيجاد تسريب ارضي محتمل أو استهلاك غير قانوني ممكن فمن احدى الوصلات -Ⓣ.

Block 2

- §. فتح المحبس في الموقع الثاني والبدء بتغذية block2.
- f. تركيب جهاز الألتراسونيك المحمول في الموقع Y: القراءة الألية للتدفق = $3\text{A}3.5$ / الساعة.
- Ⓣ. تم اغلاق جميع محابس عدادات المشتركين بشكل يدوي في block2: ولم يصبح مقدار التدفق صفرا (كذا) أصبح 2.5 3A / الساعة. « يزال هناك جريان في الخط.
- ث. تم فحص جميع الوصلات المنفصلة باستخدام Y: السمع لإيجاد A: تسرب محتمل أو استهلاك غير قانوني .
- ج. تم إيجاد تسريب ارضي محتمل أو استهلاك غير قانوني ممكن في احدى الوصلات -Ⓣ.
- Ⓞ. بعد الحفر تم إيجاد وصلة غير قانونية في الموقع المشبته K.

f-Ⓞ: يحتوي دليل إدارة الفاقد على شرح لفصل لفحص " Stop-Cock".

الفصل الثاني: أعمال إصلاح التسريب

8.1 التحضيرات اللازمة لتنفيذ أعمال إصلاح التسريب.

- ✧ اعداد خطة العمل لأعمال تصليح التسريب - اعداد قائم يوم للتسريب ذات الأولوية الإكواد، حيث تُعطى الأولوية لحالات التسريب الحرجة في مراعاة الأمور التالية: الإضرار بالبنية التحتية، وازعاج المواطنين، وكمية المياه المهدورة واحتمال تلوث المياه المزودة وتوفر مواد التصليح في مستودع دائرة المياه إلى ذلك.
- ✧ الحصول على أمر الموافقة على حفر الشارع إذا لزم الأمر.
- ✧ توفير المعدات اللازمة مثل: الحفار، ماكينة قص المواسير (pipe cutter)، اللحام (welding machine)، المولّد الكهربائي (generator)، مضخة غاطس (drainage pump) وغيرها.
- ✧ توفير الأيدي العاملة اللازمة لتنفيذ أعمال التصليح مثل: سائق الحفار، الفني، فني اللحام، راد الحراس، الخ.
- ✧ توفير أدوات السلامة مثل: الاشارات التحذيرية، حواجز السلامة، العواكس، المصابيح.. الخ.
- ✧ فحص وتقدير كمية القطع والمواد اللازمة مثل المواسير، القطع، المرابط، مرابط الاصلاح وغيرها.

8.2 أعمال التصليح.

- ✧ العمل على تصليح التسريب ذو الأولوية القصوى.
- ✧ عزل مقطع الخط المراد تصليحه عن طريق اغلاق المقابس القريبة
- ✧ والبعيدة المتحكم بالخط والمغذوون عدم الانتهاء من إصلاح التسريب.
- ✧ وضع حواجز السلامة محيط مكان العمل.
- ✧ التحقق من جاهزية مكان العمل للبيئة والتنفيذ.
- ✧ إصلاح التسريب وفقاً للإجراءات المعتمدة.
- ✧ تعبئة الخط عن طريق فتح المحابس القريبة (المغذوون).
- ✧ التحقق من عدم وجود تسريب في الجزء الذي تم كتمه، أو المنطق المحيطة به.
- ✧ تصوير موقع العمل وتسجيل الإحداثيات الـ GIS واستخدام أجهزة الـ GBS أو الموبايل المحمول.
- ✧ تفريغ الخط من المياه عن طريق فتح محبس التفريغ (التصريف-washout) القريب بعد وقوع التصليح.
- ✧ إعادة مكان العمل (سطح الطريق) إلى حالته السابق.
- ✧ تنظيف مكان التصليح وإزالة وارجاع كافة الأدوات المستخدمة وحفظ السلامة.



إصلاح التسريب باستخدام رابط الـ OYKI



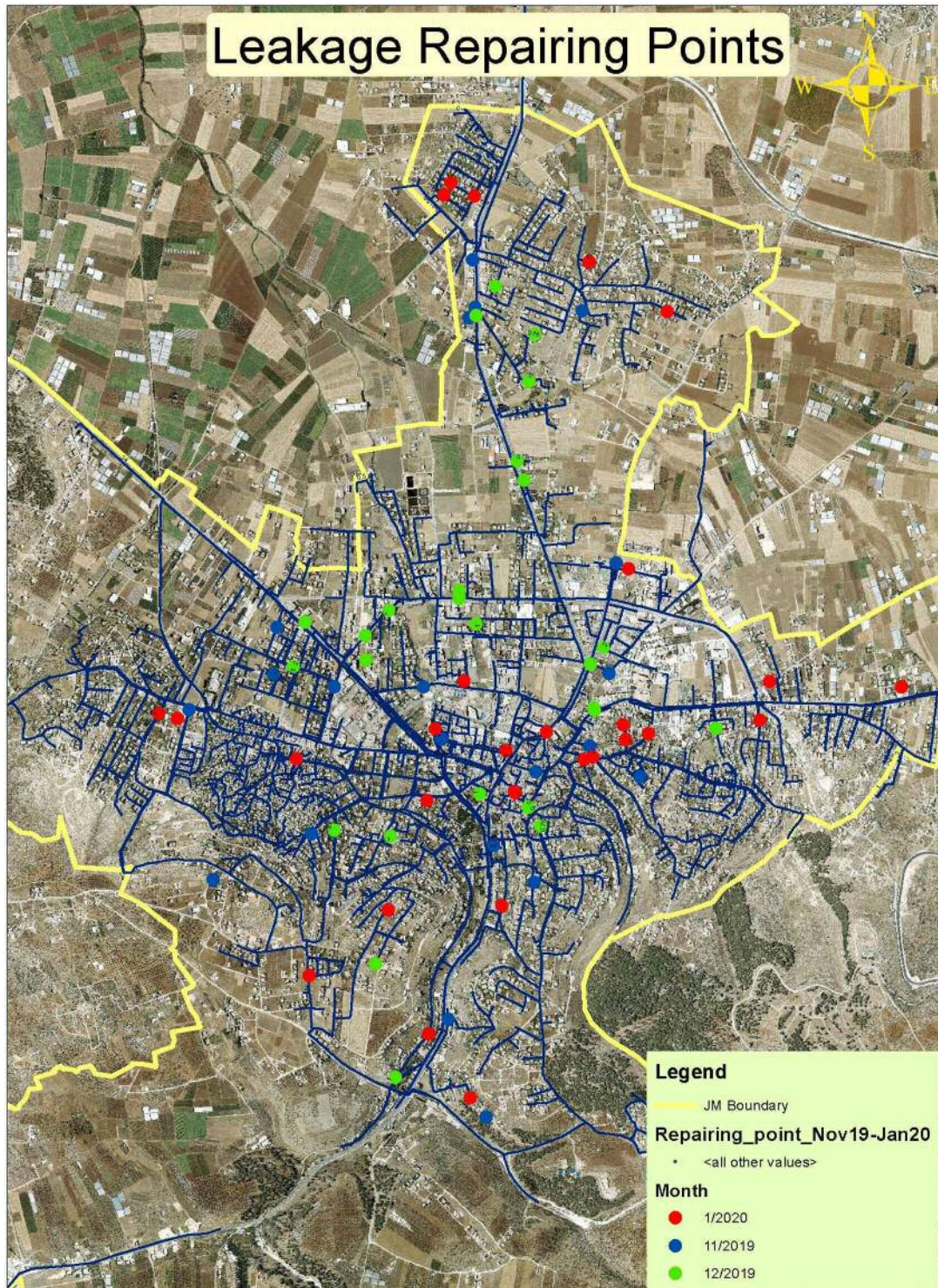
إصلاح التسريب عن طريق قن الماسورة ووضع جزء من ماسورة أخرى باستخدام المرابط



إصلاح ماسورة معدنية باستخدام فلنج لحام في جهة واستخدام فلنج محوّل (فلنج براغي في الجهة الأخرى).

8.3 اعداد التقارير والخرائط .

- ✧ تسجيل نوع وعدد المواد المستخدمة، الوقت الذي استغرقت، عمل إصلاح التسرب، عدد الأفراد المشاركين في عمل الإصلاح، تعبئة تقرير إصلاح التسرب.
- ✧ تحديث خرائط الـ GIS الخاصة بتسجيل إقاط إصلاح التسرب. توضح الخريطة ديناه، نقاط التسرب التي تم تصليحها خلال 2019- 12/11 و 2020/1.



الشكل 27: نقاط إصلاح التسرب wG في مدينة جنين خلال الفترة 2019-12/11 و 2020/1

الفصل التاسع اجراءات الأمن والسلامة

الالتزام بارتداء ملابس السلامة الملائمة (قفازات الحماية protective gloves و الحذاء المطاطي العازل لماء gumboots) والحرص على توفير أدوات الإسعافات الأولية .
9.1 آجاءات السلامة خلال العمل في مواقع العمل.



الشكل 28: ستر الوقاية (الخضراء) بالمشروع (القسم الأيسر) الستر المستخدمة خلال سلاخ العمل الليلي (القسم الأوسط والأيمن)

- ✧ ارتداء ستر عاكسة للضوء في العمل في سلاخ الليل.
- ✧ احمّل مصباح اضاءة 1/2 وات وبشكل دائم .
- ✧ توفير صورة بطاقة التعريف (الهوية) و احمّلها بشكل دائم .
- ✧ توفير واعداد ملخص عن أهداف العمل و اظهره وقت الحاجة .
- ✧ اِتبه لظروف المكان المحيط بك : كن حذرا من الكابلات ، والأشخاص المشبوهين .
- ✧ تجنب الوقوع في جدال أو مشادة كلامية مع الناس ، في حال وقوع مثل هذا الأمر قم بالانسحاب .

9.2 آجاءات الوقاية خلال انشاء غرف التحكم (chambers) أعماخ إصلاح التسرب.

- ✧ حواجز السلامة : استخدام حواجز السلامة ووضعها حول مكان العمل ودهن قضبان الحواجز بالألوان السهلة تمييزها.



الشكل 29: حواجز السلامة المستخدمة في المشروع

- ✧ الاشعارات أو اللوحات التحذيرية :اعداد وتركيب لوحة تحذير تتضمن جم " العمل قيد التنفيذ أو منطقة عمل.
- ✧ التنسيق لمرور (إن لزم) خلال المخيمات بشكل مسبق عن وجود عمال انشائي أو حفرة الطريق والحصول على مساعدتها في إدارة حركة السير في منطقة العمل.
- ✧ ارتداء معدات السلامة دائما على سبيل المثال ارتداء النظارة الواقية عند القيام بأعمال اللحام .

9.3 اجراءات السلامة أثناء العمل داخل غرف التحكم (chambers)

- ✧ الاحتفاظ بالمضخة الغاطسة (drainage pump) في الحاوية إلى سطح مزيدا من مياه غرفة التحكم إلى الخارج .
- ✧ عند فتح غرفة التحكم محكمة الإغلاق - تدخل الغرفة مباشرة بعد فتح الغطاء ، وانتظر بعض الوقت للتخلص من الغازات الخطرة التي قد تكون في الغرفة .
- ✧ شكل عام تكون مساحات العمل داخل غرف التحكم محدودة لذلك اختيار واحضار المعدات الملائمة لظروف العمل.

別冊資料 CD 1.10

Equipment Usage Manual (Standard Version)

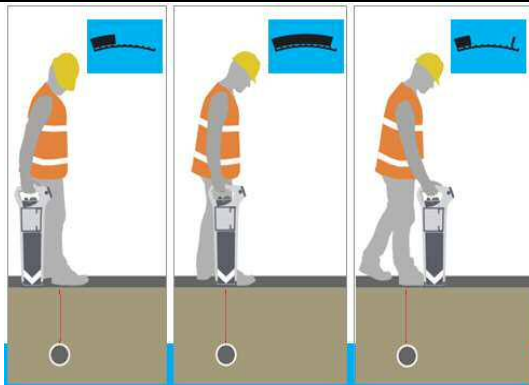
別冊資料 CD 1.10.1 English Version



سلطة المياه الفلسطينية
PALESTINIAN WATER AUTHORITY

PALESTINIAN WATER AUTHORITY

**THE PROJECT FOR STRENGTHENING THE CAPACITY OF WATER SERVICE
MANAGEMENT IN JENIN MUNICIPALITY**



EQUIPMENT USAGE MANUAL

(STANDARD VERSION)

APRIL 2021

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

TEC INTERNATIONAL CO., LTD.

PADECO CO., LTD.

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LIST OF ATTACHMENT

- Attachment 1. Ground microphone (Aquaphon A100) user manual**
- Attachment 2. Pipe and cable locator (MXL4) manual**
- Attachment 3. Portable ultrasonic flowmeter (PF330) user manual**
- Attachment 4. Pressure logger (LE05) manual**
- Attachment 5. Dual channel logger (i20) manual**
- Attachment 6. Manual of pressure measuring devices**

CHAPTER 1. INTRODUCTION

All leaks, big or small, generate some sound. The principle behind the acoustic leakage tools is to capture the sound, also called a leak noise, and make an estimation of leak location based on the sound intensity and characteristics.

A leak noise is composed of several components; flow, friction, vibration and impact noises. The gushing out of high-pressure water from a hole or fault on pipe creates flowing-out noise while the friction of inner pipe-surface with flowing water generates friction noises. Similarly, pipe body near the leak hole makes vibration sound and when the spurting water from leak hole hits the surrounding earth it produces impact noise.

Magnitude and nature of a leak noise depend upon several factors related with the origin of leak and the medium through which the noise is transmitted. Some of the most important factors are water pressure, type of hole/crack, pipe material, pipe diameter, soil type, and laying depth. Noise from a leak is conducted through both the pipe wall and the water within the pipeline.

Intensity of a leak noise is higher at higher pressure, sharper cracks, metal and smaller diameter pipes, hard or concrete surface and shallow laying depth. On contrary, the opposite characteristics such as low pressure, blunt edges of cracks/holes, plastic or non-metallic pipes, bigger diameter pipes, loose surrounding soil and deeper laying depth will result into lower intensity of noise.

Acoustic tools are used to identify underground leaks. They range from very basic tool such as plain mechanical listening stick to sophisticated devices such as digital noise loggers.

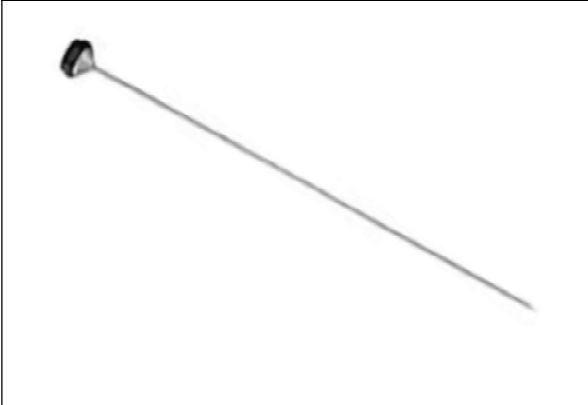
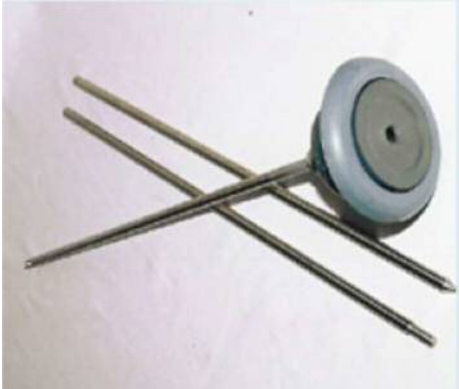
In this document we will outline most commonly used acoustic tools for underground leak detection along with basic principles of use, important factors to be considered, and practical tips for leak detection.

CHAPTER 2. LISTENING STICK

2.1 Mechanical Listening Stick

Mechanical listening stick is the simplest acoustic tool. The concept for this tool came from a method of checking the open and closed status of valves by hearing the sound of running water with a plug opener, which is used for valve operation. It has been used for a long time and still is a major leak survey tool.

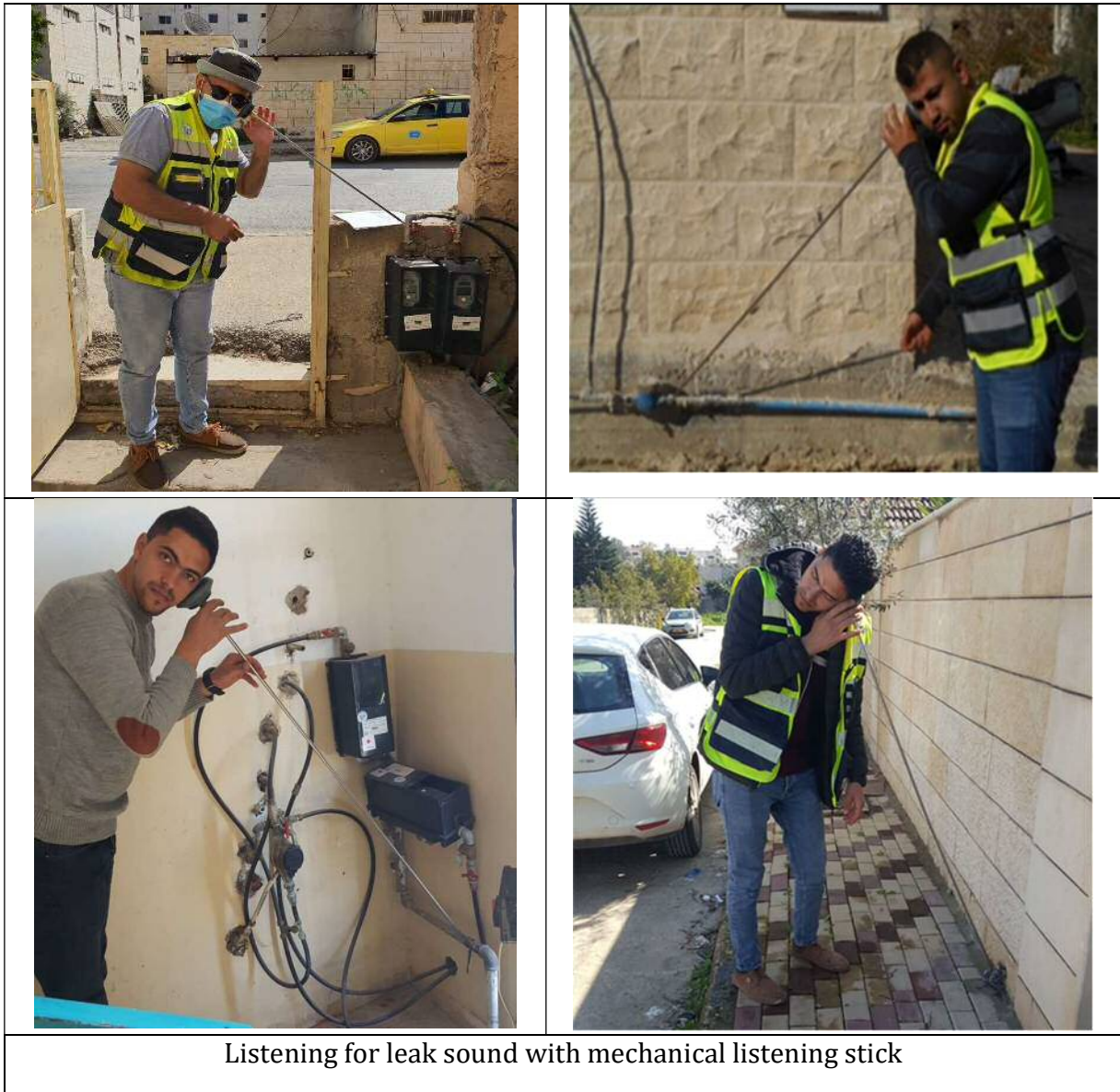
The structure of a listening stick is quite simple. It is generally a single or detachable multi piece solid steel rod of about 9 mm diameter with a diaphragm on one side and a pointed tip on the other. As it is nothing but a simple sound transfer device and no mechanism for sound amplification or filtration is available with this tool, it needs longer experience and more practice in order to be able to make full use of it.

	
Mechanical listening stick (one piece)	Mechanical listening stick- disassemble (for easy carrying)

To achieve the best result, use it as described below

- (a) Gently hold the rubber part of the ear pad. Do not hold the metal bar.
- (b) Do not press your ear against the ear pad too much as it will be harder to hear. Your ear should be slightly in contact with the ear pad.
- (c) Find the best condition for you to hear sounds by gently tapping the bar with your fingernail.

It is a simple and cheaper tool and requires almost no maintenance. It is useful in preliminary scanning of bigger leak noises. However, the main drawbacks with this tool are that its use demands a considerable experience and it needs to touch directly the pipe, fitting or hydrant surface.



2.2 Electronic Listening Stick

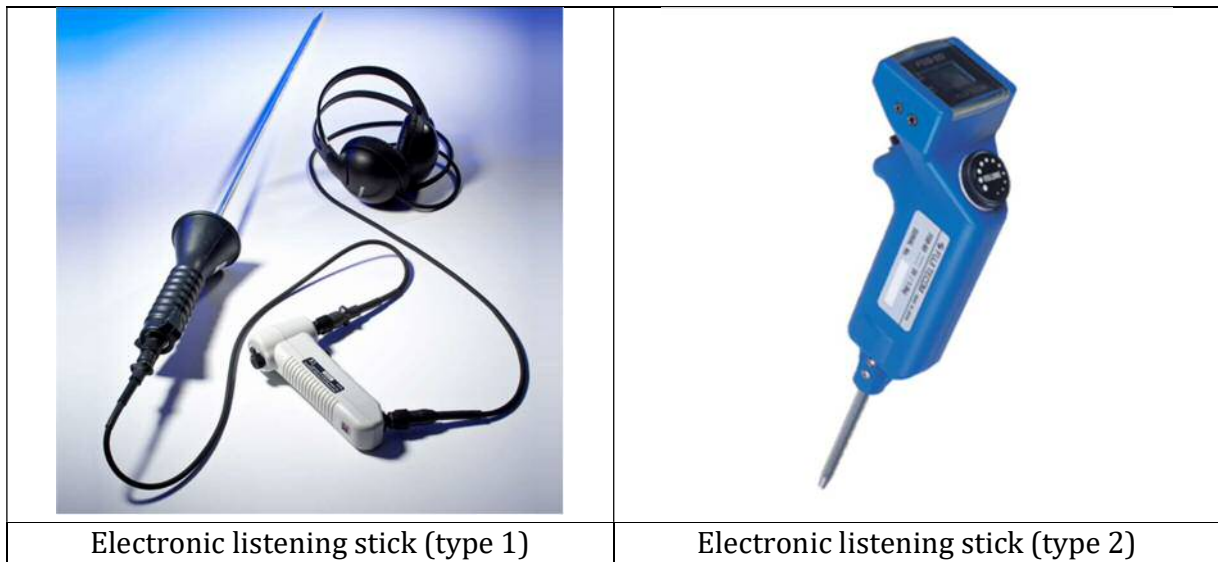
This is an improvisation over the mechanical listening stick by adding a piece of electronic which can amplify the leak noise level as well as filter unwanted interferences. Noise amplification and digital display of noise level make this tool more useful as even a person with inferior hearing capacity can also use it.

An electronic listening stick essentially comprises three main parts; (1) solid metallic stick, (2) electronic unit for amplification and filtration, and (3) head phone.

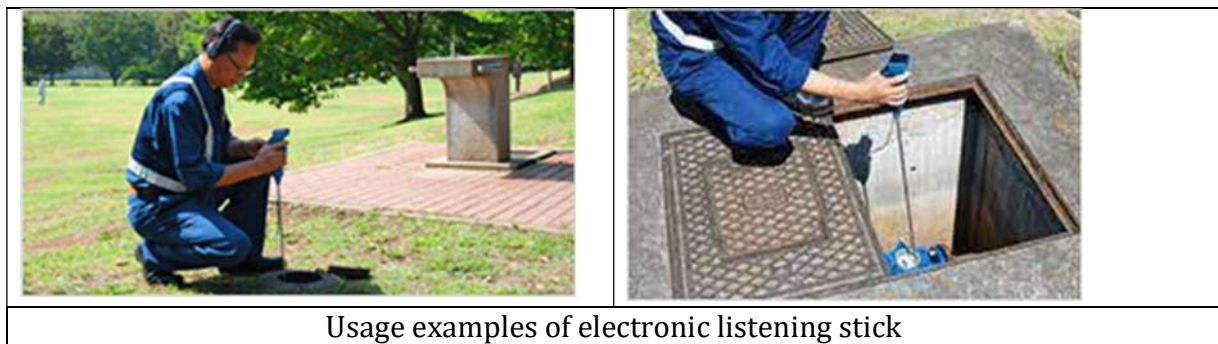
Like mechanical listening stick, this also needs a direct contact with pipe or fitting surface. As electronic parts are involved, it needs more care and maintenance such as regular replacement of battery etc in comparison to mechanical listening stick.

In this project no separate electronic listening stick has been procured. But when required, the Test Rod of ground microphone (described in next chapter) can be used as an electronic listening stick.

The following figures show some typical electronic listening sticks.



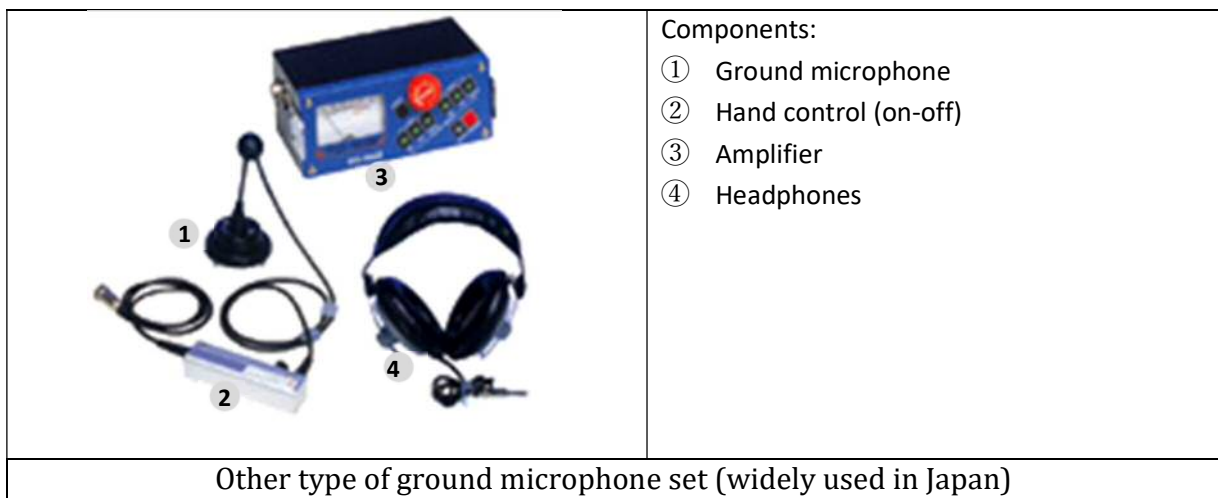
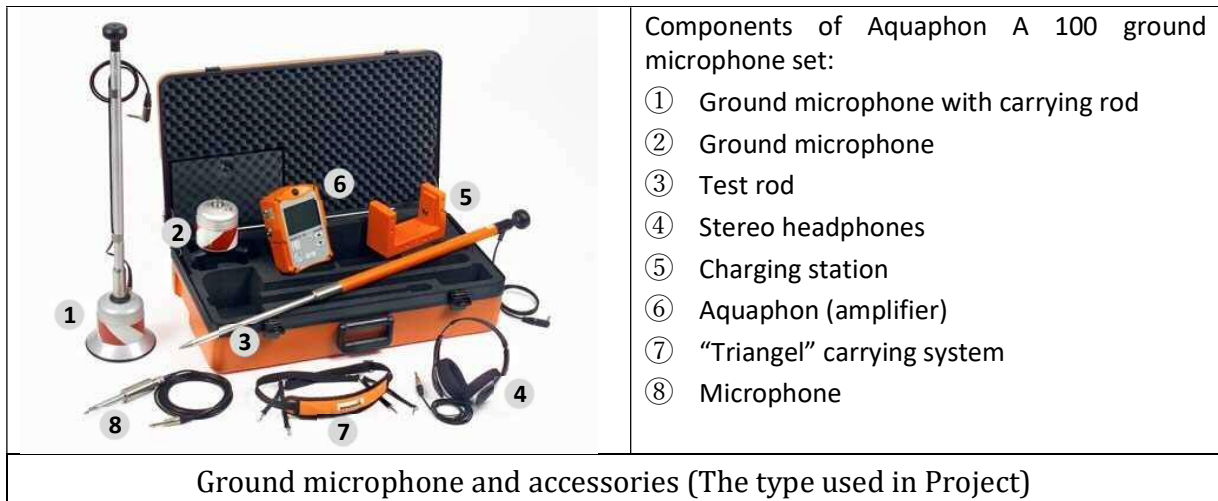
Usage examples of electronic listening stick

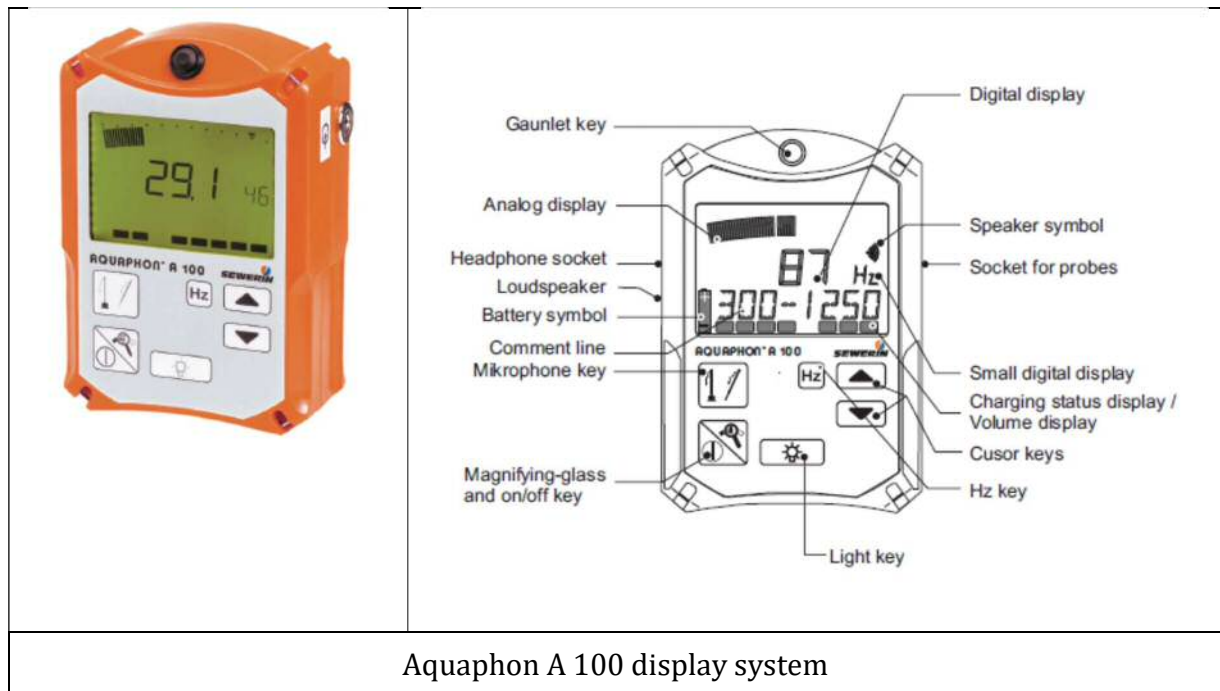


CHAPTER 3. GROUND MICROPHONE (LEAK DETECTOR)

3.1 Introduction and Components

Ground microphone, also called 'leak detector', is the device placed on the ground which can capture and amplify the sound produced by a leak in underground object. There are many models of ground microphone from different manufacturers. Contrary to listening sticks which require a direct contact with pipe or fittings surface, this tool doesn't require a direct contact with the object. Instead, leak noises can be listened to from the ground surface above the pipe or leaking object. Like an electronic listening stick the ground microphone also comprises three main components; Pick up sensor with hand switch, Electronic unit for amplification and filtration, and Headphone.






3.2 How to Prepare and Keep Ready for Use at Site

A) Switching on and off

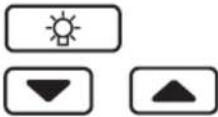
- Plug a probe into the appropriate input.
Probe connection: **input 1**
- A brief signal tone sounds.
- The software version appears in the display.
- The charge status of the re-chargeable batteries appears in the display.
- The type of probe plugged in is automatically determined.
- The probe type briefly appears in the display. If the probe type is not automatically identified it can be selected manually (see section 3.1.1 of the User Manual).
- If a microphone has been plugged in, the bandpass currently set for the frequency filter is briefly displayed.
- The layout of the display depends on the used probe. The measurement process may be started.
- To switch off, unplug the probe from the input.

Manual probe selection

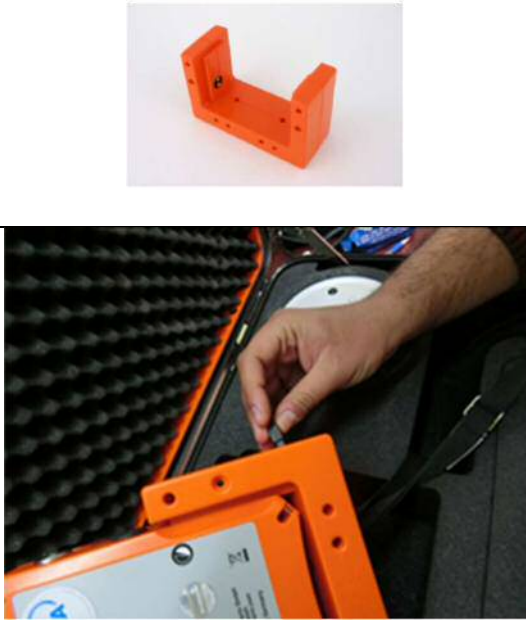
If the probe is not automatically identified (if it is an old model, for example), it can be selected manually:

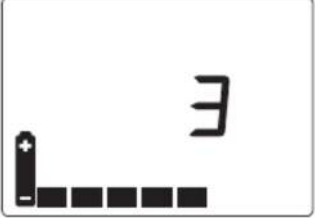
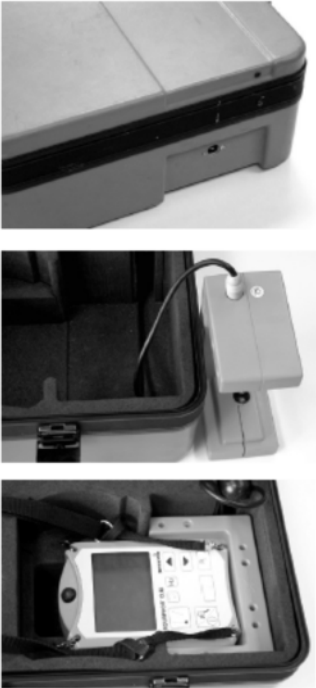
	<ul style="list-style-type: none">● Hold down the microphone key.● Plug in the probe. The „>“ symbol appears on the left of the bottom text line and the name of the probe that can be selected, e.g. „M01“ in the middle.● Pressing the cursor keys switches between possible probes.● Pressing the magnifying-glass key displays the selected probe.
---	--

B) Adjusting the display contrast


	<p>The display contrast can be adjusted as follows:</p> <ul style="list-style-type: none">● Hold down the light key.● Press the cursor-down key to reduce the contrast.● Press the cursor-up key to increase the contrast.
--	--


C) Charging equipment

	<p>When fully charged the instruments have a maximum operating time of approx. 12 hours.</p> <p>To charge an instrument you need the docking station HS 1,2 A (see figures on left), which can be used either in the workshop or in the emergency vehicle.</p> <ul style="list-style-type: none">● The docking station has the following sockets on its side:<ul style="list-style-type: none">- AC/DC adapter M4, 100 – 240 V~- Vehicle cable M4 for 12 V
---	---

	<ul style="list-style-type: none"> ● Switch off the instrument and plug it into the docking station. The left (or similar) appears in the display. ● The instrument now has 5 operating hours (= 5 bars) left. It will take another 3 hours to be fully charged. <p>The actual operating time depends on the accumulators' condition (age ...) and operation (light, volume ...) charging time takes max. 4 hours.</p> <ul style="list-style-type: none"> ● When it is fully charged all the bars appear and the number display disappears. ● You can leave the instrument in the docking station until you need it again.
	<p>If you have a case for your A 100, it can be charged inside.</p> <ul style="list-style-type: none"> ● Connect cable to the docking station inside the case. <p>Connect the plug-in AC/DC adapter M4 or vehicle cable M4 to socket 2.</p> <p>Self-discharge</p> <p>If the instrument is not placed in the docking station HS 1,2 A when switched off the NiMH-accumulator will self-discharge, which is considered when displaying the remaining operating time.</p> <p>The charge will not last more than 30 days, the instrument will indicate zero operating hours when the equipment discharge, and it must be recharged.</p>

D) Connecting the headphone

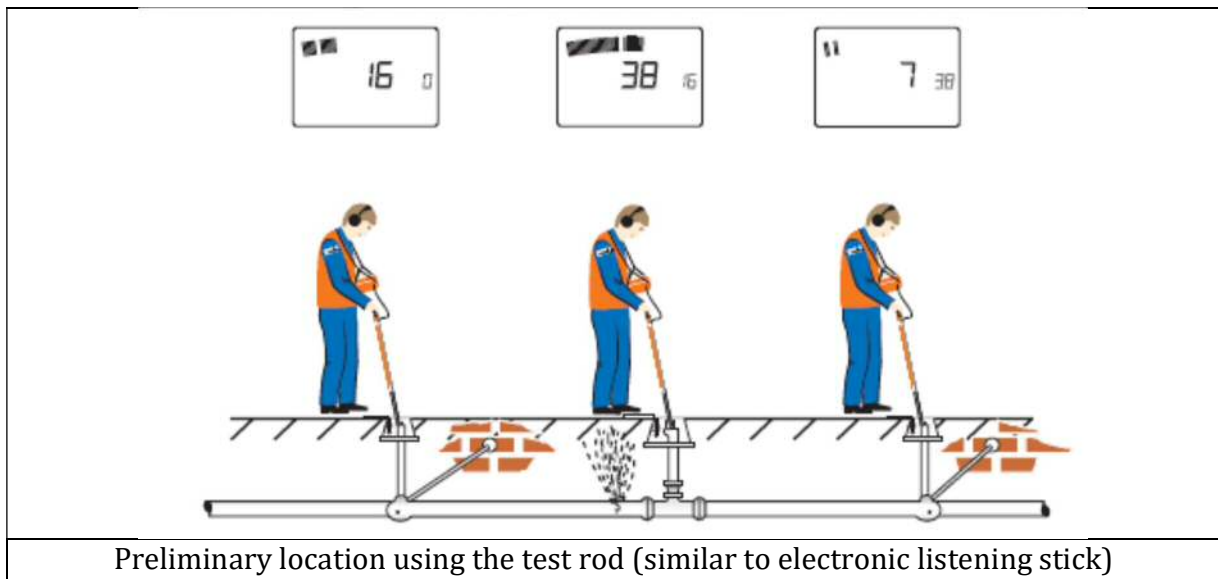
	<p>A 100 are fitted with a speaker (1) Such produces the confirmation and alarm signals. During water leak detection no leak noise is emitted over the speaker: headphones must be used. Switching from speakers to headphones:</p>
---	---

	<ul style="list-style-type: none">● Plug the headphones jack-plug into socket 2. The speaker is switched off automatically; sound is output to the headphones.● When the headphones are unplugged the sound is once more output to the speaker.
---	---

3.3 Brief instruction on Water Leak Detection Using Aquaphon A 100

The ground microphone can be assembled for use in either of two modes, contact mode and survey mode. The contact mode is for preliminary location which is done by sounding on fittings, similar to an electronic listening stick. This is done by using the test rod. The survey mode is used to search for leaks on lengths of pipeline between fittings. The technique involves placing the microphone on the ground at intervals along the pipe and noting the changes in sound amplification as the microphone nears the leak position.

A) Preliminary location

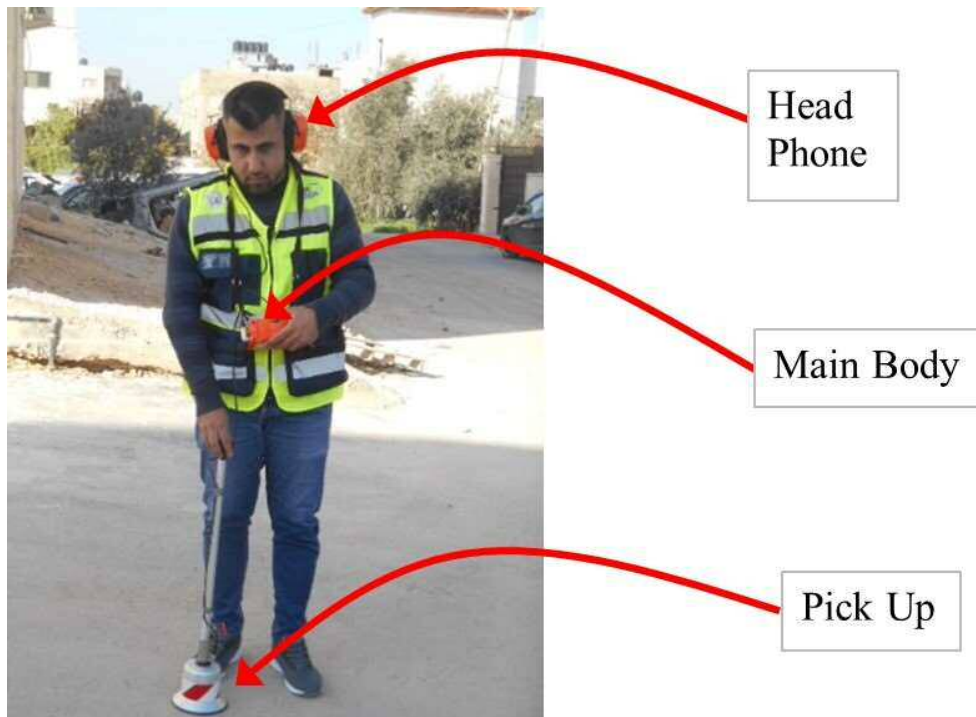


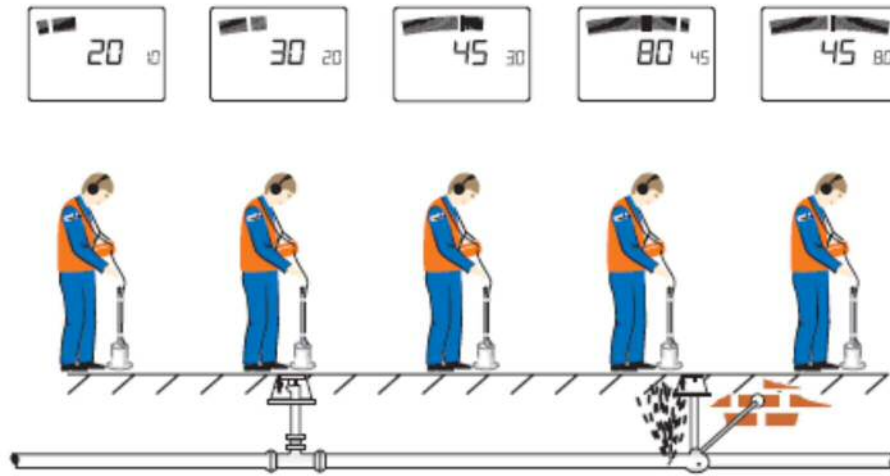
- Connect the headphones to the **A 100**.
- Connect the test rod to the **A 100**.
- Place test rod on the first measurement point.
- Activate the **A 100** with the gauntlet key or the microphone key.
 - A speaker symbol appears in the display during measurement.
 - The analog display indicates the current measurement volume.
 - The noise can be heard by the headphones.

- During this measurement the big digital display indicates the smallest value measured.
- During this measurement the small digital display indicates the smallest value of the precedent measurement. For the first measurement this value is 0. During this measurement the smallest measured value is shown in the analog display in reverse video.
- To deactivate the **A 100** release the gauntlet key or press the microphone key again.
 - If the **A 100** is not deactivated when the gauntlet key is released, the function of the gauntlet key has been changed (see section 4.8 of the User Manual). In this event press the gauntlet key again.
- Place the test rod on the next measurement point and proceed exactly as described above.
 - The previously measured value now appears in the small digital display for the purposes of comparison.

B) Pinpointing

How to position the ground microphone on ground?



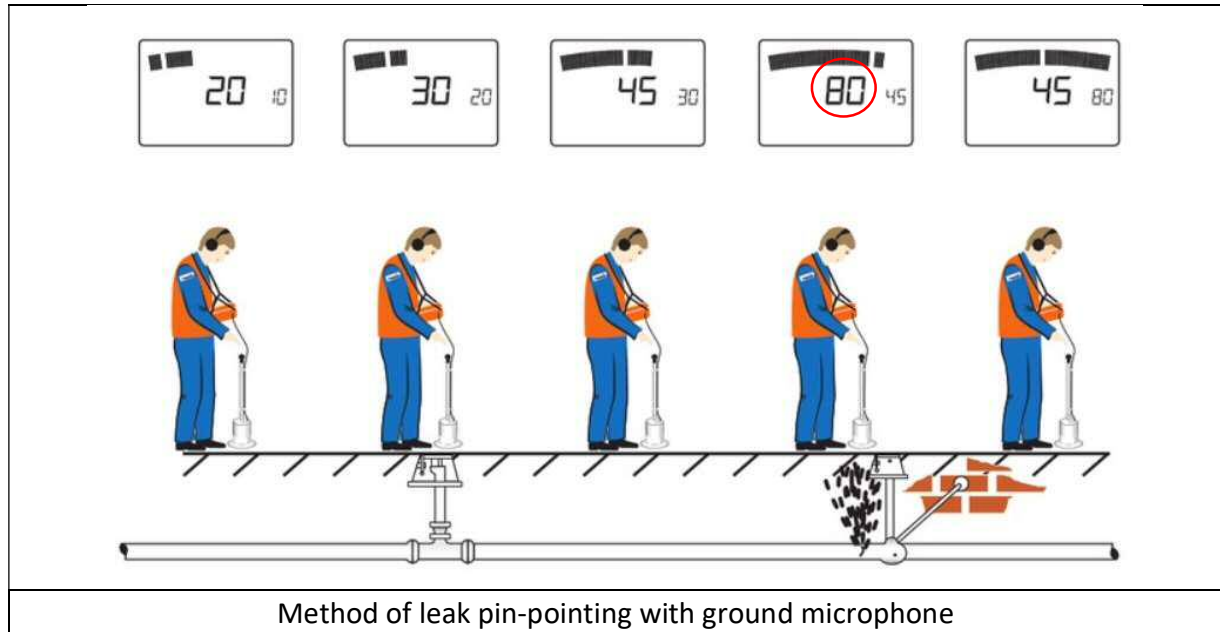


Pinpointing using ground microphone

- Instead of a test rod connect a ground microphone to the **A 100**.
- Place the microphone on the ground.
- Activate the **A 100** with the gauntlet key or the microphone key.
 - A speaker symbol appears in the display during measurement.
 - The analog display indicates the current measurement volume.
 - The current noise can be heard through the headphones.
 - The digital display indicates the smallest value measured.
 - The small digital display indicates the previously-measured value. For the first measurement this value is 0.
 - The smallest measured value is shown in the analog display in reverse video.
- To deactivate the **A 100** release the gauntlet key or press the microphone key again.
 - If the **A 100** is not deactivated when the gauntlet key is released, the function of the gauntlet key has been changed (see section 4.8 of the User Manual). In this event press the gauntlet key again.
- Place the ground microphone on the next measurement point and proceed exactly as described above.
 - The previously measured value now appears in the small digital display for the purposes of comparison.
- Use the ground microphone to check the area of the section where the leak is thought to be.

3.4 Illustration of Ground Microphone Use

Ground microphone is probably the most widely used equipment in water leak detection work. This is used to preliminary locate water leak first and then to pinpoint it later.



Principle of use of ground microphone is illustrated above. In short, when you reach near the leak, the sound intensity scale increases progressively and when you move away it decreases progressively. Near the leak the sound intensity is maximum.



External noises make it difficult to hear water leak noise, the survey is preferably done during nighttime when the external noises are less.

3.5 Precaution Against External Sound Interference (Pseudo Sound)

There is a need to wait before starting the survey because when the water-feed has just begun, there tends to be many noises caused by the running water.

The surveyors record all the detected sound as possible /probable leakage sound while executing leakage survey. The detected sound may include pseudo leakage sound, which is similar to the leakage sound and is a critical obstacle during the survey. In order to differentiate the real from the pseudo leakage sounds, it is necessary to obtain many years of site experience.

Typical examples that may be confused with leakage sound are as follows.

a) Turbulent flow sound inside pipe

When the water passes flow-regulating devices such as gate valves, pressure reducing valves and reducers, it generates vibration-like sound of which frequency is like the leakage sound and which is hard to differentiate especially when the distance is far. When the gate valve is not opened fully, the sound of turbulent water is so similar to the leakage sound. So, at the location where gate valves or other flow-regulating devices are installed, it is necessary to conduct the leakage survey when the valves are fully closed or opened.

b) Circuit sound such as electric power cables

Electric current flow generates low frequency sound of 300 Hz or more by electric dis-charge vibration, from underground cables, transformers on utility poles, streetlights etc.

c) Sound from filling of customer tanks

Sound from filling of customers' water tanks is similar to the leakage sound.

d) Stream sound in drainage

The stream sound in drainage including the fall sound in the manhole is similar to leakage sound and thus hard to differentiate.

e) Sound of running vehicles

The running sound of cars is transitory and easy to distinguish because the volume changes irregularly. However, the friction sound of the tire with the road surface is easily confused with the leakage sound.

f) Noise of wind

Sound of low velocity wind is different from that of leakage but when the velocity of wind increases the sound becomes similar to that of leakage and it becomes difficult to distinguish between the sound of wind and leakage.

g) Town noise

In urbanized area, various sounds such as from air-conditioning equipment and running cars are mixed together, which is similar to the leakage sound.

*Aquaphon A 100 User's Manual from the equipment manufacturer is attached as **Attachment 1**. It covers all aspects of the equipment including potential malfunction and troubleshooting.*

CHAPTER 4. METALLIC PIPE LOCATOR

4.1 Introduction

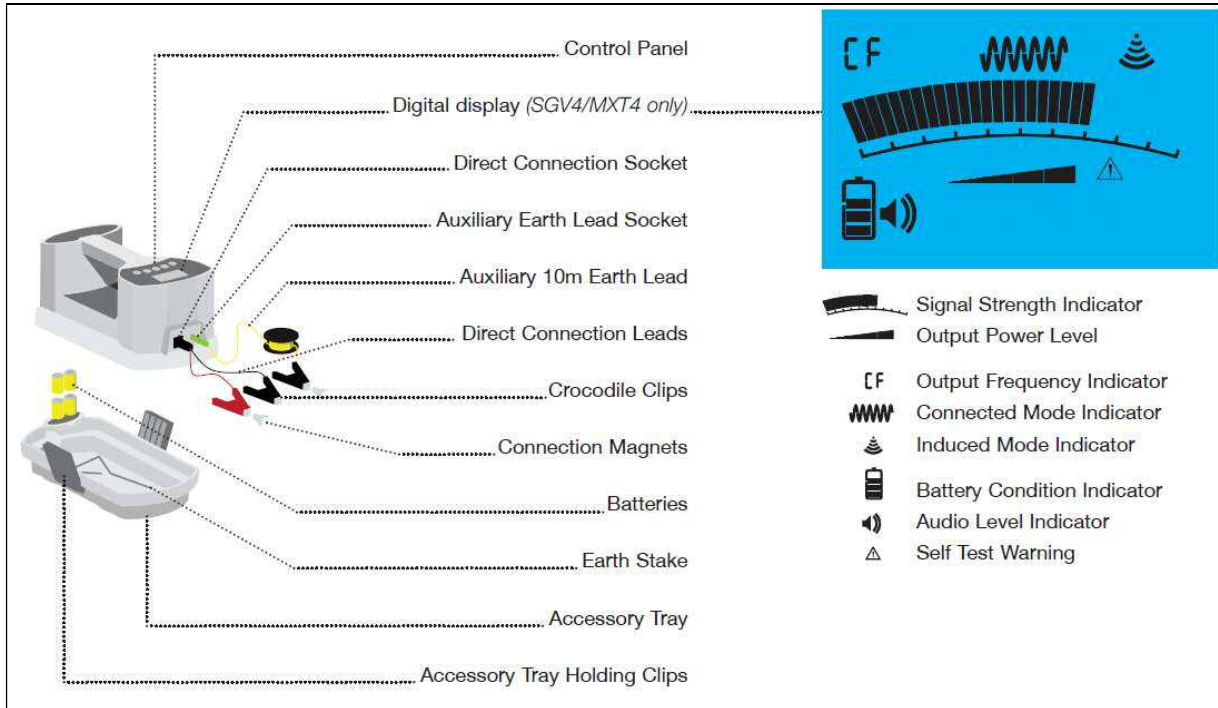
The type of pipe locator available in WWD is C.Scope MXL4, as shown below .



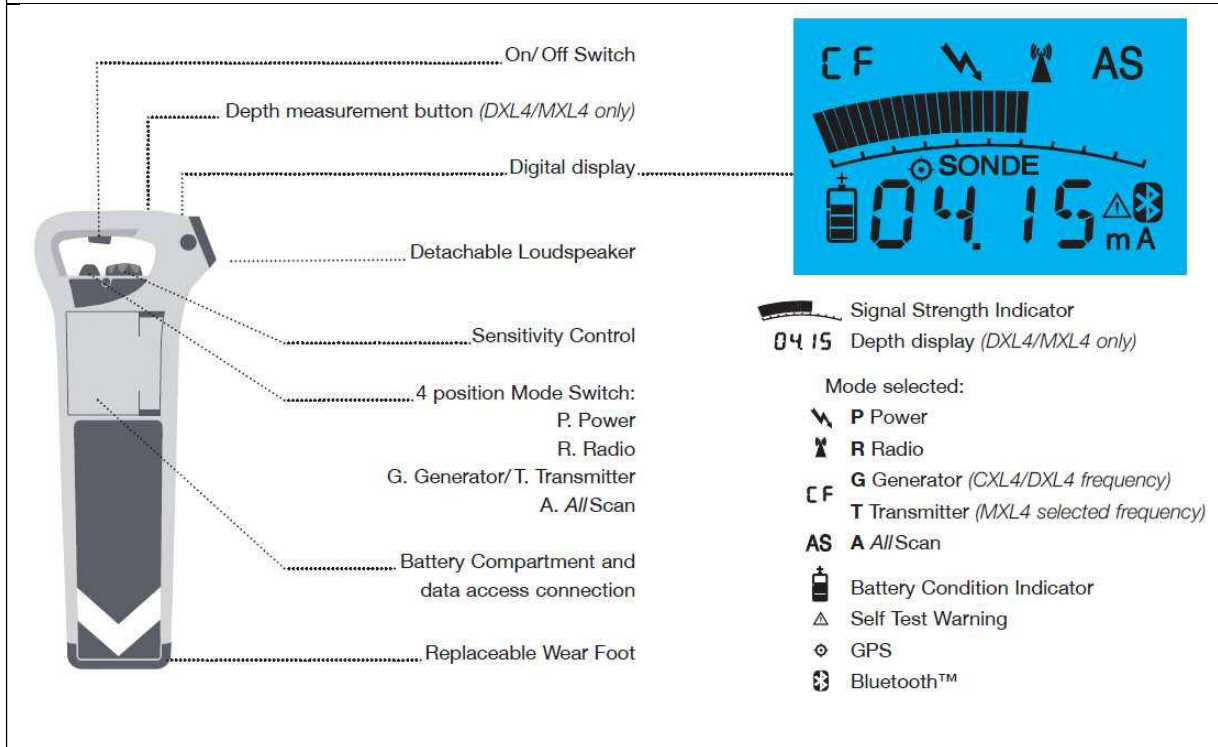
This locator can locate metallic pipes underground.

4.2 Components of the Device

The device consists of two main components; signal generator and receiver as shown above.



Signal generator and accessories of C.Scope MXL4 pipe locator



Receiver of C.Scope MXL4 pipe locator

4.3 Locator Operating Modes

A) Power mode

In Power Mode the Locator detects power signals. These power signals are present on all current carrying electricity cables although not all are detectable. Power signals may also flow along other conductors such as metal gas and water pipes, telecom cables, metal fences and railway tracks.

Not all electricity cables can be found using the Power Mode, also one of the limitations of this mode is the cables more than 3m deep may not be detectable.

Note: Generally not used for water pipes.



B) Radio mode

In Radio Mode, the Locator detects signals from various radio transmitters. These signals flow through the ground and will tend to follow the line of least resistance such as a buried metallic pipe. When this happens, the service (i.e., metallic pipe) can often be detected by using the Locator in Radio Mode.

Normally it is only possible to detect radio signals present on services up to 2 m deep.



C) All Scan mode

In All Scan Mode, the Locator detects at ALL frequencies in a wide band. Sometimes a signal that is outside of the frequency range of the other search modes (Power, Radio, and Generator/ Transmitter) will be present on a buried metallic service.

All Scan Mode is a useful additional search mode to employ as it may detect these 'extra' signals as well as the Power, Radio and Generator/ Transmitter signals.

Using the All Scan Mode is also a good way to confirm the accuracy of the marking of metal pipes and cables previously detected using the Power, Radio and Generator/ Transmitter modes of detection.

In *All Scan* mode has the following limitations:

- A strong All Scan signal present on one service may mask a weaker All Scan signal present on an adjacent service.
- It is not normally possible to determine what the service is in All Scan Mode, only its position.
- The depth of the buried service cannot be judged by the strength of the All Scan signal alone.
- Normally it is only possible to detect All Scan signals present on services up to 2 m deep.
- A short service may not have enough signal to be detected.



D) Generator/Transmission mode

This is the most commonly used method for detecting buried metallic pipes. In this mode the Locator detects conductors radiating a signal applied by the Signal Generator/ Transmitter or the signal radiated by a Sonde.

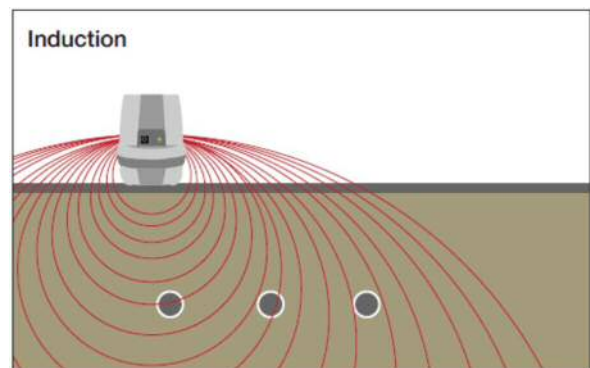
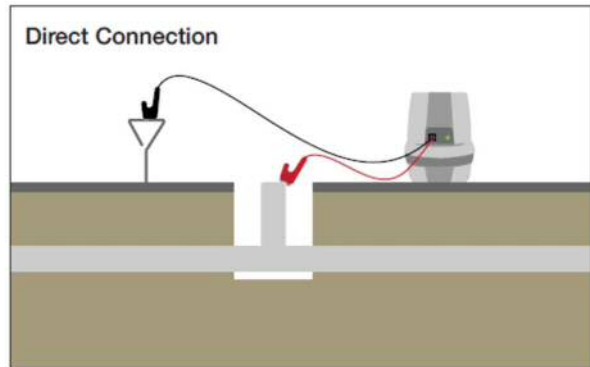
The Signal Generator/ Transmitter provides a way of sending a known signal along buried metallic services which can then be detected using the Locator. By detecting this signal it is possible to locate, trace and identify the pipes or cables that may be carrying it.



Use of the Signal Generator/ Transmitter enables most, if not all, of the remaining buried metallic services to be detected and traced.

There are TWO basic methods by which the Signal Generator/ Transmitter signal can be applied to buried services:

- Direct Connection - The Signal Generator/ Transmitter is attached directly to the service using either the Direct Connection Leads or one of the accessories available for use with the Signal Generator/ Transmitter such as the Signal Clamp or Signal Injector.
- Induction - The Signal Generator/ Transmitter can induce a signal onto a buried metallic service remotely from the surface without the need to physically connect to that service.



4.4 Using the Locator

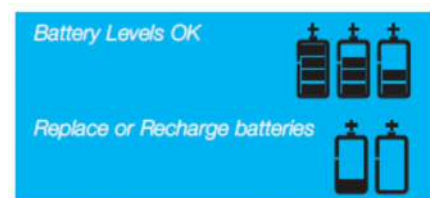
A) Batteries

The locator can be powered by either eight standard alkaline or Nickel-Metal Hydride rechargeable (NiMH) AA (LR6) size batteries.

Locator Battery Check

Switch the Locator on by pulling up on the On/Off trigger positioned on the underside of the handle. The Locator should emit a clear audible battery check tone for one second and the display should come on.

Check the battery level indicator in the bottom left hand corner of the display. If there is only one segment or no segments of the indicator filled in then the batteries will need to be replaced or recharged before locating work can begin.



Changing Locator Batteries

- Push the two clips back to release the Battery Compartment door.
- Remove ALL EIGHT used batteries and replace with new or recharged ones.
- Be careful to insert the new batteries the correct way round in the holder.

- Replace the holder in the Battery Compartment making sure that the two terminals on the holder make contact with the two terminals within the Battery Compartment.
- Close the Battery Compartment door securely.

B) Holding the locator



When in use the Locator should always be held upright. Never swing the Locator such that it moves away from the vertical. The Locator will emit an audio warning if the Locator is being swung excessively.

Your middle or little finger should be used to squeeze, and hold on, the On/Off trigger. Your index finger will then be free to adjust the Sensitivity Control.

C) Locating

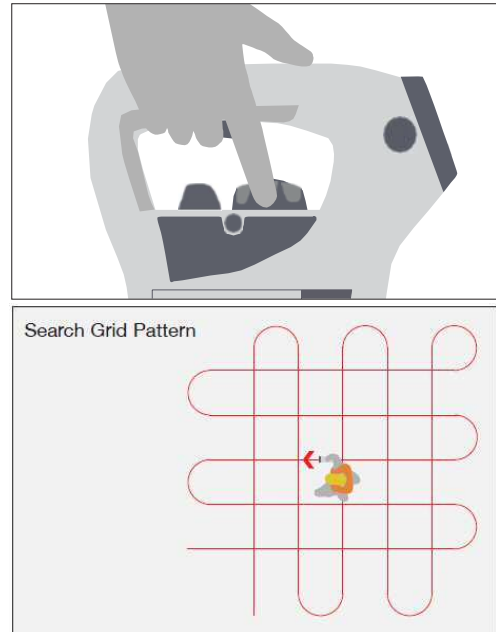
There are three stages to the locating process; searching, pinpointing and tracing.

Searching: The searching is done by the following steps:

1. Turn the Mode Switch to the appropriate mode.
2. Hold in the On/Off trigger. The Locator should emit the audible battery test tone and the digital display should come on.

Check the battery level indicator to confirm the batteries are usable.

3. Rotate the Sensitivity Control fully clockwise to its maximum setting as indicated by the arrow on the control.
4. Carry out the search using a grid pattern as shown in the diagram. Walk slowly and keep the Locator upright at all times and stationary by your side.
5. As you approach the area in which there is a signal the Locator will emit an audible response and show a visual response on the display.
6. Keep walking until the audible and visual responses disappear.

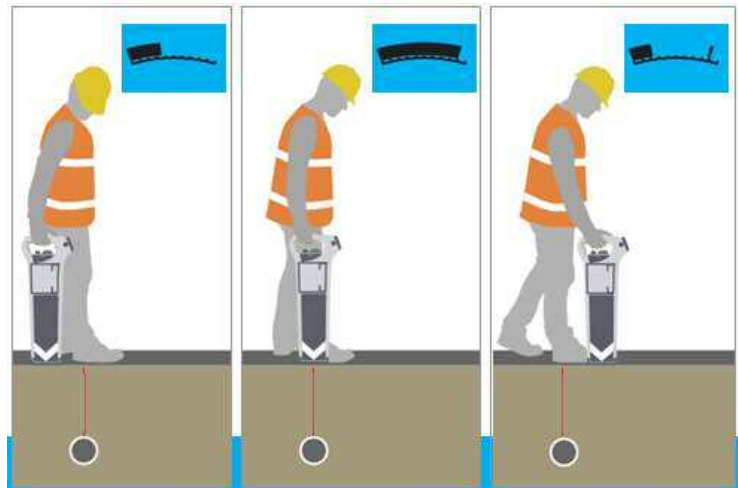


Pinpointing: Having found a signal, the next step is to pinpoint the source. The closer the Locator is to the signal source the stronger the response.

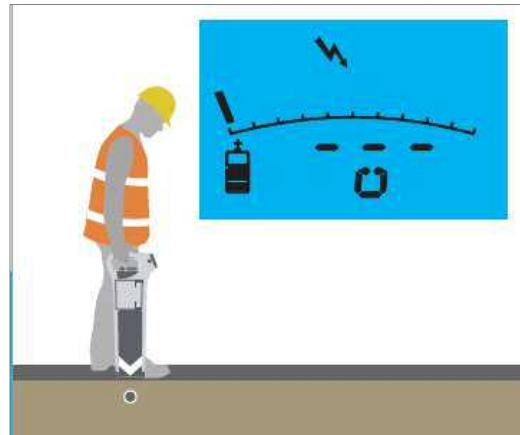
To Pinpoint a Signal

1. Keeping the Locator vertical, walk through the area of the signal response. If the visual response goes up off the scale then stop and reduce the sensitivity of the Locator slightly before continuing.

2. The width of the signal response will shrink as the sensitivity is reduced. Once it is reduced enough then a clear peak response will be seen on the display as the Locator traverses the service. The Locator is positioned directly above the buried service when the display is at its highest (peak) reading.



3. Carefully rotate the Locator over the peak reading until the visual response falls to a minimum. The Locator will now be roughly IN LINE with the direction of the buried service.

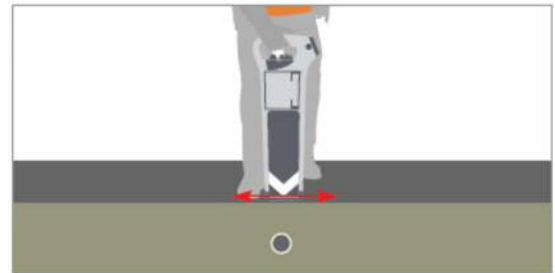


4. Mark the position of the buried service.

Note: The Alarm Zone™ warning will be triggered if the Locator measures a Power, Generator/Transmitter or All Scan signal as being less than 0.3 m (12 ") away. The Locator will give an audible alert and the Alarm Zone™ warning symbol will flash on the display of the Locator.

Tracing: Having pinpointed a service it should now be possible to trace its route.

1. Carefully follow the direction of the signal holding the Locator at right angles to the line of the signal. It is necessary to constantly 'slice' the Locator from side to side in order to be sure of still being over the peak signal response.

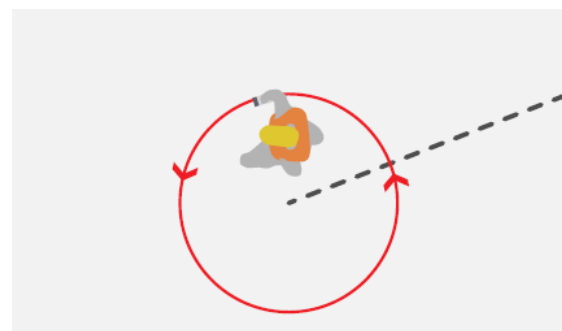


2. Stop and mark the position of the signal at regular intervals. As more marks are recorded the precise direction of the service will become more apparent.

Caution: Never rush the tracing process. Small and unexpected changes in the service's route will be missed if care is not taken to follow the signal's path every step of the way.

Lost Signals:

This can be because of a curve, or bend in the route, change in depth of the service, a T connection or the end of the service.



Finding Lost Signals:

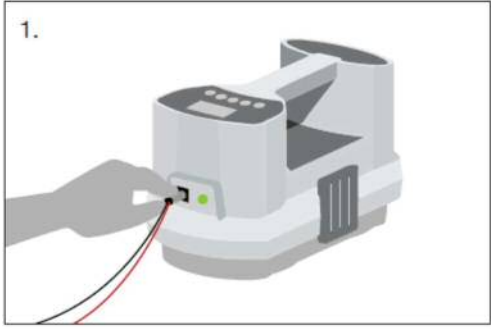
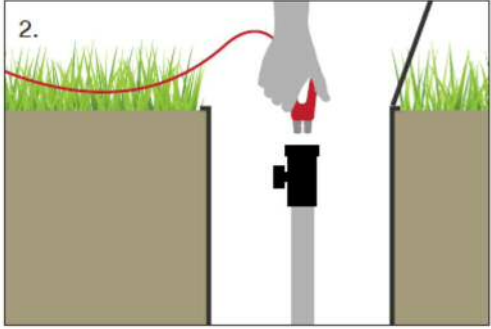
1. Walk in a circle at least 1 m (3'3") around the point where the signal was lost. This should locate the service if the signal has been lost because of a curve or bend in the route of the service, or a T connection into another service.

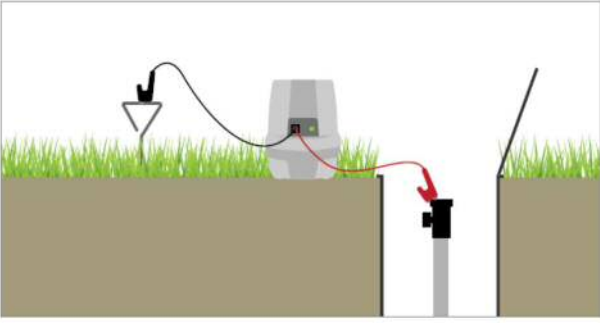
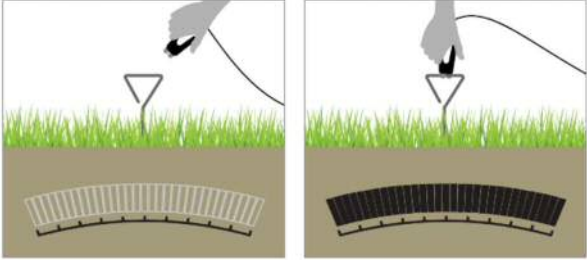
2. If you find nothing then increase the sensitivity and repeat the circle. This should find the service if it has continued but at a greater depth.

4.5 Procedure of Direct Connection Method

The Direct Connection Leads and Earth Stake that are supplied with the Signal Generator/ Transmitter are used to apply a signal to any metal pipe at a suitable access point such as a valve, hydrant point, stop cock or exposed pipe length.

The steps are as follows:

Steps	Illustration
<p>1. Plug the Direct Connection Leads into the Signal Generator/ Transmitter Connection Socket.</p>	
<p>2. Attach the red lead to the pipe at your point of access using the Crocodile Clip. Ensure that you have a secure and clean grip on the pipe with the Crocodile Clip.</p>	
<p>3. Turn the Signal Generator/ Transmitter on. <i>Select frequency to be used; 512Hz, 640Hz, 8kHz, 33kHz, CF, 131kHz (HF).</i></p>	
<p>4. Place the Earth Stake in the ground.</p> <p>The ideal position for the Earth Stake is at right angles to the assumed line of the pipe and the full length of the Direct Connection Leads away from the pipe access point.</p>	

Steps	Illustration
<p>5. Connect the black Earth Lead to the Earth Stake (or an alternative earth point). If your earth point is too far away from the pipe access point for the black Earth Lead to reach then use the yellow 10 meter Auxiliary Earth Lead instead.</p>	
<p>6. As the Earth Lead is connected to the Earth Stake the audible signal from the Signal Generator/ Transmitter should change in pitch. The lower the pitch, the better the signal will be on the metal pipe.</p> <p><i>There will be a visual representation of the quality of the connection in addition to the audible pitch change. The greater the response on the display, the better the signal will be on the pipe.</i></p> <p><i>If there is no change in pitch it may be that some dirt, rust or paint on the pipe is preventing from making a good contact with the pipe. Alternatively, it may be that your earth point is at fault. Change the position of the Earth Stake or use an alternative earth point.</i></p>	
<p>7. Adjust the Output Power Level to suit.</p>	

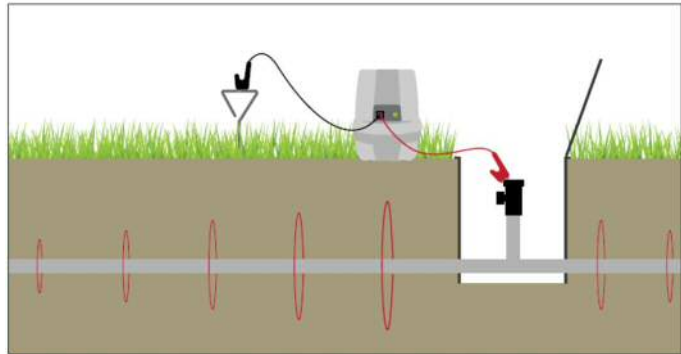
Notes:

- If it is not possible to use the Earth Stake, use a nearby metal fence post, manhole cover or gully cover.
- If the Earth Stake cannot be inserted into the ground, then simply laying it flat on the ground can sometimes provide a successful earth connection (especially if the ground is wet).

- DO NOT use something that may have another metallic service attached to it, such as a metal street lighting column.
- If the Signal Generator/ Transmitter pitch does not change then there is no signal being transferred onto the service.

Tracing the Direct Connected Signal:

The tracing technique used to follow the Signal Generator/ Transmitter signal when applied by a direct connection method (Direct Connection Leads, Signal Clamp or Signal Injector) is almost exactly the same as the normal tracing technique used on Power, Radio or All Scan Modes, except the signal the Locator is detecting will get weaker the further away from the Signal Generator/ Transmitter that you go. It will be necessary to regularly increase the Locator Sensitivity Control to compensate for this.



Note: For MXT4, having traced the signal for a short distance it may be worthwhile switching the MXT4 Transmitter to alternative frequencies to see if they give a stronger response. Choose the frequency that gives the strongest response and continue with the trace.

4.6 Procedure of Induction Method

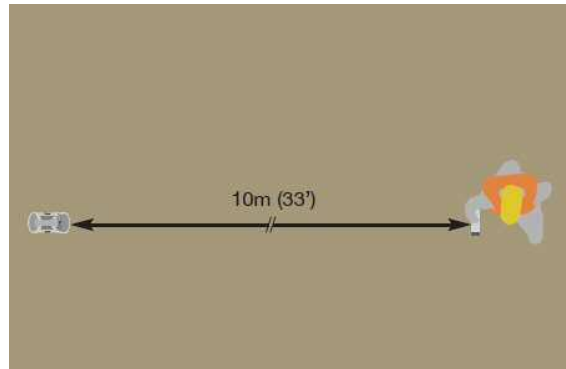
This is the standard method for inducing signals onto buried metallic services. It produces a strong signal directly below the Signal Generator/Transmitter but the signal strength drops off quite quickly either side of the Signal Generator/ Transmitter. Follow the following procedure:

1. Check that there are no accessories plugged into the Connection Socket. The Signal Generator/ Transmitter switches automatically to Induction Mode when the socket is unused.
2. Place the Signal Generator/ Transmitter upright on the ground where you suspect the services are buried. Make sure the Signal Generator/Transmitter is in line with the expected route of these services.
3. Turn the Signal Generator/ Transmitter on and check that the batteries are OK.

For MXT4 only, select 8kHz, 33kHz, CF or 131kHz (HF). It is **not possible to induce a 512Hz or 640Hz signal onto buried services.**

4. The signal will be radiated into the ground immediately below and for approximately 3 m (10') either side of the Signal Generator/ Transmitter.

5. Move **AT LEAST 10 m** (33') away from the Signal Generator/Transmitter position with your Locator. This is to avoid the Locator picking up the airborne signal rather than the signal induced onto the buried service.



6. Stand so that you are roughly in line with the end of the Signal Generator/ Transmitter and hold the Locator so that the side of the Locator is facing towards the Signal Generator/ Transmitter.

7. Select Generator / Transmitter Mode.

The MXL4 Locator must be set to the same frequency as the MXT4 Transmitter.

8. Adjust the sensitivity so that the Locator shows a minimal visual response and emits a minimal audible response.

9. Walk in a straight line across the end line of the Signal Generator / Transmitter. When a signal is detected 'pinpoint' that signal as shown in the 'Using the Locator' section.

If no signal is found move the Signal Generator / Transmitter 5 m (16) and try again. Continue this procedure moving the Signal Generator / Transmitter in 5 m (16) steps, following a grid pattern, until a signal can be found.

10. It may be possible to increase the strength of the induced signal on the buried service by improving the positioning of the Signal Generator / Transmitter. Once the buried service has been pinpointed, moving the position of the Signal Generator / Transmitter from side to side will give an increase or decrease in the Locator response.

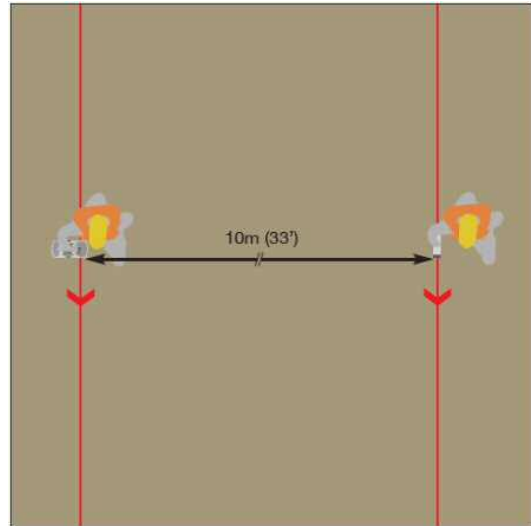
Remember, the closer the Signal Generator / Transmitter is to the position of the buried service the stronger the signal will be on that service.

11. If a large area needs to be searched for buried services then an '**Inductive Sweep**' could be used. It is an ideal method for detecting the position of buried services as they cross the boundary of a large site.

Procedure:

An Inductive Sweep requires two people; one to operate the Locator and another to position the Signal Generator / Transmitter.

a) Stand about 10 m away from each other as shown in the photo. The first person holds the Signal Generator / Transmitter, switched to its lowest Output Power Level, close to the ground and 'end on' (see diagram) whilst the other holds the Locator switched to Generator / Transmitter Mode.



b) Adjust the sensitivity so that the Locator shows a minimal visual response and emits a minimal audible response.

c) Then together, slowly walk across the site, staying the same distance apart and being careful to keep in line with each other. When the Signal Generator / Transmitter gets close to a buried metallic service the signal will be induced onto it and you should see this in the increased response on the Locator.

d) Immediately tell your colleague to stop and place the Signal Generator / Transmitter on the ground at that point. Now you can pinpoint the service and trace out its route. Continue the sweep across the length and width of search area.

4.7 Depth measurement

Depth cannot be measured on the Power, Radio or All Scan Modes. For the MXL4 Locator, depth measurements can be taken from a 512Hz, 640Hz, 8kHz, 33kHz, CF or HF (131kHz) signal.

WARNING! The depth indication MUST NOT be used to decide if mechanical digging over the buried service is appropriate.

Procedure to measure the depth:

1. The Signal Generator / Transmitter must be set to 'Continuous' signal output, not 'Pulsed' output.



2. It is vital that the signal being measured is a good quality signal. This is best achieved by using the Signal Generator / Transmitter in Connected Mode rather than Induced Mode.

3. Set the Locator to Generator / Transmitter Mode and pinpoint the position of the buried service. Make sure the Locator is directly over, and at right angles to the route of the buried service. Rest the Locator on the ground with the body vertical.

Note: If the pinpointing of the service is inaccurate then the Depth Measurement will be inaccurate.

4. Press and hold down the depth button. The depth will be shown on the display.

5. The depth can be verified by lifting up the Locator whilst keeping the depth button depressed. The depth indication should increase by the same amount that the Locator has been raised.



MXL4 User's Manual from the equipment manufacturer is attached as Attachment 2. It covers all aspects of the equipment including potential malfunction and troubleshooting.

CHAPTER 5. PORTABLE ULTRASONIC FLOWMETER

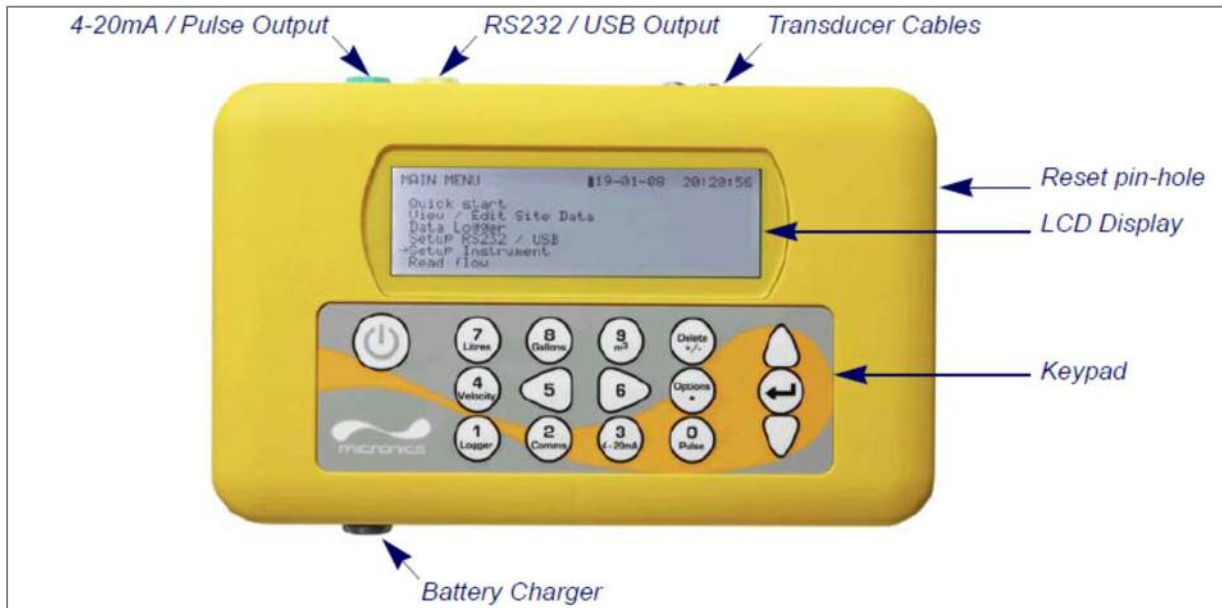
The type of ultrasonic flowmeter procured by the Project and being used in Jenin WWD is Micronics Portaflow 330. Although the flowmeter is not a direct equipment for leak detection, it helps indirectly in many ways to identify the area of leakage by measuring and monitoring water flow into an area. This part of the manual briefly describes about the functions and use of this flowmeter.

5.1 Hardware Components and Measuring Principle

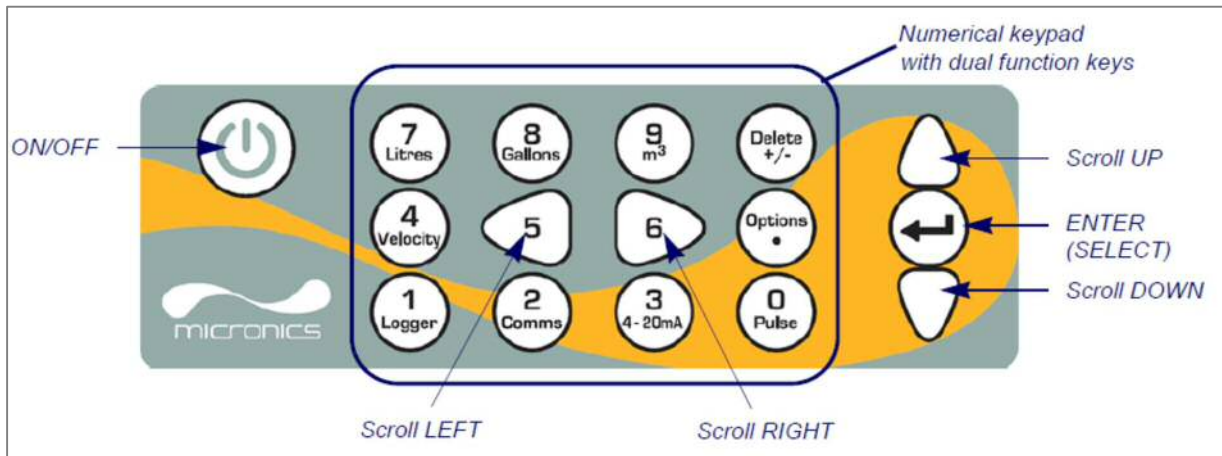
The is a clamp-on type flowmeter which can measure flow rate of water in a pipe without needing to cut it or insert any mechanical parts through the pipe wall. Standard components of the flowmeter are as shown below.



Connectors and other details of the equipment are shown below.



Keypad details are shown below.

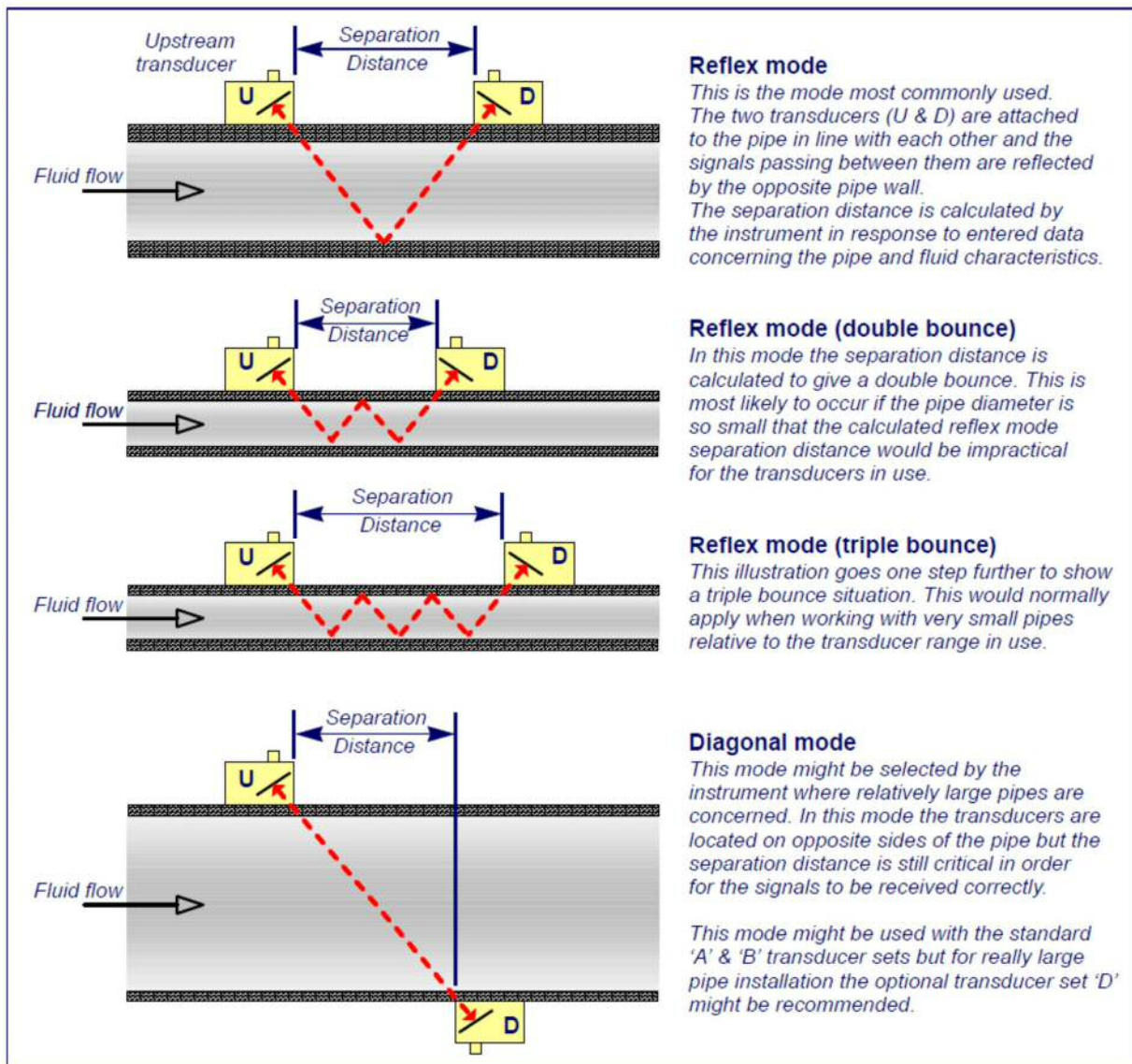


Measuring principle

When ultrasound is transmitted through a liquid the speed at which the sound travels through the liquid is accelerated slightly if it is transmitted in the same direction as the liquid flow and decelerated slightly if transmitted against it. The difference in time taken by the sound to travel the same distance but in opposite directions is therefore directly proportional to the flow velocity of the liquid.

The Portaflow 330 system employs two ultrasonic transducers attached to the pipe carrying the liquid and compares the time taken to transmit an ultrasound signal in each direction. If the sound characteristics of the fluid are known, the Portaflow microprocessor can use the results of the transit time calculations to compute the fluid flow velocity. Once the flow velocity is known the volumetric flow can be easily calculated for a given pipe diameter.

The Portaflow system can be set up to operate in one of four modes determined mainly by the pipe diameter and the type of transducer set in use. The diagram below illustrates the importance of applying the correct separation distance between the transducers to obtain the strongest signal. Various installation position (operating modes) are shown below.

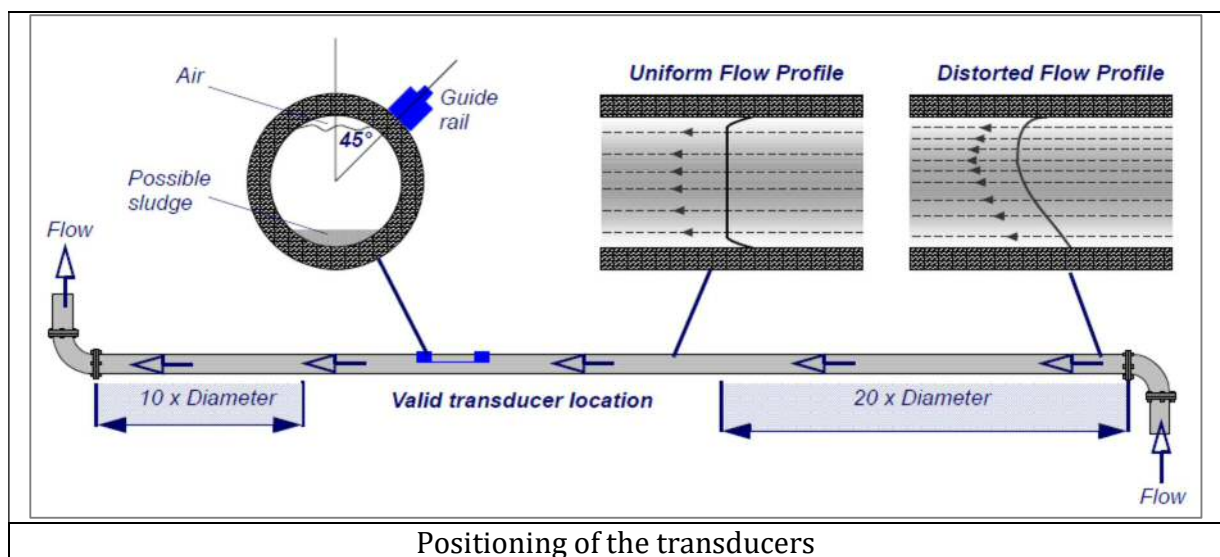


5.2 Installation

A) Transducer positioning

The proper positioning of transducer is shown below.

- Upstream and downstream straight pipe sections requirement should be maintained. Near the obstructions or bends the flow profile gets distorted. This affects the measurement accuracy. If any location of pipe makes it difficult to maintain the requirement of U/S, D/S straight pipe, another location should be found.
- The transducer should be placed not exactly at the top but at about 45° angle as shown below. This is to avoid any potential air bubbles which cause problem in measurement.



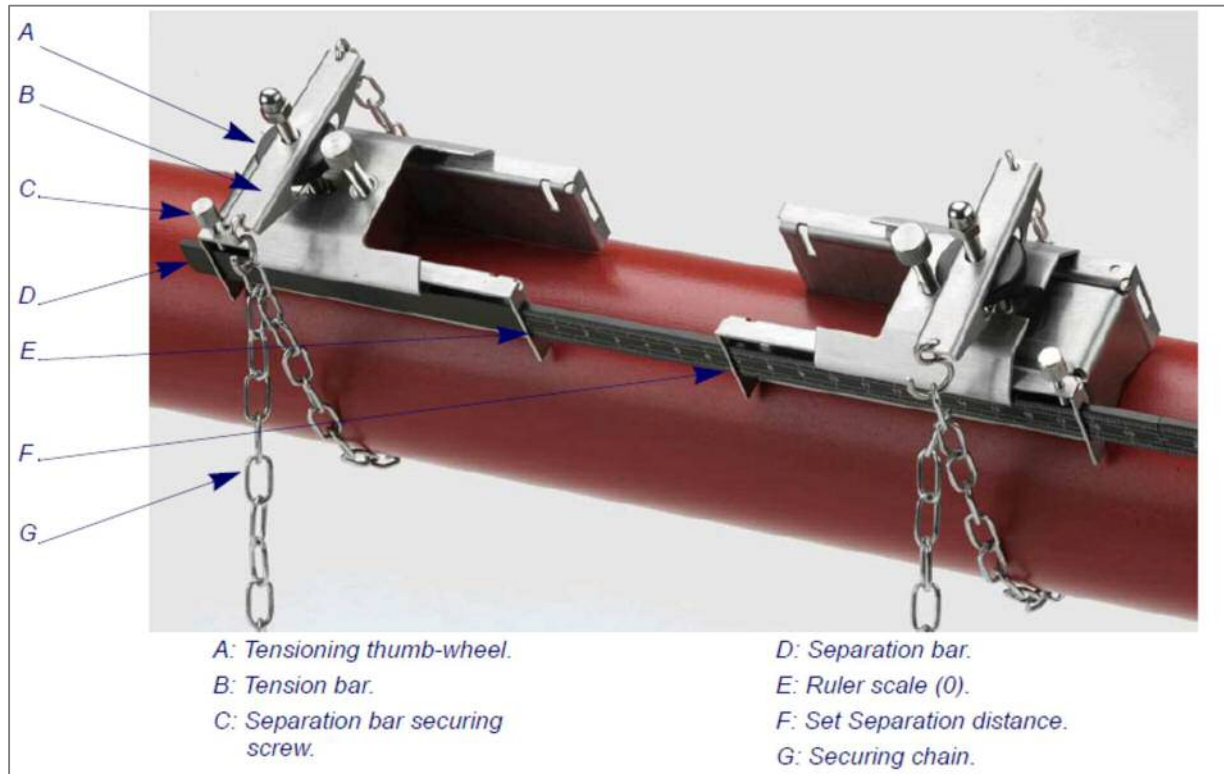
B) Preparation of pipe surface

External coating of the pipe surface needs to be removed and cleaned.



C) Attaching the transducers

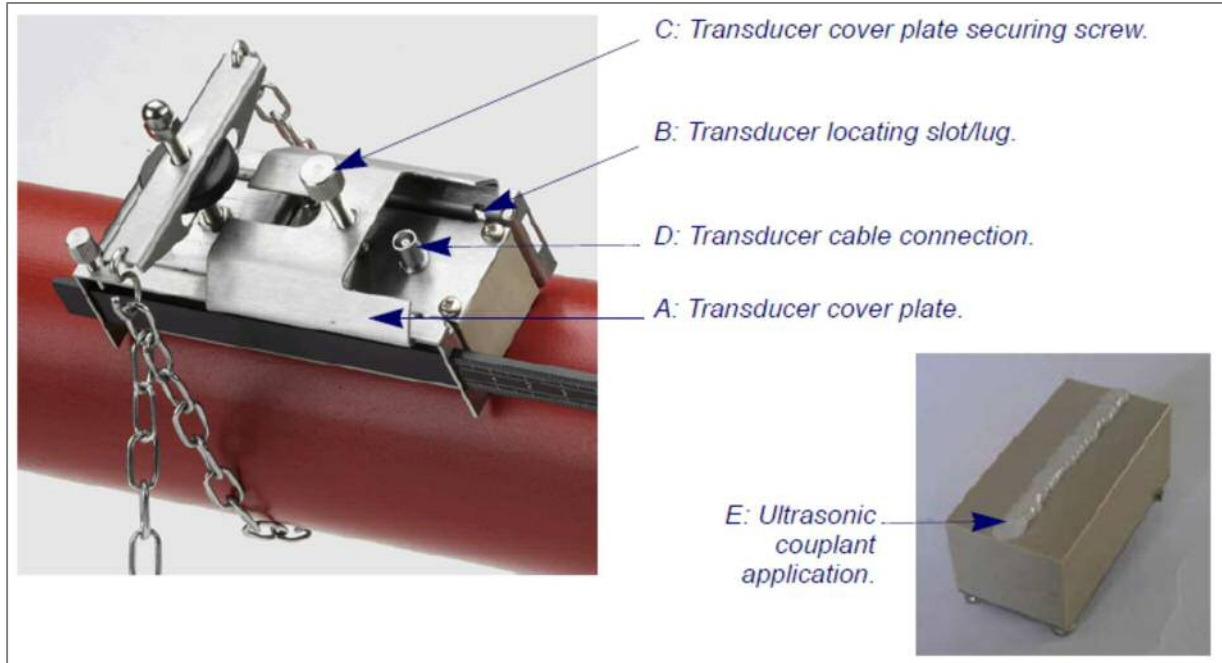
See figures below.



Attaching the transducers after removing the external coating of pipe



Fitting the transducers



Attaching the sensors



Starting to take reading

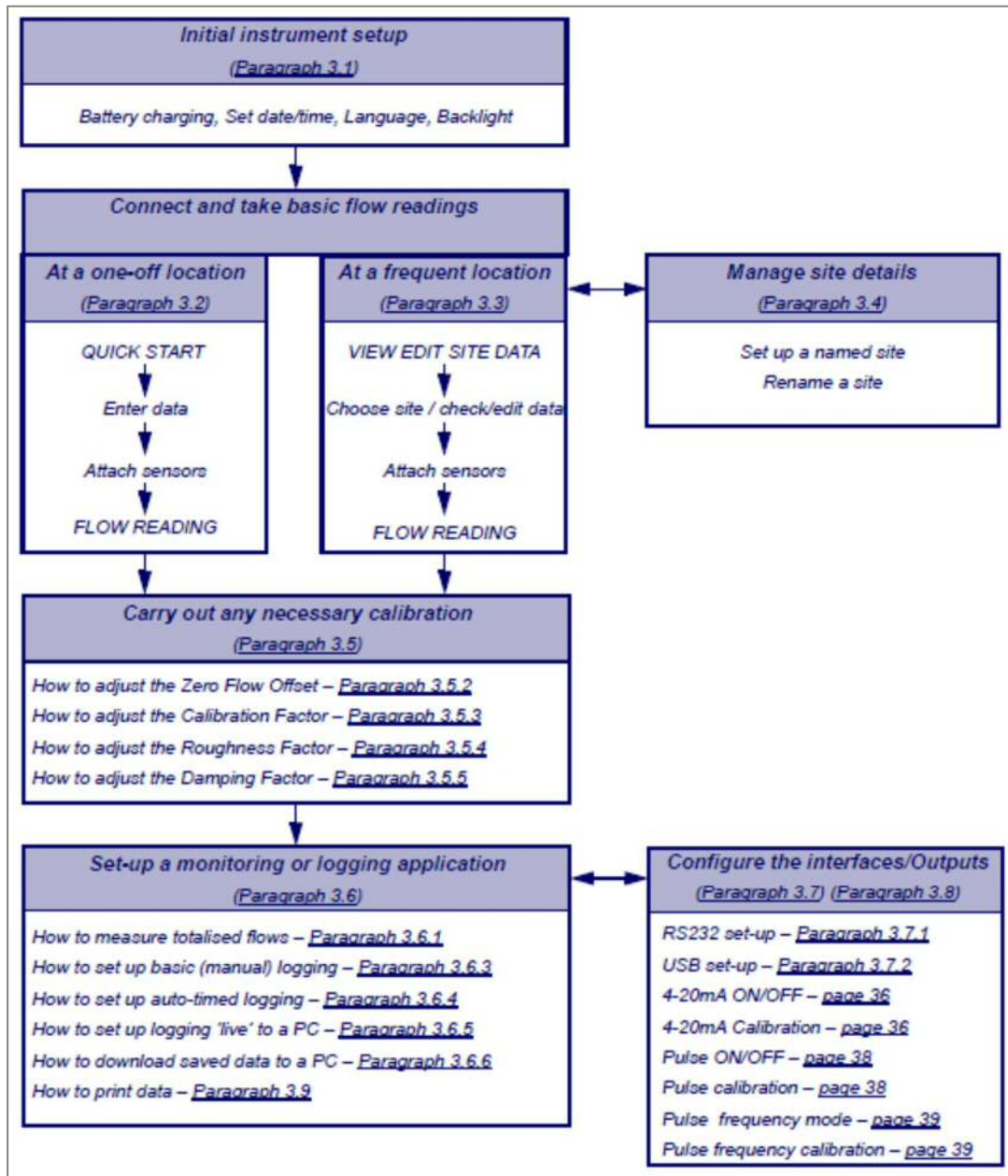
D) Deciding separation space of transducers

In order to decide the separation space of transducers pipe external diameter, wall thickness of pipe material, and thickness of internal coating are required. For pipes generally used in Palestine, these parameters are shown in the following Table.

Black Steel Pipe (BSP)			
Diameter (inch)	Wall Thickness (mm)	Type of Lining	Lining Thickness (mm)
2	3.65	mortar	3.0
3	3.96	mortar	4.0
4	3.96	mortar	6.0
6	3.96	mortar	6.0
8	3.96	mortar	6.0
10	3.96	mortar	6.0
12	3.96	mortar	8.0
14	3.96	mortar	8.0
16	3.96	mortar	8.0
Galvanized Iron Pipe (GIP)			
Diameter (inch)	Wall Thickness (mm)	Type of Lining	Lining Thickness (mm)
2	3.65	X	X
3	3.96		
4	3.96		
6	3.96		
8	3.96		
10	3.96		
12	3.96		
14	3.96		
16	3.96		

5.3 Operating Procedure

The two main steps in using the ultrasonic flowmeter are (i) Initial instrument setup, and (ii) Connecting and taking basic flow readings. With these steps one can get flow values. There are other steps to increase measurement accuracy, manage site details and log data. These are graphically shown below with references to the flowmeter’s operational manual provided by the manufacturer.



The most important steps are Initial instrument setup and Connecting and taking basic flow reading. Other steps will then be gradually mastered.

All these are explained in detail in the user’s manual of the instrument.

PF330’s User Manual from the equipment manufacturer is attached as Attachment 3. It covers all aspects of the equipment including potential malfunction and troubleshooting.

PORTAFLOW 330

Portable Ultrasonic Flowmeter User Manual



CHAPTER 6. PRESSURE LOGGER

6.1 Introduction

Water pressure values at different parts of water network can be used to understand the overall health of distribution network. Unexpected variation of pressure in a pipe section indicates pipe blockage, pipe break (leak), or unknown branches in between the pressure measurement locations. Pressure measurement is also essential to check customer complaints related to low pressure.

For the above-mentioned types of pressure measurement, the project procured Keller (Leo 5) pressure loggers. These loggers have internal pressure transducers, so they can measure pressure and store the data in memory. These loggers have been used extensively to measure pressure at various parts of Jenin and thus Jenin WWD staff are familiar with their operation.



They are compact and robust. They can be programmed by connecting with computers to start logging immediately or from a certain hour afterwards. Similarly, they can be programmed to stop logging at a given time or continue until removed and stopped. The recorded measurement data can be presented graphically and exported.

Two other types of pressure measurement instruments are also used in the project; simple pressure gauges and multi-channel (pressure and flow) data loggers. Detail usage of these

instruments have been given in a separate manual. Thus here only the usage of Leo 5 has been outlined, that too in brief.

6.2 Steps in Using the Pressure Logger

There are three principal steps in use of this pressure logger; programming, installing at site, and downloading and analyzing data. These are briefly explained below. For detail, please refer to another manual entitled '**Manual on Pressure Measurement Devices**' (Attachment 6) prepared by the project.

Programming

- Download and install the software. This can be downloaded from Keller's website,
- Connect the logger to the computer and provide required parameters. Measurement interval and starting and stopping time are the two most important parameters.
- Upon completion, close the program and disconnect the logger.



Installation at site

- Decide where to install
- Prepare a tapping or tee
- Connect the logger and by checking display confirm the logger is working

Downloading and analyzing data

- When the desired measurement period is completed, disconnect the logger and bring to office
- Connect with the computer and download the data using the logger program
- Export and analyze the chart/data

Precaution:

 <p>Ventilation film DO NOT touch/press it</p>	
<p>Do not touch/press the ventilation film</p>	<p>The pressure connection is screwed in with the aid of a wrench on the hexagon of the sensor. Please DO NOT use the LEO 5 housing for tightening!</p>

Example of installations to measure pressure at customer connections in Jenin are shown below.







CHAPTER 7. WHEN THESE DEVICES CAN BE USED




7.1 Introduction

Some of the devices mentioned in the preceding sections are more effective than others in certain circumstances. Some devices such as pressure and flow measurement devices indicate a leakage problem indirectly. Sometimes it is necessary to use more than one devices in conjunction. Thus, a NRW expert needs to be aware when each device can be used to get best result.

7.2 Guidance for Selecting Devices for Particular Circumstances

The following table gives an idea when and how to prioritize using each mentioned device:

Device name	Device photo	When to use it	Related devices that can be used together
Listening Stick		<ul style="list-style-type: none"> • If the area of leakage is known and need to shorten the searching area • If the area of leakage is not identified, preliminary screening (area wise) by listening on exposed fittings such as customer meters, service connections, valves, fire hydrants, and so on 	<ul style="list-style-type: none"> • UFM can be used at first in the step test or stop cock test in order to predict which branch includes potential leaks
Ground Microphone		<ul style="list-style-type: none"> • If the area of the leakage is known and needs to pinpoint its exact location. 	<ul style="list-style-type: none"> • Listening stick site survey may precede the GM use to shorten the length of investigation by GM

Device name	Device photo	When to use it	Related devices that can be used together
Pipe Locator		<ul style="list-style-type: none"> • Before the leakage detection activities by other devices, it is needed to identify accurately the pipeline locations at first • To identify where is the pipeline to install UFM, before the excavation to expose the pipe 	<ul style="list-style-type: none"> • Needed before using the ground microphone
Portable Ultrasonic flowmeter		<ul style="list-style-type: none"> • For doing the step test or stop cock test in order to identify the branch or area that contains potential leaks or illegal uses. This is before using the other leak detection devices 	<ul style="list-style-type: none"> • Listening stick to be used during the stop cock test, and after identifying the most potential leakage area during the step test
Pressure logger		<ul style="list-style-type: none"> • When water pressure in nearby areas connected with a same distribution pipeline seems very much different 	<ul style="list-style-type: none"> • Listening stick and UFM

End of the Manual!

List of Attachment

Attachment 1. Ground microphone (Aquaphon A100) user manual

Attachment 2. Pipe and cable locator (MXL4) manual

Attachment 3. Portable ultrasonic flowmeter (PF330) user manual

Attachment 4. Pressure logger (LEO5) manual

Attachment 5. Dual channel logger (i2O) manual

Attachment 6. Manual of pressure measuring devices

Attachment 1

**Ground microphone (Aquaphon
A100) user manual**

AQUAPHON® A 100

Operating Instructions




SEWERIN
Technologies for leak detection

Measurable success by Sewerin equipment

Congratulations.

You have chosen a quality instrument manufactured by Hermann Sewerin GmbH.

Our equipment will provide you with the highest standards of performance, safety and efficiency. They correspond with the national and international guide-lines.

Please read and understand the following operating instructions before using the equipment; they will help you to use the instrument quickly and competently. If you have any queries we are available to offer advice and assistance at any time.

Yours

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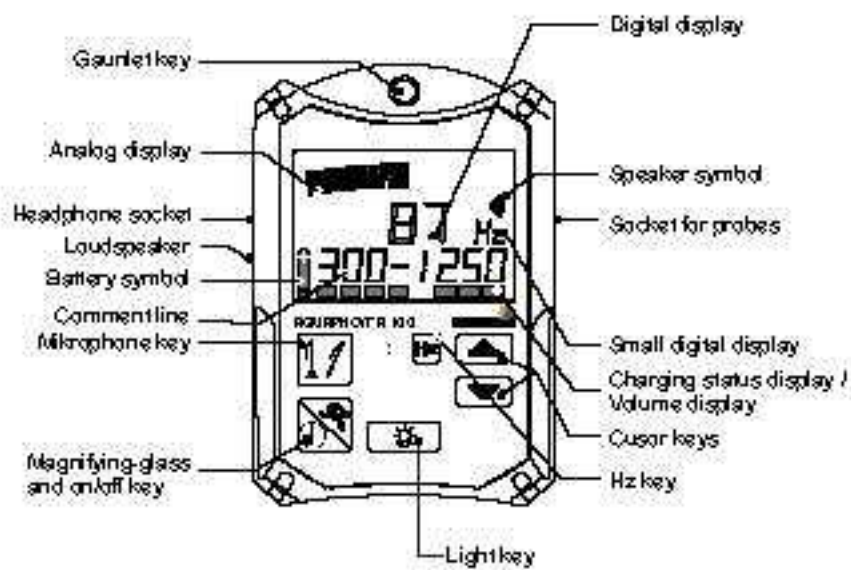
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Illustration AQUAPHONA 100



Operating Instructions

AQUAPHON® A 100

20.04.2016 a - V8 X - 104194 - en

Symbol explanation



CAUTION!

This symbol warns of dangers that may threaten the safety of the user or may damage or destroy the product.



Note:

This symbol flags information and hints extending beyond the actual operation of the product.



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1.3	General notes.....2
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1 General

1.1 Warranty

Hermann Sewerin GmbH bears no liability for damage attributable to non-compliance with these instructions.

The terms of warranty and liability of the conditions of sale and delivery of Hermann Sewerin GmbH are not extended by the above.

- This product may only be used after the operating instructions have been read and understood.
- This product was developed for qualified skilled personnel in public utility companies. The device must only be commissioned after respective introduction.
- This product may only be used for its designated purpose.
- This product is destined for industrial and commercial applications.
- Repair work may only be carried out by appropriately trained persons.
- Changes and modifications to the product may only be carried out with the consent of Hermann Sewerin GmbH. Unauthorised modifications to the product render the warranty of the producer null and void.
- Only accessories from Hermann Sewerin GmbH may be used with this product
- Only replacement parts approved by Hermann Sewerin GmbH must be used for repairs.
- We reserve the right to make technical modifications in the interests of further development.

Please comply with general safety rules in addition to these instructions!

1 General

1.2 Intended use

The A 100 is a instrument for electro-acoustic water leak detection and acoustic pipeline location



Note:

This operating instructions describes the functions of software version 8.X. Future changes are subject to modification!

1.3 General notes

- In order to ensure the correct functioning of the devices, the following requirements must be complied with:
 - Devices must not be dipped or immersed.
 - Display and keyboard must not be scratched.
 - Devices must not be dropped.
 - Devices must not be used as supports.
- The allowed operating temperature range is $-10\text{ °C} - +50\text{ °C}$.
- The allowed storage temperature is $-25\text{ °C} - +70\text{ °C}$.
- If additional devices are used (e.g. generators), the corresponding operating manuals must be complied with.

2 Function description

2.1 Water leak detection

The A 100 is used in combination with various microphones (listed in the „Accessories“ section) for the electro-acoustic detection of water-leaks.

When a pressurised pipeline develops a leak, water flows through it into the surrounding soil at high speed.

Consequence:

The pipeline material vibrates at the exit point. This vibration is transmitted by the pipe, with the result that it can be picked up even at remote contactpoints (valves and the like). This structure-borne noise is rendered audible by the A 100.

The water jet- and the pipe, in the vicinity of the leak - also induce vibration in the soil. This is transmitted to the surface, where it can be picked up as ground-borne noise.

Even with electro-acoustic leak detection the human ear retains its importance. Suitable practice enables noises of different types, and tones to be compared, and leak noise distinguished from extraneous, unrelated noise.

2.2 Acoustic pipeline location

Plastic lines cannot be located by the classical electromagnetic method because they do not conduct electricity.

The acoustic method of pipeline location uses a different principle: the lines transmit mechanical vibration better than the surrounding earth. If suitable vibrations are applied to the line, they are transmitted along its length and through the earth to its surface, and can then be located there with a ground microphone and receiver with headsets according to the water leak detection principle. As with water leak detection, the line is in the place where the greatest intensity is found. Fibrous-cement and metallic pipes can also be located in this way.

If you wish to detect the lines acoustically, follow the operating instructions for the vibration emitter (e.g. COMBIPHON). Proceed as with for water leak detection. The A 100 also offers an additional mode to assist in detecting lines (see section 4.2.1).

3 Use

3.1 Switching on and off



- Plug a probe into the appropriate input.
Probe connection: input 1
- A brief signal tone sounds.
- The software version appears in the display.
- The charge status of the rechargeable batteries appears in the display.
- The type of probe plugged in is automatically determined.
- The probe type briefly appears in the display. If the probe type is not automatically identified it can be selected manually (see section 3.1.1).
- If a microphone has been plugged in, the bandpass currently set for the frequency filter is briefly displayed.

- The layout of the display depends on the used probe. The measurement process may be started.
- To switch off, unplug the probe from the input.

3.1.1 Manual probe selection

If the probe is not automatically identified (if it is an old model, for example), it can be selected manually:



- Hold down the microphone key.
- Plug in the probe. The „>” symbol appears on the left of the bottom text line and the name of the probe that can be selected, e.g. „MQ1” in the middle.
- Pressing the cursor keys switches between possible probes.
- Pressing the magnifying-glass key displays the selected probe.



3.2 Adjusting the display contrast

The display contrast can be adjusted as follows:



- Hold down the lightkey.
- Press the cursor-down key to reduce the contrast.
- Press the cursor-up key to increase the contrast.

3 Use

3.3 Charging equipment



When fully charged the instruments have a maximum operating time of approx. 12 hours.

To charge an instrument you need the docking station HS 1,2 A (see fig.), which can be used either in the workshop or in the emergency vehicle.

The docking station has the following sockets on its side:

- AC/DC adapter M4, 100 – 240 V~
- Vehicle cable M4 for 12 V

3.4 Charging



Note:
Charging the accumulator only within temperature range 0 – 45 °C.



- Switch off the instrument and plug it into the docking station. The following (or similar) appears in the display:
- The instrument now has 5 operating hours (= 5 bars) left. It will take another 3 hours to be fully charged.

The actual operating time depends on the accumulators' condition (age ...) and operation (light, volume ...) charging time takes max. 4 hours.

- When it is fully charged all the bars appear and the number display disappears.



- You can leave the instrument in the docking station until you need it again.

If you have a case for your A 100, it can be charged inside.

- Connect cable to the docking station inside the case.
- Connect the plug-in AC/DC adapter M4 or vehicle cable M4 to socket 2.



3.4.1 Self-discharge

If the instrument is not placed in the docking station HS 1,2 A when switched off the NiMH-accumulator will self-discharge, which is considered when displaying the remaining operating time.

After no more than 30 days the instrument will indicate zero operating hours, and it must be recharged.

3.5 Connecting the headphones



A 100 are fitted with a speaker (1).

Such produces the confirmation and alarm signals. There is, furthermore, a specific tone for pipeline location.

During water leak detection no leak noise is emitted over the speaker; headphones must be used. Switching from speakers to headphones:



- Plug the headphones jack-plug into socket 2.

The speaker is switched off automatically; sound is output to the headphones.

- When the headphones are unplugged the sound is once more output to the speaker.

4 Water leak detection

4.1 Displays

4.1.1 Analog display



The analog display indicates the current reading.

4.1.2 Digital display



The digital display indicates the smallest value measured during a single measurement.

In the „MAX“ mode, the digital display always shows the greatest measured value. In „MAX“ mode you can switch by holding the micro key for 3 seconds (only with microphones with cable connection, not with radio microphones).

4.1.3 Small digital display



For the purposes of comparison the small digital display always indicates the precedent value measured.

4 Water leak detection

4.1.4 Speaker symbol

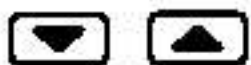


The speaker symbol indicates that the A 100 headphones are activated.

4.1.5 Volume display



The volume display indicates the volume set. If the bar on the extreme left is shown in reverse video, the volume is low; if the bar on the extreme right is shown in reverse video, the volume is maximum.



The volume can be adjusted with the cursor keys.

4.1.6 Battery symbol



The battery symbol appears about 15 minutes before the battery runs out. In case the accumulator voltage drops further, the instrument automatically switches off to protect the accumulator.

4.1.7 Comment line



Various possible settings and parameters are displayed in the comment line. The filter setting is shown here, for example.

4.1.8 Basic amplification



Basic amplification is useful for adapting to extreme situations. The higher the basic amplification, the louder the noise in the headphones. The values 10, 100 or 1000 appear in the display.



Basic amplification can be altered with the magnifying-glass key (see section 4.2.8).

10 = high noise amplification

100 = medium noise amplification

1000 = low noise amplification

4.2 Key functions

4.2.1 Microphone key



Pressing the microphone key activates the A 100. Pressing it again deactivates it.

4 Water leak detection

Modus „MAX“



If you hold down the micro key for 3 seconds, you can switch to „MAX“ mode. This mode helps with acoustic line detection. Instead of minimum values, only max values are shown in this mode (only with microphones with cable connection, not with radio microphones).

4.2.2 Gauntlet key



Pressing the gauntlet key activates the A 100. Depending on the options selected in the set up menu it is deactivated either by releasing the gauntlet key or by pressing it again.

4.2.3 Hz key



The Hz key is used to alter the frequency-filter setting. The filter bandpass - which is a least 300 Hz wide - can be set anywhere between 1 Hz and 10 kHz.



Pressing both cursor keys at once resets the bandpass to its default setting, which depends on the probe.



Different leak noises can be heard best in different frequency ranges, and two people may hear the same noise differently. To optimise acoustic perception a bandpass can be set. In this case only a particular frequency range is fed to the headphones. The best setting can be found by experiment, or alternatively the A 100 can search for it automatically.

Setting the frequency range manually



- Press the Hz key.

The most recently set limits are displayed; the lower filter limit flashes.



- The cursor keys change the lower filter limit step by step.



- Press the Hz key again.

The upper filter limit flashes.



- The cursor keys change the upper filter limit step by step.



- Press the Hz key again.

The filter limits are saved.

4 Water leak detection

Automatic search for the best frequency range

The A 100 has a filter-optimisation function that automatically searches for the best frequency range. It should not be activated if there is any significant extraneous noise, and the leak noise - particularly ground-borne noise - should already be audible.



- Press the Hz key until a clearance tone sounds.
- The A 100 takes a „noise sample“ and analyses it.

While analysis is under way the display indicates various frequency ranges. The noise produced by the filter values displayed can be heard over the headphones.

- The A 100 selects the frequency range in which the leak noise is especially clear.

4.2.4 Cursor keys



The cursor keys are used to adjust the volume of the speaker or headphones. The volume setting is shown in the display by a bar in reverse video.

4.2.5 Light key



The light key switches the display illumination on and off. It switches off automatically after about 2 minutes.

4.2.6 Magnifying-glass and on/off key



The analog display indicates the relative noise level. The display can be adapted to prevailing conditions to make a change in the display from one measurement point to another easier to detect. This adaptation switches the analog display (instantaneous value) between scale values 10, 100 and 1000 and alters basic amplification for the headphones.



10 = high sensitivity, high noise amplification

100 = medium sensitivity, medium noise amplification

1000 = low sensitivity, low noise amplification

Automatic adjustment takes place to maintain the ratio between the current delayed action value and the instantaneous value.



- Press the microphone key. The A 100 is activated.



- Press the magnifying-glass key.

The sensitivity of the analog display is altered.

- The current sensitivity setting is shown above and to the right of the display.

4 Water leak detection

4.3 Probe overview

4.3.1 Ground microphone BO-4



The ground microphone BO-4 is used to locate leaks beneath stabilised surfaces.

4.3.2 Ground microphone 3P-4



The ground microphone 3P-4 is used to locate leaks beneath unstabilised surfaces. An earth spike can be screwed onto it for use in soft ground. Its 3 feet guarantee stability at all times.

4.3.3 Carrying rod H-4



The carrying rod can be used with both ground microphones. The BO-4 or 3P-4 microphone is screwed onto its lower end.

4.3.4 Test rod T-4



The test rod is used for preliminary leak location. The test rod is placed in contact with valves on the line under investigation.

4 Water leak detection

4.4 Switching on and off



- Put the microphone jack-plug into socket 1 on the A 100.
- The A 100 switches on.



- If the A 100 does not switch on, press the on/off key.
- One of the following displays briefly appears in the display:
 - for test rod or
 - for ground microphone or
 - for other microphone types.
- To switch off, unplug the probe from socket 1.

4.5 Sound-protection function

The A 100 incorporates a sound-protection function. With a sudden loud noise the sound in the headphones is immediately muffled. If the sound gets even louder the headphones are switched off. Once this noise source has ceased the A 100 reverts to normal operation. The sound-protection function ensures that no excessive sound pressure reaches the ears.



This headphones symbol appears in the comment line when the sound-protection function is activated.



Caution!

Only Sewerin headphones should be used, as these are adjusted to the A 100. The threshold at which the sound-protection function is triggered can be adjusted: see section 4.8 „Individual adjustments“.

4.6 Preliminary location

Structure-borne sound is transmitted a very long way by metallic pipes, which makes the test rod very effective for preliminary location.

- Connect the headphones to the A 100.
- Connect the test rod to the A 100.
- Place test rod on the first measurement point.

4 Water leak detection



- Activate the A 100 with the gauntlet key or the microphone key.

A speaker symbol appears in the display during measurement.

The analog display indicates the current measurement volume.

The noise can be heard by the headphones.

During this measurement the digital display indicates the smallest value measured.

The small digital display indicates the smallest value measured during the previous measurement. (This value is 0 after first measuring.)

The smallest measured value is shown in the analog display in reverse video during the measurement.

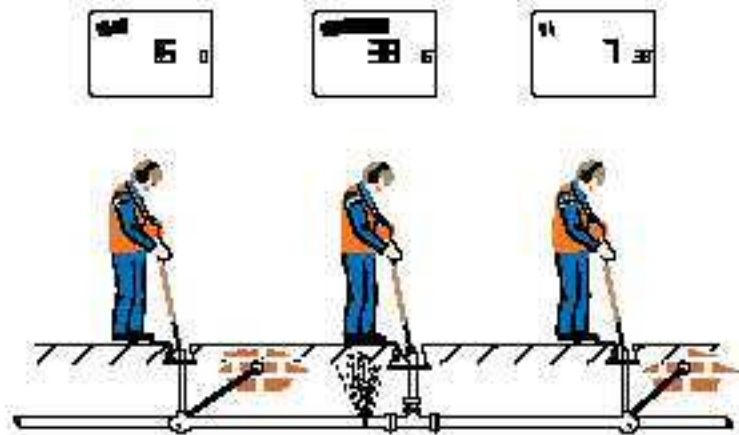


- To deactivate the A 100 release the gauntlet key or press the microphone key again.

If the A 100 is not deactivated when the gauntlet key is released, the function of the gauntlet key has been changed (see section 4.8). In this event press the gauntlet key again.

- Place the test rod on the next measurement point and proceed exactly as described above.

The previously measured value now appears in the small digital display for the purposes of comparison.



In water leak detection the display will be similar to that shown in the illustration above.

The noise is loudest near the leak and quieter further away.

On the left: the analog display indicates about 30%: this is the instantaneous noise value.

However, the analog display often fluctuates substantially because of changing ambient noise. Even a trend can be hard to recognise. This is why the large digital display (figure 18) indicates the smallest noise value measured at this point so far (the current delayed-action value). Even if ambient noise grows louder, this display is unaffected - while if it grows quieter the display falls further.

The figure 18 is also shown in the analog display as a segment in reverse video.

The small digital display indicates "0": as yet there is no value in memory.

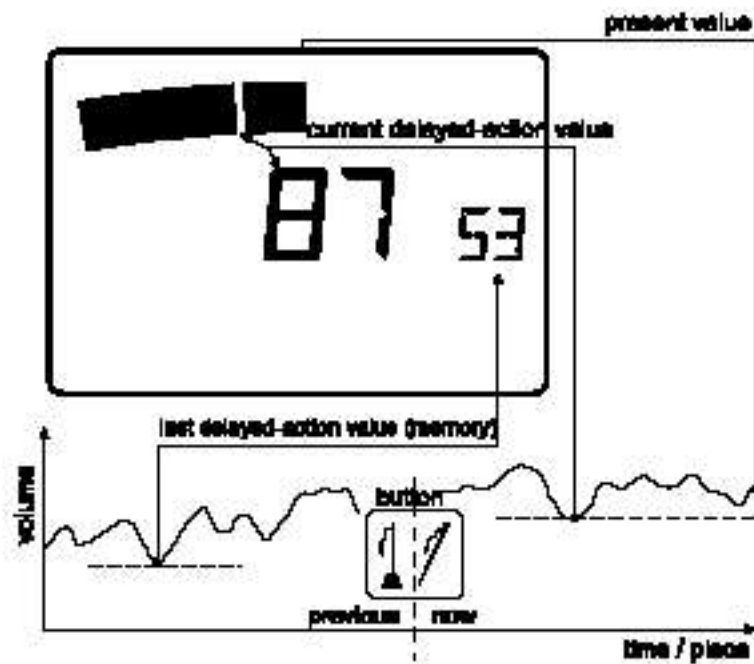
Centre: the analog display indicates about 60%. The large digital display (figure 38) indicates a value greater than the left hand measurement point. This is an indication that the leak is closer.

The small digital display now indicates "18": it reminds you of the result from the last measurement point (last delayed-action value). This makes it easier to decide whether you have not yet reached the leak or have already gone past it.

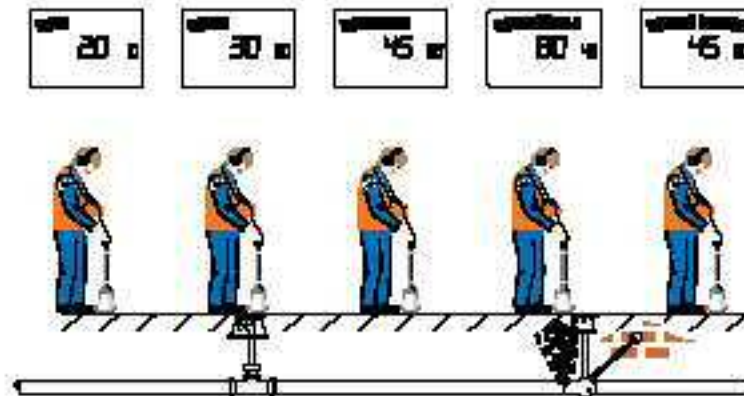
4 Water leak detection

Right: the current delayed-action value has fallen because the leak is further away. The last delayed-action value, "38", provides us a further comparison.

The following illustration shows how a leak noise overlaid by fluctuating extraneous noise is shown in the display.



4.7 Pinpointing



Non-metallic pipe materials do not transmit structure-borne sound as well. Therefore checking at the valves is not enough. The sections between valves must also be checked with a ground microphone.

Listening to the surface of the ground at short intervals enables the leak to be located without digging. Here, too, the A 100 provides a precise optical comparison of the noise intensities.

The above illustration, for example, shows how the display changes when passing a leak.

- Connect the ground microphone to the A 100.
- Place the microphone on the ground.
- Activate the A 100 with the gauntlet key or the microphone key.



A speaker symbol appears in the display during measurement.

The analog display indicates the current measurement volume.



The current noise can be heard through the headphones.

The digital display indicates the smallest value measured.

The small digital display indicates the previously-measured value. For the first measurement this value is 0.

The smallest measured value is shown in the analog display in reverse video.

- To deactivate the A 100 release the gauntletkey or press the microphone key again.

If the A 100 is not deactivated when the gauntlet key is released, the function of the gauntlet key has been changed (see section 4.8). In this event press the gauntlet key again.

- Place the ground microphone on the next measurement point and proceed exactly as described above.

The previously measured value now appears in the small digital display for the purposes of comparison.

- Use the ground microphone to check the area of the section where the leak is thought to be.

The illustration on the previous page shows an example of the display when crossing a leak.

4.8 Individual settings

On the A 100 various settings can be freely selected and permanently saved. The set up table on the next page highlights the various possibilities.

This is a list of settings that you can alter and save. First of all please switch-on the instrument.



- Hold down the microphone key.



- Press the on/off key.
„ELO/set” appears in the comment line.



- The microphone key calls the menu items one after another.



- The cursor-up key alters the status of the selected menu.
- After the last menu the „save” message appears.



- The cursor-up key saves the current settings and terminates the function.

**Notes:**

The ear protection function should be set to „low level” only with low surrounding noise so that is already activated with moderate noise levels. In situations with high noise, such level should be set to option (1), factory settings. In special cases, the setting option (2) may be used. The ear protection function will then only be activated in case of very loud noise levels. To avoid that the ear protection function is activated too often and impairs locating the leak, the headphones' volume may not be set too loud.

4 Water leak detection

ELW - setup table

Menu number	Description	Condition (0)	Condition (1)	Condition (2)
1	The gauntlet key (item 1) is a key which does or does not stay down when pressed	without*	with	/
2	Quit tone on pressing button	on*	off	/
3	sound-protection function operates at	low threshold	middle threshold*	high threshold
4	Basic amplification	low	middle*	high
5	headphones switch off completely	yes*	no	/

(* = factory setting)

Example:

If the comment line contains „No 3 0“, the sound-protection function operates at the low threshold.

Basic amplification is useful for adapting to extreme situations. The higher the basic amplification, the louder the noise in the headphones at a given volume setting. Pressing the magnifying-glass key is a convenient way to alter basic amplification.

If you do not want the headphones to switch off completely when the sound-protection function is triggered by loud noises, only heavily muffled, select „switch off headphones completely: No“. This means that the user will not lose all ambient noise while using the hearing-protection headphones. An orientation, for example in traffic, is limited possible.

4.9 Factory settings (reset)

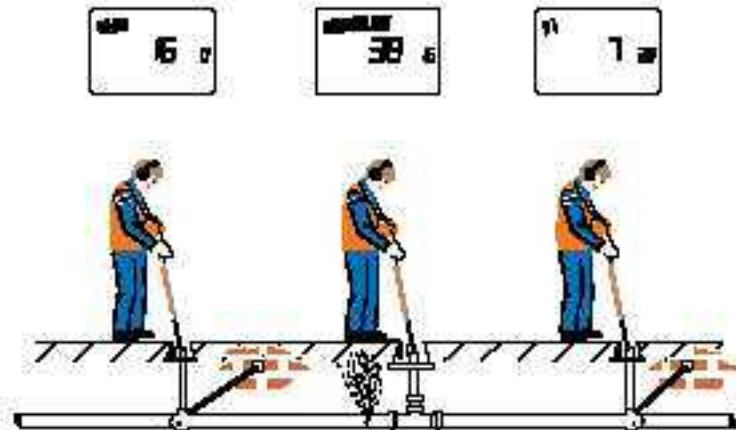
The factory settings (e.g. filter settings) can be restored as follows.

- Plug in a microphone jack-plug while holding down the light key.
- „Reset“ appears in the bottom text line for about 2 seconds.

5 Brief instruction

5.1 Brief instruction on water leak detection

Preliminary location



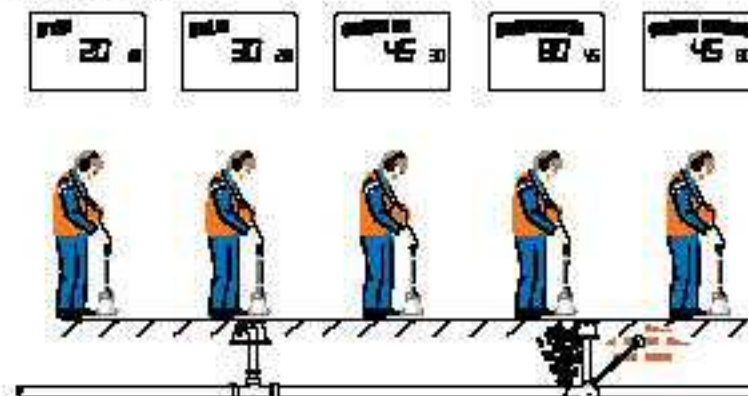
- Connect the headphones to the A 100.
- Connect the test rod to the A 100.
- Place test rod on the first measurement point.
- Activate the A 100 with the gauntlet key or the microphone key.
Speaker symbol appears in the display during measurement.
The analog display indicates the current measurement volume.
The noise can be heard by the headphones.
During this measurement the big digital display indicates the smallest value measured.
During this measurement the small digital display indicates the smallest value of the precedent measurement. For the first measurement this value is 0. During this measurement the smallest measured value is shown in the analog display in reverse video.
- To deactivate the A 100 release the gauntlet key or press the microphone key again.
If the A 100 is not deactivated when the gauntlet key is released, the function of the gauntlet key has been changed (see section 4.8). In this event press the gauntlet key again.

- Place the test rod on the next measurement point and proceed exactly as described above.

The previously measured value now appears in the small digital display for the purposes of comparison.

5 Brief instruction

Pinpointing



- Instead of a test rod connect a ground microphone to the A 100.
- Place the microphone on the ground.
- Activate the A 100 with the gauntlet key or the microphone key. A speaker symbol appears in the display during measurement. The analog display indicates the current measurement volume. The current noise can be heard through the headphones. The digital display indicates the smallest value measured. The small digital display indicates the previously-measured value. For the first measurement this value is 0. The smallest measured value is shown in the analog display in reverse video.
- To deactivate the A 100 release the gauntlet key or press the microphone key again. If the A 100 is not deactivated when the gauntlet key is released, the function of the gauntlet key has been changed (see section 4.8). In this event press the gauntlet key again.
- Place the ground microphone on the next measurement point and proceed exactly as described above. The previously measured value now appears in the small digital display for the purposes of comparison.
- Use the ground microphone to check the area of the section where the leak is thought to be.

6 Malfunctions

Malfunctions of the device are indicated through an error message on the display.

An F and an error code will be displayed.

Error code	Description	Error behaviour	Remedy
10	A 100 not recognised	self locking	Switch device back on, SEWERIN service
40	Temperature at battery too high for charging ($> 45^{\circ}\text{C}$)	self locking	Improve device surroundings, SEWERIN service
41	Temperature at battery too low for charging ($< 0^{\circ}\text{C}$)	self locking	Improve device surroundings, SEWERIN service
52	Data flash error occurred	self locking	Switch device back on, SEWERIN service
100	Probe not recognised by device	self locking	Switch device back on, manually select probe, SEWERIN service
110	No probe detected by device	self locking	Switch device back on, manually select probe, SEWERIN service

6 Malfunctions

Error code	Description	Error behaviour	Remedy
210	Communication error with CODEC	Self-resetting	Switch device back on, SEWERIN service
239	DSP error in boot program	self-locking	Switch device back on, SEWERIN service
240	DSP error when loading firmware	self-locking	Switch device back on, SEWERIN service
241	Communication error with DSP	Self-resetting	Switch device back on, SEWERIN service

7 Specifications

Fab-no. A 100	037 11
Transmission band- width (A 100):	1 – 10000 Hz
Filter, adjustable:	steps of 50, 500 and 1000 Hz
Filter, minimum band- width:	300 Hz
Power supply:	built-in rechargeable accumu- lator (NiMH) integral automatic charging/buffer system Displayed battery status Operating time approx. 12 hours
Type of protection in operation:	IP65
Weight:	approx. 1,0 kg
Approx. dimensions (W x H x D):	12,5 x 18 x 8,5 cm
Temperature range:	operation -10 °C – +50 °C storage -25 °C – +70 °C

8 Accessories

8.1 Accessories for water leak detection

Piezo-Test rod T-4, with screwed on tip.

Ground microphone BO-4

With sound-proofed against extraneous noise, especially suitable for stabilised surfaces.

Carrying rod H-4

For ground microphones BO-4 and 3P-4

Ground microphone 3P-4

with tripod, for both stabilised and unstabilised surfaces, with screw-on 20-cm measuring spike.

Test rod extension 60 cm

needed for listening to valves in shafts

Valve adapter

Gate valve adapter

Piezo-microphone EM30

especially suitable for use in buildings.

8.2 General accessories

Headphones stereo

Docking station HS 1.2 A

Case A 100

Case with foam inlay, special transport protection, incorporated pockets for accessories, device may be charged inside the case.

AC/DC adapter M4

Vehicle cable M4

Carrying system Triangel

adjustable upholstered back belt

Carrying system Cross Belt

Carrying system „Cross Belt“, 2 adjustable straps with diagonal attachment points. The straps cross over at the back for extra comfort.

9 Annexe

9.1 EU declaration of conformity

Hermann Sewerin GmbH hereby declares that the AQUAPHON A 100 fulfils the requirements of the following guideline:

- 2014/30/EU

The complete declaration of conformity can be found online.

9.2 Hints on Disposal

The disposal of instruments and accessories is governed by the European Waste Catalogue (EWC).

Type of Waste	Corresponding EWC Code
Instrument	16 02 13
Battery, accu	16 06 05

Old Instruments

Old instruments can be returned to Hermann Sewerin GmbH. We will arrange the qualified disposal free of charge through certified specialists.

9.3 Record of changes

Version 4.2

- Display: set to sensitivity ranges 1 – 10, 1 – 100, 1 – 1000, switch via magnifying-glass key
- Factory settings: sound protection functions only active at middle threshold. This threshold is active after renewed power-up.
- Band filter acc. to micro type (manually adjustable to 9,950 Hz):

BD-4:	50 – 1500 Hz
T-4:	50 – 3000 Hz
EM30, M01:	50 – 9950 Hz
- Pre-amplification matched to micro-types

Version 5.0

- Radio microphones usable
- If the accu-voltage is lower than the accu-nominal voltage, the device is being recharged.
- The version number of the software is displayed on switch-on.

Version 5.2

- Marker for system Combiphon (max level is stored)
- Version with battery power possible

Version 7.0

- Use of new hardware resulting in a weight reduction from 1.4 to 1.0 kg.
- In this version, the programme is stored in a flash memory and no longer in a EPROM.
- Quick charging due to NiMH-accumulators.
- The lowest level of the band-pass filter is set from 50 Hz to 1 Hz. This allows for hearing even lower frequencies.

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Attachment 2

**Pipe and cable locator (MXL4)
manual**

CXL4 Cable Avoidance Tool

DXL4 Depth Measuring Cable Avoidance Tool

SGA4 Signal Generator

SGV4 Signal Generator

MXL4 Precision Pipe & Cable Locator

MXT4 Transmitter

We recommend the Locator is regularly used with the C.Scope PC Toolkit. The Toolkit checks & updates the Locator firmware to the latest version each time.

Download Toolkit at cscopelocators.com/toolkit



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GENERAL WARNINGS



ALWAYS EXCAVATE WITH CARE

C.Scope Locators detect services radiating a detectable signal. There may be some services that do not radiate a signal and cannot be located.

Do not use the equipment outside of the temperature range -10°C to +50°C (14°F to 122°F) as the batteries may cease to function adequately.

Geographical conditions such as hills and mountains may effectively screen signals and prevent a detectable Radio signal.

The Locators alone will not always locate every service. Use a Signal Generator/Transmitter wherever possible.

Do not touch the metal of the Signal Generator/Transmitter Crocodile Clips or of the Plastic Pipe Tracer or Flexible Tracer terminals when in use.

The Signal Generator/Transmitter leads MUST NOT be connected directly to a live service.

Beware of multiple services. The Locators will not always indicate services that are close together or one above the other.

Do not use the equipment in areas where hazardous gases may be present.

Check for underground services before using the Earth Stake.

Always make sure that the Locator and Signal Generator/Transmitter are set to the same frequency when used together.

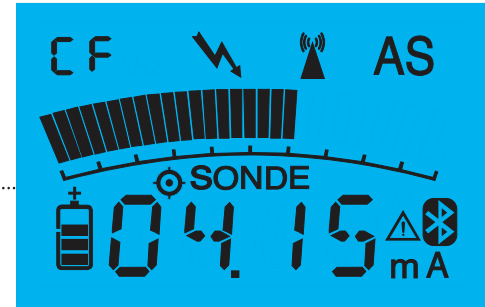
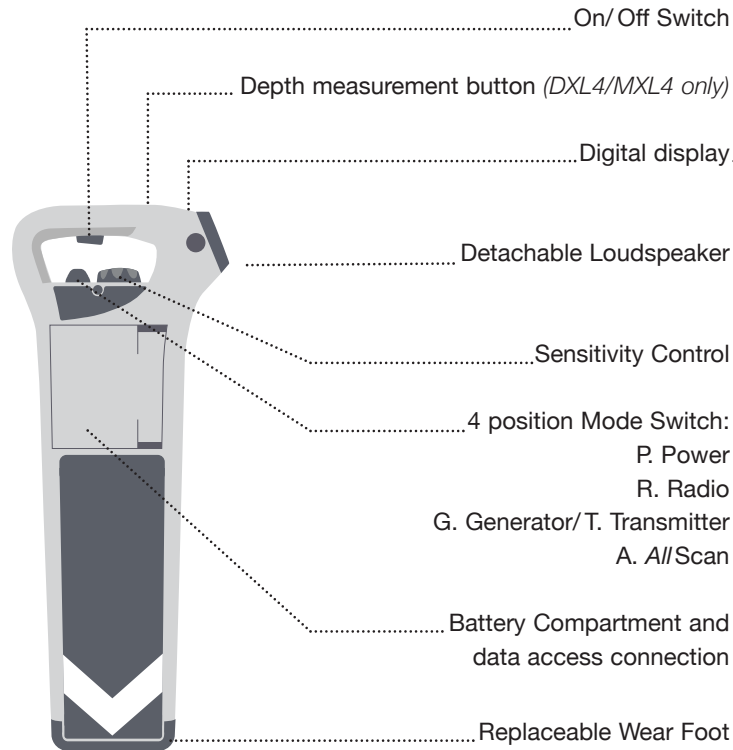
Performance may be impaired by unusually strong electromagnetic fields.








Do not hold the Locator Loudspeaker close to the ear for extended periods.

It is recommended that the operation of the Locator and Signal Generator/Transmitter is regularly checked (see pages 53-56).

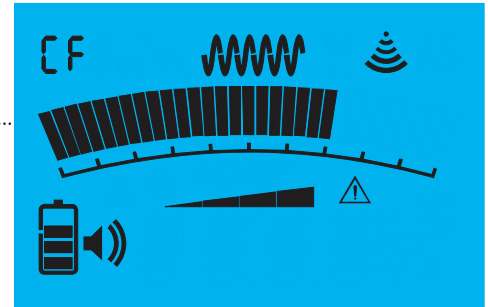
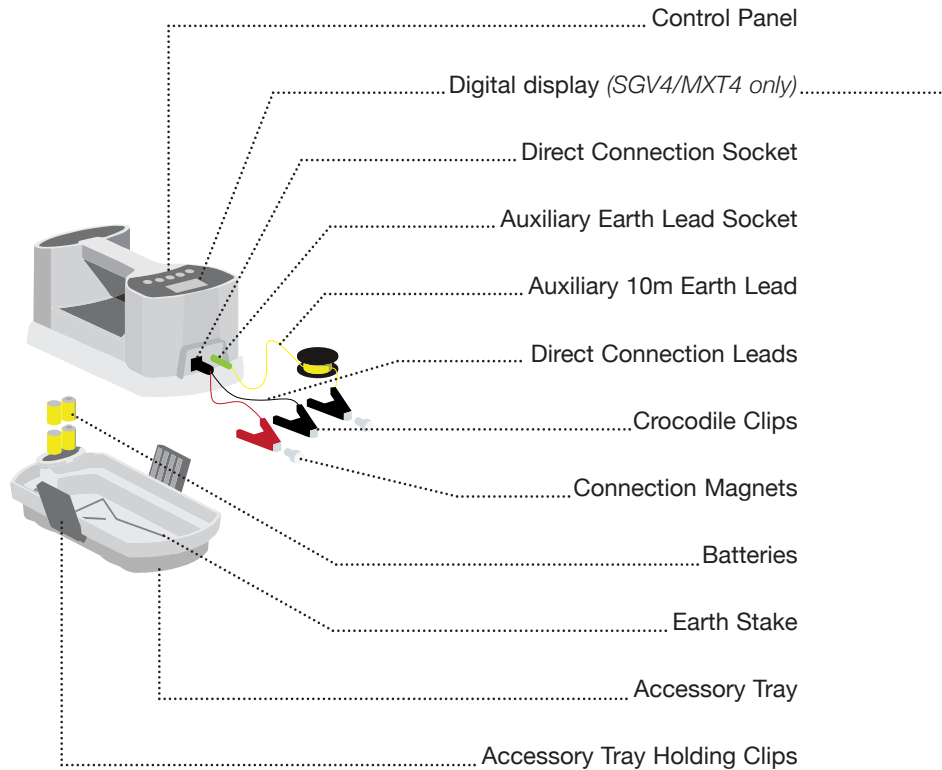
CXL4, DXL4 and MXL4 Locators









The CXL4, DXL4 and MXL4 can provide precise information about the position and depth (DXL4 and MXL4 only) of buried services. The combination of locating modes enables buried services to be detected quickly and reliably.



-  Signal Strength Indicator
- 04 15** Depth display (*DXL4/MXL4 only*)
- Mode selected:
-  **P** Power
-  **R** Radio
- [CF]** **G** Generator (*CXL4/DXL4 frequency*)
- [CF]** **T** Transmitter (*MXL4 selected frequency*)
- AS** **A** All Scan
-  Battery Condition Indicator
-  Self Test Warning
-  GPS
-  Bluetooth™

SGA4/SGV4 Signal Generator and MXT4 Transmitter



-  Signal Strength Indicator
-  Output Power Level
-  Output Frequency Indicator
-  Connected Mode Indicator
-  Induced Mode Indicator
-  Battery Condition Indicator
-  Audio Level Indicator
-  Self Test Warning

SGA4 and SGV4 Signal Generator

SGA4 Signal Generator

The SGA4 Signal Generator is designed for use with the CXL4 and DXL4 Locators.

- High (One Watt) and low Power Output settings.
- Pulsed or Continuous output signal.
- Loud or Muted audible output.



SGV4 Signal Generator

The SGV4 Signal Generator is designed for use with the CXL4 and DXL4 Locators.

- Automatic Daily Self Test.
- Data Logging of all Signal Generator activity.
- Automatic Back-light.
- Four Power Output settings up to One Watt.
- Pulsed or Continuous output signal.
- Loud, Muted or Silent audible output settings.
- Combined Frequency (CF) signal output (33kHz and 131kHz) applicable using both Connected and Induced methods of signal transfer.



MXT4 Transmitter

MXT4 Transmitter

The MXT4 Transmitter is designed for use with the MXL4 Locator.

- Automatic Daily Self Test.
- Data Logging of all Transmitter activity.
- Automatic Back-light.
- Four Power Output settings up to One Watt.
- Pulsed or Continuous output signal.
- Loud, Muted or Silent audible output settings.
- Six Frequency settings: 512Hz, 640Hz, 8kHz, 33kHz, CF (33kHz and 131kHz combined), 131kHz (HF).
- All Frequencies applicable using the Direct Connect method of signal transfer.
- 8kHz, 33kHz, CF (33kHz and 131kHz combined), 131kHz (HF) frequencies applicable using the Induced method of signal transfer.



Locator Operating Modes: Power Mode

In Power Mode the Locator detects power signals. These power signals are present on all current carrying electricity cables although not all are detectable. Power signals may also flow along other conductors such as metal gas and water pipes, telecom cables, metal fences and railway tracks.

Limitations of Power Mode

Not all electricity cables can be found using the Power Mode. Here are the most important examples of electricity cables that may not be detectable in the Power Mode:

- Street lighting cables. When the lights are off, no current flows and so no power signal is created.
- Supplies to buildings or plant using very little or no electricity may not have a detectable power signal.
- Pot-ended or capped cables. These will never have any current flowing through them but are possibly still live.
- Disused or abandoned cables.
- A few high voltage electricity cables. These can be 'well balanced', electrically and therefore radiate little or no power signal.
- Direct Current cables (such as those found on railway systems). These do not create their own Power signals.
- Cables more than 3m (9'9") deep.



NOTE Locators can only detect services radiating a detectable electromagnetic signal.

There may be some services that do not radiate these signals and cannot be located.

NOTE The absence of a power signal does not mean the service is not live.



WARNING Generally these services should be detectable using the Radio or Generator/Transmitter Modes.

Locator Operating Modes: Radio Mode

In Radio Mode, the Locator detects signals from various radio transmitters. These signals flow through the ground and will tend to follow the line of least resistance such as a buried metallic service. When this happens the service can often be detected by using the Locator in Radio Mode.

Limitations of Radio Mode

- Not all services will be detectable in Radio Mode.
- A strong radio signal present on one service may be masking a weaker radio signal present on an adjacent service.
- It is not normally possible to determine what the service is in Radio Mode, only its position.
- Radio signals do not favour one utility over another.
- The depth of the buried service cannot be judged by the strength of the radio signal alone.
- Normally it is only possible to detect radio signals present on services up to 2 m (6'6") deep.
- A short service may not have enough signal to be detected.



NOTE Locators can only detect services radiating a detectable electromagnetic signal. There may be some services that do not radiate these signals and cannot be located.

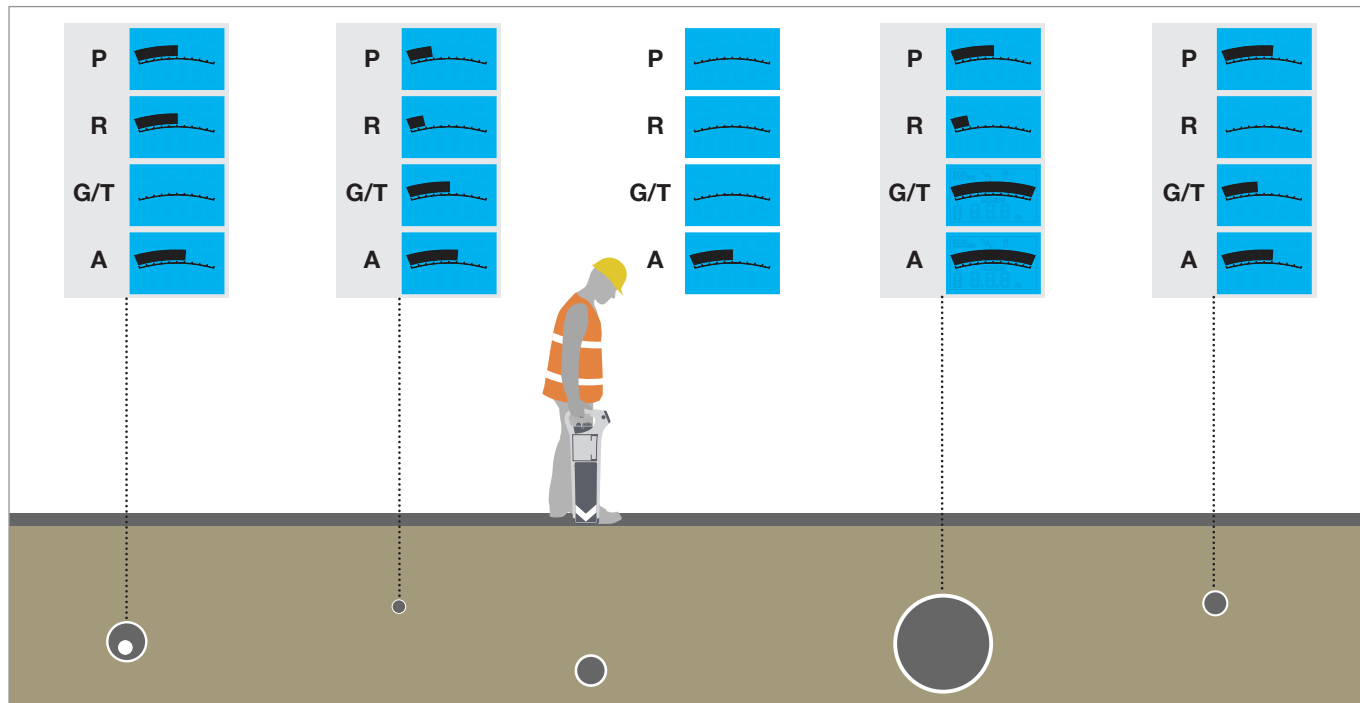


WARNING Most buried metallic services not found in Radio Mode should be detectable by using Generator Mode with the Signal Generator/Transmitter.

Locator Operating Modes: AllScan Mode

In AllScan Mode, the Locator detects at ALL frequencies in a wide band. Sometimes a signal that is outside of the frequency range of the other search modes (Power, Radio, and Generator/Transmitter) will be present on a buried metallic service. AllScan Mode is a useful additional search mode to employ as it may detect these 'extra' signals as well as the Power, Radio and Generator/Transmitter signals.

Using the AllScan Mode is also a good way to confirm the accuracy of the marking of metal pipes and cables previously detected using the Power, Radio and Generator/Transmitter modes of detection.



Locator Operating Modes: *All*Scan Mode

Limitations of *All*Scan Mode

*All*Scan Mode has exactly the same limitations as those listed for the Power and Radio Modes:

- Street lighting cables when the lights are switched off, supply cables to buildings or plant using little or no electricity, pot-ended or capped cables, well balanced high voltage cables and direct current cables may all be missed on the *All*Scan Mode.
- A strong *All*Scan signal present on one service may mask a weaker *All*Scan signal present on an adjacent service.
- It is not normally possible to determine what the service is in *All*Scan Mode, only its position.
- *All*Scan signals do not favour one utility over another.
- The depth of the buried service cannot be judged by the strength of the *All*Scan signal alone.
- Normally it is only possible to detect *All*Scan signals present on services up to 2 m (6'6") deep.
- A short service may not have enough signal to be detected.



WARNING Using the Power and Radio Modes may be more effective in areas where there are many services radiating an *All*Scan signal.

Locator Operating Modes: Generator/Transmitter Mode

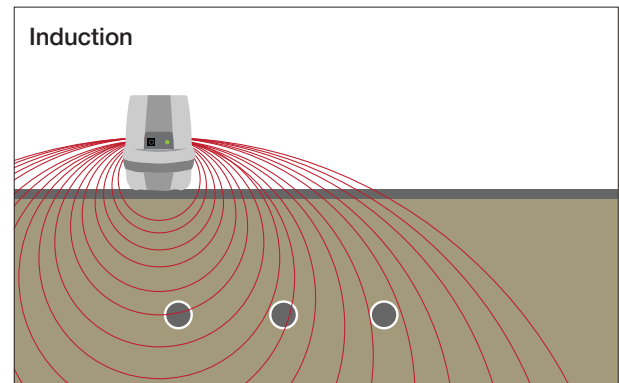
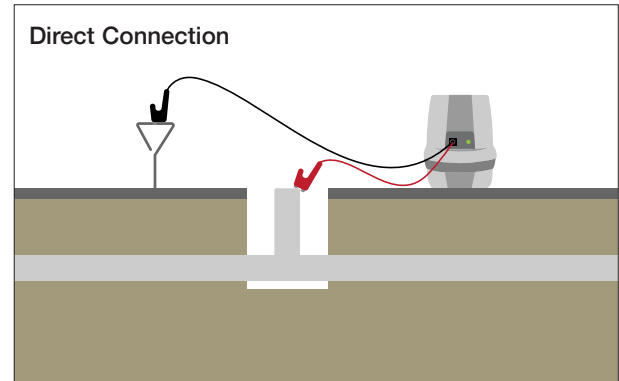
In Generator/Transmitter Mode the Locator detects conductors radiating a signal applied by the Signal Generator/Transmitter or the signal radiated by a Sonde.

The Signal Generator/Transmitter provides a way of sending a known signal along buried metallic services which can then be detected using the Locator. By detecting this signal it is possible to locate, trace and identify the pipes or cables that may be carrying it.

There are TWO basic methods by which the Signal Generator/Transmitter signal can be applied to buried services:

- Direct Connection - The Signal Generator/Transmitter is attached directly to the service using either the Direct Connection Leads or one of the accessories available for use with the Signal Generator/Transmitter such as the Signal Clamp or Signal Injector.
- Induction - The Signal Generator/Transmitter can induce a signal onto a buried metallic service remotely from the surface without the need to physically connect to that service.

Limitations of Generator/Transmitter Mode are covered in the 'Using the Signal Generator/Transmitter' section of this Manual.



WARNING Locators can only detect services radiating a detectable electromagnetic signal. There may be some services that do not radiate these signals and cannot be located.

Using the Locator: Batteries

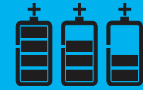
C.Scope Locators can be powered by either eight standard alkaline or Nickel-Metal Hydride rechargeable (NiMH) AA (LR6) size batteries.

Locator Battery Check

Switch the Locator on by pulling up on the On/Off trigger positioned on the underside of the handle. The Locator should emit a clear audible battery check tone for one second and the display should come on.

Check the battery level indicator in the bottom left hand corner of the display. If there is only one segment or no segments of the indicator filled in then the batteries will need to be replaced or recharged before locating work can begin.

Battery Levels OK



Replace or Recharge batteries



NOTE The Locator will carry out an automatic daily Self Test when it is switched on for the first time each day (see pages 12-13 for full details)

Changing Locator Batteries

- Push the two clips back to release the Battery Compartment door.
- Remove ALL EIGHT used batteries and replace with new or recharged ones.
- Be careful to insert the new batteries the correct way round in the holder.
- Replace the holder in the Battery Compartment making sure that the two terminals on the holder make contact with the two terminals within the Battery Compartment.
- Close the Battery Compartment door securely.



NOTE A spare battery pack can be carried inside the Battery Compartment.

NOTE Only use alkaline or Nickel-Metal Hydride rechargeable (NiMH) AA (LR6) size batteries.

NOTE Dispose of the used batteries safely in accordance with local regulations.



WARNING Do not change batteries in confined spaces where gas may be present.

WARNING Do not mix old and new or different types of batteries.

Using the Locator: Automatic Daily Self Test

The CXL4, DXL4 and MXL4 Locators have an in-built automatic Daily Self Test function. This tests the Locator's circuits and receiving aerials for correct performance.

The Self Test is automatically performed the first time the Locator is switched on each day and takes approximately four seconds.

i **NOTE** When turning the Locator on for the first time it is important that no other Locator is situated within 30cm (1') and that no Signal Generators, Transmitters or Sondes are operating within 5m (16') .

NOTE Try not to switch the Locator on for the first time in an area with unusually high Power signals such as next to an electricity transformer.

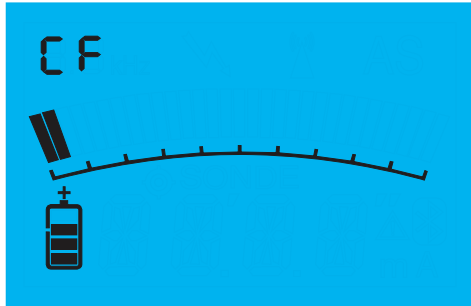
The Self Test process is indicated by 'TEST' appearing on the display. In the top left hand corner of the screen a countdown timer shows the progress of the test.



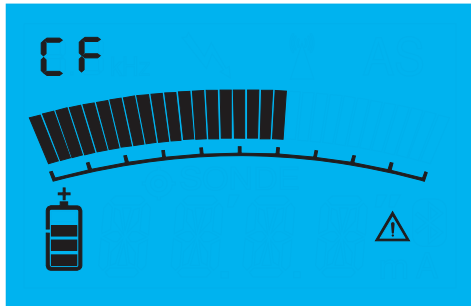
i **NOTE** The Locator records every Automatic Daily Self Test. The Test results can be retrieved from the Locator to produce a Product Validation Certificate by using the PC Toolkit (see page 57).

Using the Locator: Automatic Daily Self Test

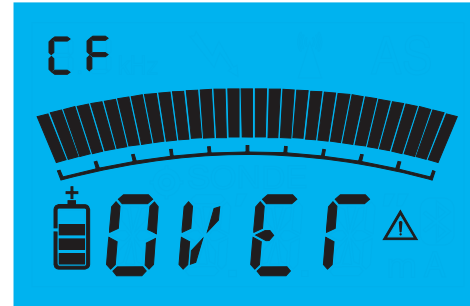
After the Locator has successfully completed the Self Test the Locator is ready for use as per normal. It will not undertake another Self Test that day.



If the Locator has failed the Self Test the Warning symbol will appear in the bottom right hand corner of the screen.



If the error code 'OVER' is displayed alongside the Warning symbol this indicates that there is a significant external signal present that has corrupted the actual Self Test process.



The source could be an active Signal Generator, Transmitter, Sonde or Locator or a nearby transformer or other power source emitting a strong Power mode signal.

In this situation make sure all nearby Signal Generators, Transmitters and Sondes are switched off or move a few metres/feet to a different location. The Locator will automatically initiate a new Self Test when it is next switched on and will continue to do this until a successful Self Test has been achieved.

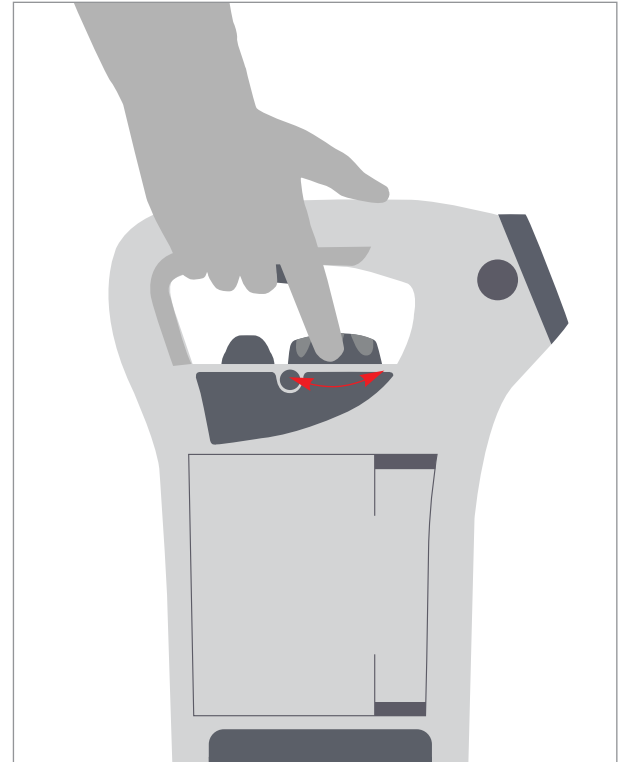
If the Locator still fails a Self Test then this is indicating that there is a fault and the Locator should be withdrawn from service. Contact C.Scope or a C.Scope Authorised Service Centre for advice.

Using the Locator: Holding the Locator

When in use the Locator should always be held upright. Never swing the Locator such that it moves away from the vertical. The Locator will emit an audio warning if the Locator is being swung excessively.



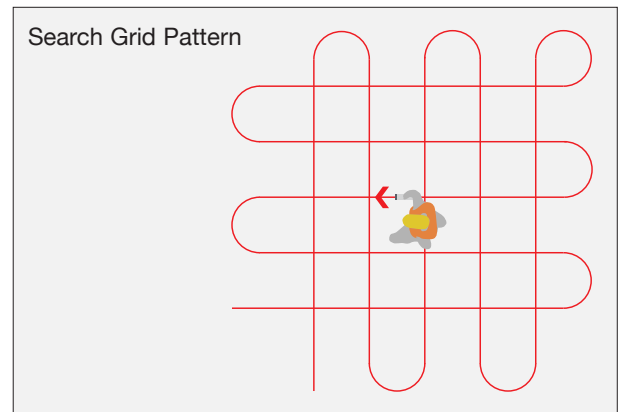
Your middle or little finger should be used to squeeze, and hold on, the On/Off trigger. Your index finger will then be free to adjust the Sensitivity Control.



Using the Locator: Searching

There are three stages to the locating process; searching, pinpointing and tracing.

1. Turn the Mode Switch to the appropriate mode.
2. Hold in the On/Off trigger. The Locator should emit the audible battery test tone and the digital display should come on. Check the battery level indicator to confirm the batteries are usable.
3. Rotate the Sensitivity Control fully clockwise to its maximum setting as indicated by the arrow on the control.
4. Carry out the search using a grid pattern as shown in the diagram. Walk slowly and keep the Locator upright at all times and stationary by your side.
5. As you approach the area in which there is a signal the Locator will emit an audible response and show a visual response on the display.
6. Keep walking until the audible and visual responses disappear.



NOTE This search technique applies only to the Power, Radio and All Scan Modes.

See 'Using the Signal Generator/Transmitter' for the correct search pattern when using Generator/Transmitter Mode.

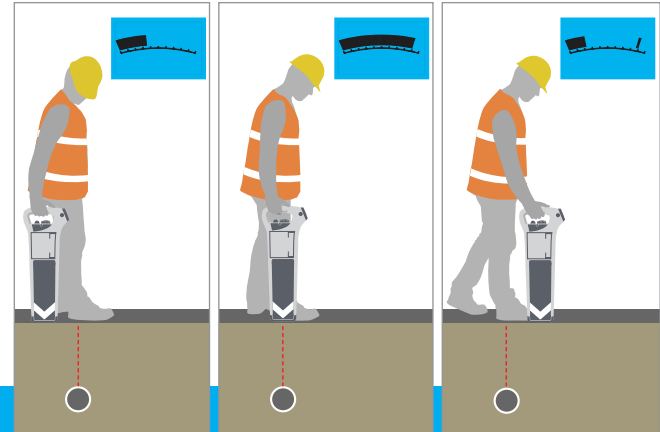
NOTE Sometimes the Locator will give an audible response and strong (full scale) visual response across the whole of the search area. In this case turn the sensitivity down slightly and repeat the search using the same grid pattern.

Using the Locator: Pinpointing

Having found a signal the next step is to pinpoint the source. The closer the Locator is to the signal source the stronger the response.

To Pinpoint a Signal

1. Keeping the Locator vertical, walk through the area of the signal response. If the visual response goes up off the scale then stop and reduce the sensitivity of the Locator slightly before continuing.
2. The width of the signal response will shrink as the sensitivity is reduced. Once it is reduced enough then a clear peak response will be seen on the display as the Locator traverses the service. The Locator is positioned directly above the buried service when the display is at its highest (peak) reading.



i **NOTE** Each time the Locator response reaches its peak position, a single 'PeakHold' line will remain showing on the bar graph for two seconds to assist you to return to the correct peak position.

3. Carefully rotate the Locator over the peak reading until the visual response falls to a minimum. The Locator will now be roughly IN LINE with the direction of the buried service.

i **NOTE** The presence of other signals in the immediate vicinity may result in the visual response not reducing to a minimum level when the Locator is rotated over the peak response.

4. Mark the position of the buried service.

i **NOTE** The amount of sensitivity adjustment needed to pinpoint a service can vary depending on the mode being used, the signal strength and the service depth.
NOTE The word 'OVER' will appear on the display if the Locator is detecting a signal that is too strong. This is irrespective of which mode of detection is being used and can also be caused if the Power Output setting on the Signal Generator/Transmitter is too high.

Using the Locator: AlarmZone™

The CXL4, DXL4 and MXL4 Locators feature an AlarmZone™ which is a form of automated depth measurement intended to alert the user to the presence of unusually shallow pipes or cables.

The AlarmZone™ warning will be triggered if the Locator measures a Power, Generator/Transmitter or A//Scan signal as being less than 0.3m (12") away. The Locator will give an audible alert and the AlarmZone™ warning symbol will flash on the display of the Locator.



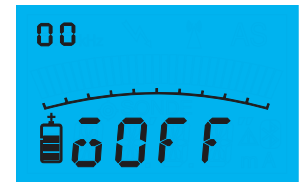
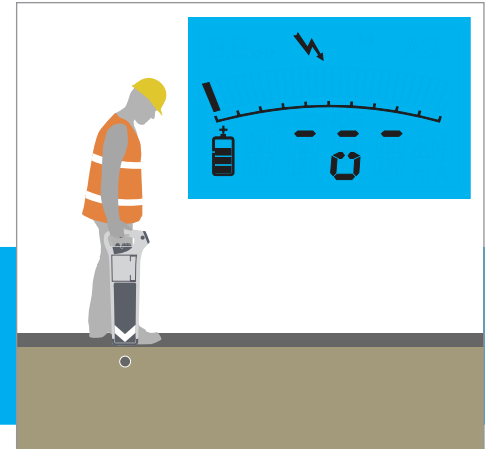
NOTE The Locator is measuring the distance from the base of the Locator to the source of the signal (the metal pipe or cable). If the Locator is held a significant distance above the ground surface then it may not trigger an AlarmZone™ warning because the Locator is now too far away from that shallow service.

The AlarmZone™ depth setting is shown each time the Locator is switched on.

The AlarmZone™ is factory set to be triggered at 0.3m (12"). This distance can be altered using the PC Toolkit.

The AlarmZone™ feature can be temporarily disabled by switching between the Generator/Transmitter mode and A//Scan mode three times in quick succession. If you have disabled the AlarmZone™ feature, each time the Locator is switched on the display will read 'OFF'.

AlarmZone™ will remain disabled for 30 minutes at which point it will be automatically reactivated.

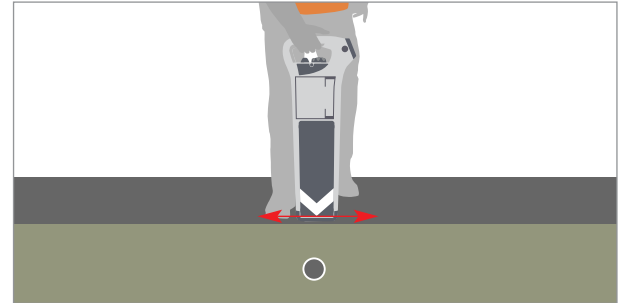


WARNING There may be some pipes and cables that are not radiating a signal so the AlarmZone™ warning will not appear. NEVER presume there are no shallow pipes or cables present simply because AlarmZone™ has not been triggered.

Using the Locator: Tracing

Having pinpointed a service it should now be possible to trace its route.

1. Carefully follow the direction of the signal holding the Locator at right angles to the line of the signal. It is necessary to constantly 'slice' the Locator from side to side in order to be sure of still being over the peak signal response.
2. Stop and mark the position of the signal at regular intervals. As more marks are recorded the precise direction of the service will become more apparent.



NOTE It may be necessary to readjust the sensitivity to maintain the optimum response.

NOTE After tracing, return to the original search grid to search for further buried services.



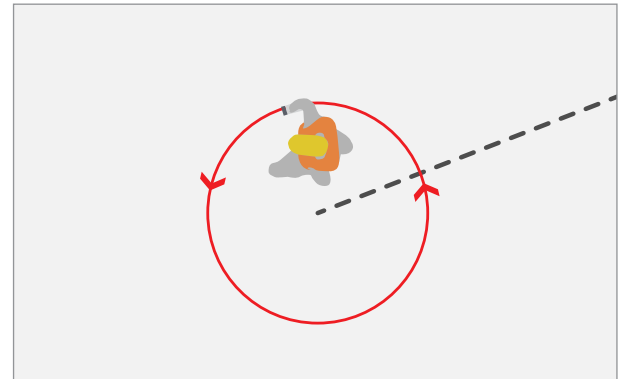
WARNING Never rush the tracing process. Small and unexpected changes in the service's route will be missed if care is not taken to follow the signal's path every step of the way.

Lost Signals

This can be because of a curve, or bend in the route, change in depth of the service, a T connection or the end of the service.

Finding Lost Signals

1. Walk in a circle at least 1 m (3'3") around the point where the signal was lost. This should locate the service if the signal has been lost because of a curve or bend in the route of the service, or a T connection into another service.
2. If you find nothing then increase the sensitivity and repeat the circle. This should find the service if it has continued but at a greater depth.



Using the Signal Generator/Transmitter

Using the Locator in Power and Radio Modes will only allow you to locate and mark the position of buried services that are producing a Power signal or re-radiating a Radio signal.

Use of the Signal Generator/Transmitter should enable most, if not all, of the remaining buried metallic services to be detected and traced. This section explains the various ways in which the Signal Generator/Transmitter can be used.

It also shows how to use those accessories that allow the Signal Generator/Transmitter to be directly connected to specific services.

Direct Connection - Physically connecting the Signal Generator/Transmitter to a service is the most effective way to transfer the signal onto that service and the best way to trace the route of that service.

Signal Clamp - The Signal Clamp is an accessory that allows the Signal Generator/Transmitter signal to be applied to a specific cable without having to make electrical contact with that cable. Although the Signal Clamp is not physically fixed to the cable we still consider it as a Connection method because it is using the Signal Generator/Transmitter in Connection Mode.

Signal Injector - The Signal Injector is an accessory that allows the Signal Generator/Transmitter signal to be safely applied to an electrical system via a conventional 3-pin power socket. This signal will then be detectable on the buried supply cable outside the building.

Induction - Induction is a method of applying a signal to a service to which there is no direct access.



NOTE The Locator should always be handled and operated according to the instructions shown in the 'Using the Locator' section unless specifically shown otherwise in this section.

NOTE SGA4 Signal Generators will always switch on at higher power output, continuous signal and loud audio setting.

NOTE SGV4 Signal Generators and MXT4 Transmitters will switch on to the last used settings.

NOTE SGV4 Signal Generators and MXT4 Transmitters have a display backlight that is activated each time any control button is pressed. The display will remain illuminated for 15 seconds.

Using the Signal Generator/Transmitter: Output Power Level and Pulse/Continuous Output

Output Power Level

The SGV4 Signal Generator and the MXT4 Transmitter have four, selectable output power levels. The SGA4 Signal Generator has two selectable output power levels.

For long distance tracing or for detecting deep services it is always best to use the highest power setting of the Signal Generator/Transmitter. Please note, however, that higher power settings will drain the batteries more quickly than lower power settings.

For tracing work close to the signal application point, especially when using Induction Mode, the lower power settings are better.



NOTE When using accessories such as the Signal Clamp, Signal Injector, Plastic Pipe Tracers and Flexible Tracer it is normally best to use the highest power setting.

Pulsed/Continuous Output

For most locating work a Continuous signal output is best and **MUST** be used for any Depth or Signal Current Measurements.

A Pulsed signal output can be useful when it has become difficult to distinguish the Signal Generator/Transmitter signal from unwanted interference, for example, when tracing services over long distances or at greater depths.

Using the Signal Generator/Transmitter: Frequency Selection (*MXT4 only*)

Select the frequency on the MXT4 Transmitter and the MXL4 Locator by pressing the Frequency (f) buttons. The Frequency (f) buttons will scroll through the various frequency options in order.

Generally, the Combined Frequency (CF) is the best frequency setting to use as it performs well in many applications. CF is a combination of 33kHz and 131kHz.

The lower frequency signals 512Hz, 640Hz and 8kHz should travel further along a metallic service although they may be more difficult to successfully apply in the first place. There should also be less 'coupling' of these lower frequency signals onto adjacent services.

The highest frequency setting, 131kHz (HF), is likely to be most successful when attempting to detect and trace short length or poorly earthed cables.

There can be exceptions to these general rules, and so often the best option is to try each frequency setting and then utilise the one that is giving the best results for that particular service. This is irrespective of the method of signal application; Direct Connection, Signal Clamp, Signal Injector or Induction Mode, and of the service being traced.



NOTE The 512Hz and 640Hz frequency signals can only be applied using the Direct Connection Leads.



WARNING The Locator frequency **MUST** always be set to the same frequency setting as the Transmitter.

Using the Signal Generator/Transmitter: Batteries

C.Scope Signal Generators/Transmitters can be powered by either four standard alkaline or by four standard Nickel-Metal Hydride rechargeable (NiMH) D (LR20) size batteries.

Signal Generator/Transmitter Battery Check

SGA4 Signal Generator

Switch the SGA4 on by pressing the On/Off Control. The SGA4 should emit a loud continuous tone. An interrupted tone will be heard if the batteries need replacing or recharging immediately.

If the batteries need replacing during use, the same interrupted tone will be heard, and the signal output will also be interrupted.

SGV4 Signal Generator and MXT4 Transmitter

Switch the SGV4/MXT4 on by pressing the On/Off Control.
Check the battery level indicator in the bottom left hand corner of the display.

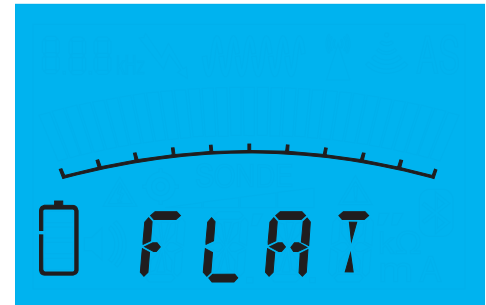
If there is only one segment or no segments of the indicator filled in it is advisable to replace or recharge the batteries before locating work begins.

If 'FLAT' appears on the display, the unit will cease to transmit any signals and the batteries must be replaced or recharged.

Battery Levels OK



Replace or Recharge batteries



NOTE The Signal Generator/Transmitter will carry out an automatic daily Self Test when it is switched on for the first time each day (see pages 24-25 for full details).

Using the Signal Generator/Transmitter: Batteries

Changing the Batteries

- Remove the Accessory Tray.
- Undo the two round knurled battery cover retaining screws situated on the underside of the Signal Generator/Transmitter.
- Remove ALL FOUR used batteries and replace with new ones.
- Be careful to insert the new batteries the correct way round in the compartment as indicated on the case.
- Replace the Battery Cover being careful to not over tighten the retaining screws.
- Replace the Accessory Tray.



NOTE Only use alkaline or Nickel-Metal Hydride rechargeable (NiMH) D (LR20) size batteries.

NOTE Dispose of the used batteries safely in accordance with local regulations.



WARNING Do not change batteries in confined spaces where gas may be present.

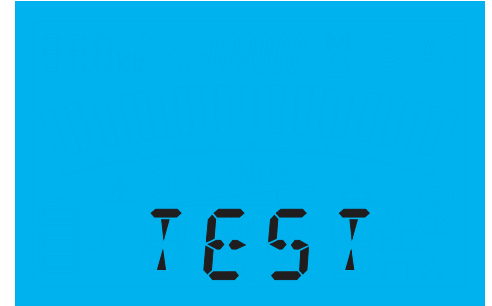
WARNING Do not mix old and new or different types of batteries.

Using the Signal Generator/Transmitter: Automatic Daily Self Test (SGV4 and MXT4 only)

The SGV4 and MXT4 have an in-built automatic Daily Self Test function. This tests the Signal Generator/Transmitter circuits and transmitting aerials for correct performance.

The Self Test is automatically performed the first time the Signal Generator/Transmitter is switched on each day and takes approximately twelve seconds.

The Self Test process is indicated by 'TEST' appearing on the display.

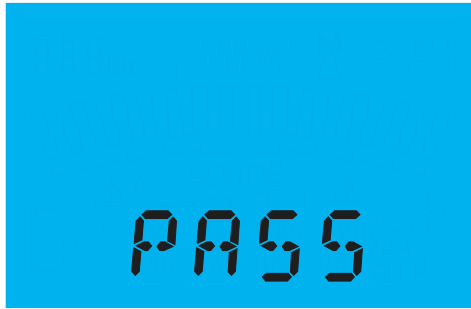


NOTE A Self Test can be initiated manually by holding down the Pulse/Continuous button while the Signal Generator/Transmitter is switched on.

NOTE The SGV4 and MXT4 record every Automatic Daily Self Test and any manual Self Test. The Test results can be retrieved from the Signal Generator/Transmitter to produce a Product Validation Certificate by using the PC Toolkit (see page 58).

Using the Signal Generator/Transmitter: Automatic Daily Self Test (SGV4 and MXT4 only)

If the Signal Generator/Transmitter has successfully completed the Self Test, 'PASS' will appear on the display. The Signal Generator/Transmitter is ready for use as per normal. It will not undertake another automatic daily Self Test that day.



If the Signal Generator/Transmitter has failed the Self Test, 'FAIL' will appear on the display and the Self Test warning symbol will flash. The Self Test warning symbol will then remain on the display.



After any Self Test fail, the Signal Generator/Transmitter will automatically initiate a new Self Test when it is next switched on.

If the Signal Generator/Transmitter fails a Self Test it should be withdrawn from service. Contact C.Scope or a C.Scope Authorised Service Centre for advice.

Using the Signal Generator/Transmitter: Direct Connection



WARNING Never connect directly to electrical services.

WARNING You may need to seek permission from the service owners before connecting on to some buried services.

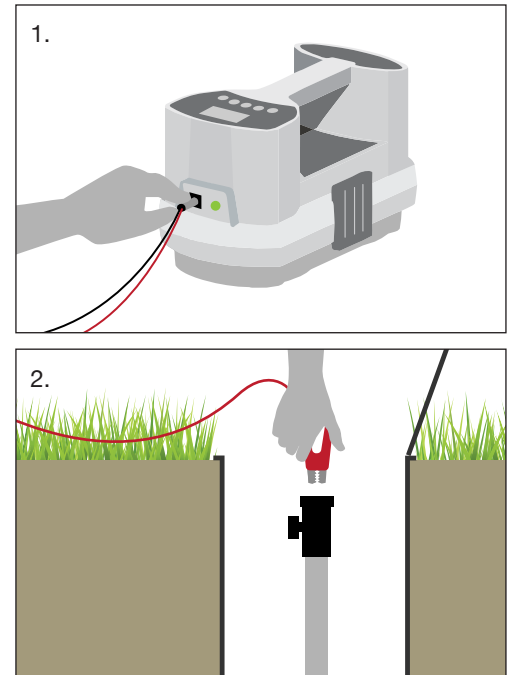
The Direct Connection Leads and Earth Stake that are supplied with the Signal Generator/Transmitter are used to apply a signal to any metal pipe at a suitable access point such as a valve, hydrant point, stop cock or exposed pipe length.

1. Plug the Direct Connection Leads into the Signal Generator/Transmitter Connection Socket.
2. Attach the red lead to the pipe at your point of access using the Crocodile Clip. Ensure that you have a secure and clean grip on the pipe with the Crocodile Clip.
3. Turn the Signal Generator/Transmitter on.

For MXT4 only, select frequency to be used; 512Hz, 640Hz, 8kHz, 33kHz, CF, 131kHz (HF).

4. Place the Earth Stake in the ground (having first searched the area for buried services with the Locator).

The ideal position for the Earth Stake is at right angles to the assumed line of the pipe and the full length of the Direct Connection Leads away from the pipe access point.



NOTE The type of metal that the pipe is constructed from or its use will have little effect on its traceability.

NOTE If it is not possible to get the Crocodile Clip to grip the pipe then use the Magnet supplied.

NOTE SGV4 Signal Generators and MXT4 Transmitters will switch on to the last used settings.

Using the Signal Generator/Transmitter: Direct Connection

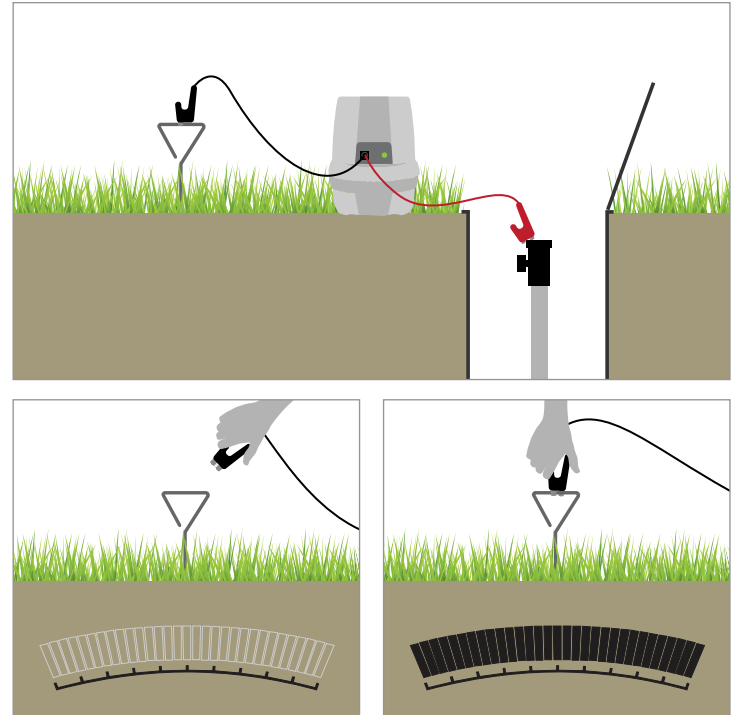
5. Connect the black Earth Lead to the Earth Stake (or an alternative earth point). If your earth point is too far away from the pipe access point for the black Earth Lead to reach then use the yellow 10 metre Auxiliary Earth Lead instead.

6. As the Earth Lead is connected to the Earth Stake the audible signal from the Signal Generator/Transmitter should change in pitch. The lower the pitch, the better the signal will be on the metal pipe.

If there is no change in pitch it may be that some dirt, rust or paint on the pipe is preventing the Crocodile Clip or Magnet from making a good contact with the pipe. Alternatively it may be that your earth point is at fault. Change the position of the Earth Stake or use an alternative earth point.

For SGV4 and MXT4 only, there will be a visual representation of the quality of the connection in addition to the audible pitch change. The greater the response on the display, the better the signal will be on the pipe.

7. Adjust the Output Power Level to suit.



NOTE If it is not possible to use the Earth Stake use a nearby metal fence post, manhole cover or gully cover.

NOTE If the Earth Stake cannot be inserted into the ground then simply laying it flat on the ground can sometimes provide a successful earth connection (especially if the ground is wet).

DO NOT use something that may have another metallic service attached to it, such as a metal street lighting column.

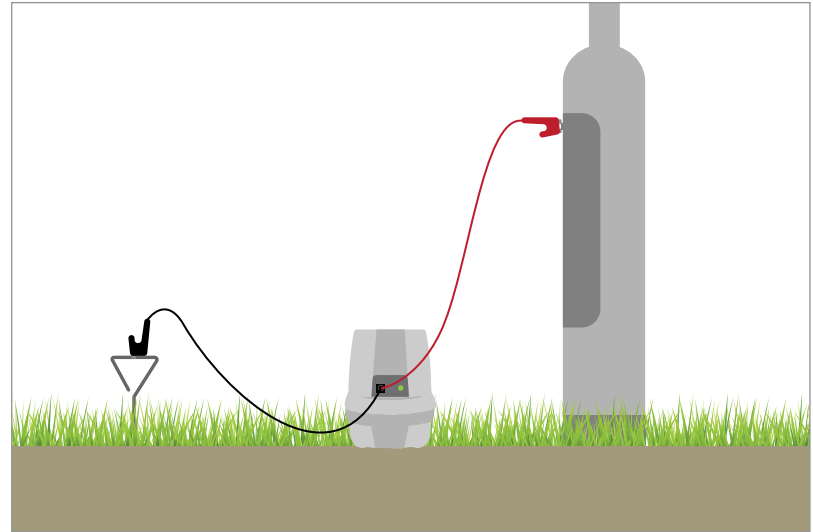
NOTE If the Signal Generator/Transmitter pitch does not change then there is no signal being transferred onto the service.

Using the Signal Generator/Transmitter: Direct Connection to street furniture

Direct Connection to a Street Lighting Column or other street furniture

The best method to determine the position and route of street lighting, car park lighting cables or any other item of street furniture with a power supply is by using a Signal Generator/Transmitter and the pipe connection method.

Follow the same rules as for connecting the Signal Generator/Transmitter to a metal pipe except attach the red Direct Connection Lead to a metal part of the OUTSIDE of the lamp column/ street furniture.



WARNING NEVER open the lamp column door to gain access to the cables, this is potentially dangerous and is not necessary.



NOTE Make sure that the Direct Connection Crocodile Clip or Magnet is not insulated from the metal of the column by paint.
NOTE If the column is concrete attach the Crocodile Clip or Magnet to the metal surround of the access door.

Using the Signal Generator/Transmitter: Signal Hopping (SGV4/MXT4 only)

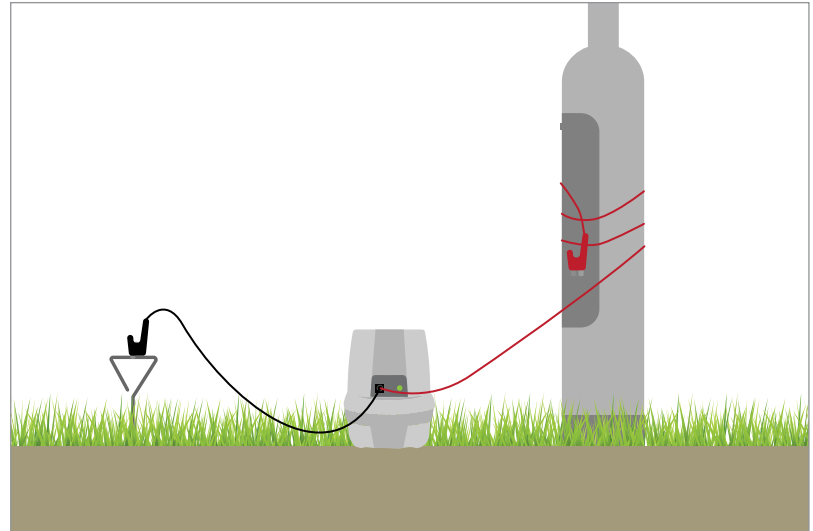
Signal Hopping using Direct Connection Leads

If it is difficult or inconvenient to use the Direct Connection method of signal application then an alternative technique called Signal Hopping can be utilised to successfully energise a street lighting or car park lighting cable with the Signal Generator/Transmitter signal.

Wrap the red Direct Connection lead around the street lighting column (two or three times if possible). This is particularly useful if it is difficult to get a good metal to metal connection between the Crocodile Clip or Magnet and the column.

The black Direct Connection lead is connected to the Earth Stake positioned away from the column.

For MXT4 Transmitter only, ensure 131kHz (HF) or CF frequency setting is selected.



NOTE If the Earth Stake cannot be inserted into the ground then simply laying it flat on the ground will often provide a successful earth connection when using the Signal Hopping technique.

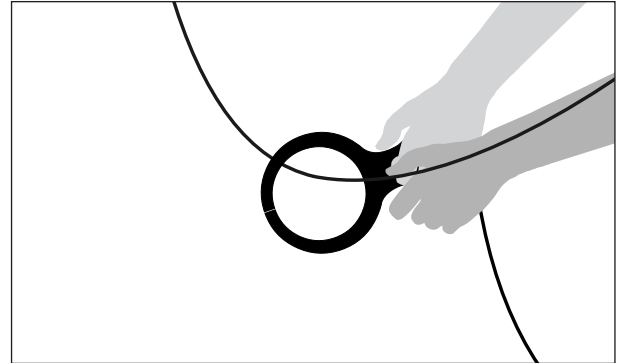
Using the Signal Generator/Transmitter: Signal Clamp

Signal Clamp

1. Plug the Signal Clamp into the Connection Socket on the Signal Generator/Transmitter.
2. Turn the Signal Generator/Transmitter on.

For MXT4 only, select either 8kHz, 33kHz or CF frequency.

3. Check that the jaws of the Signal Clamp are clean. Place the Signal Clamp AROUND the cable making sure that the jaws are able to fully close. The audible signal from the Signal Generator/Transmitter should drop in pitch indicating that the jaws have closed correctly.



WARNING NEVER attempt to place the Signal Clamp around electricity cables that are deliberately suspended out of reach. They may be unsheathed or unprotected cables.



NOTE The Signal Clamp cannot apply a signal to a cable that is not earthed at both ends such as abandoned cables that have been cut off where they appear above ground or cables supplying unearthed equipment.

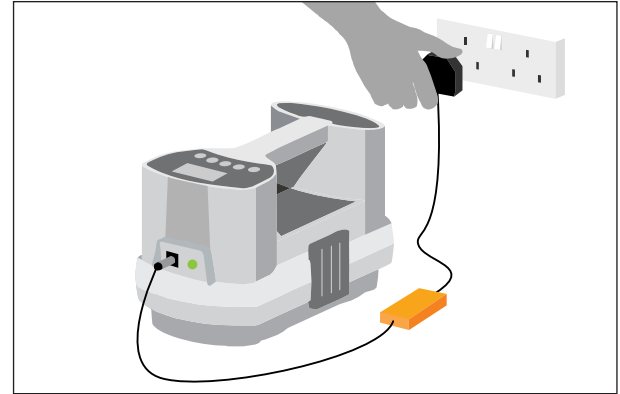
Using the Signal Generator/Transmitter: Signal Injector

Signal Injector

1. Plug the Signal Injector into the Connection Socket on the Signal Generator/Transmitter and an electric outlet.
2. Turn the Signal Generator/Transmitter on.

For MXT4 only, select either 8kHz, 33kHz or CF frequency.

3. Turn the socket on. The audible tone from the Signal Generator/Transmitter will drop in pitch to indicate a successful connection.



NOTE On two wire Protective Multiple Earth (PME) systems it may be necessary to also provide an external earth using the yellow 10 metre Auxiliary Earth Lead and Earth Stake.

NOTE Using the Signal Injector may cause the system protection to trip.

NOTE Always check with the owners that it is acceptable to interrupt the supply before connecting the Signal Injector.

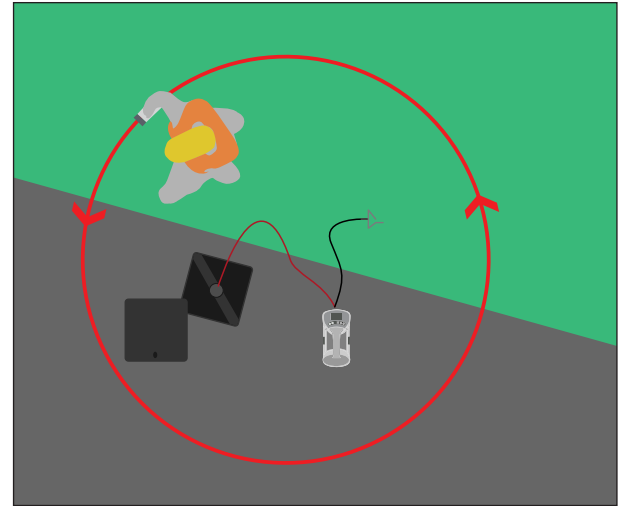


WARNING DO NOT use the Signal Injector on systems with voltages in excess of 240 volts AC. Domestic systems will normally be below this voltage.

Using the Signal Generator/Transmitter: Searching for the Direct Connected Signal

The search pattern used to find the Signal Generator/Transmitter signal when applied by a direct connection method (Direct Connection Leads, Signal Clamp or Signal Injector) is different to the normal search pattern used on Power, Radio or All/Scan Modes.

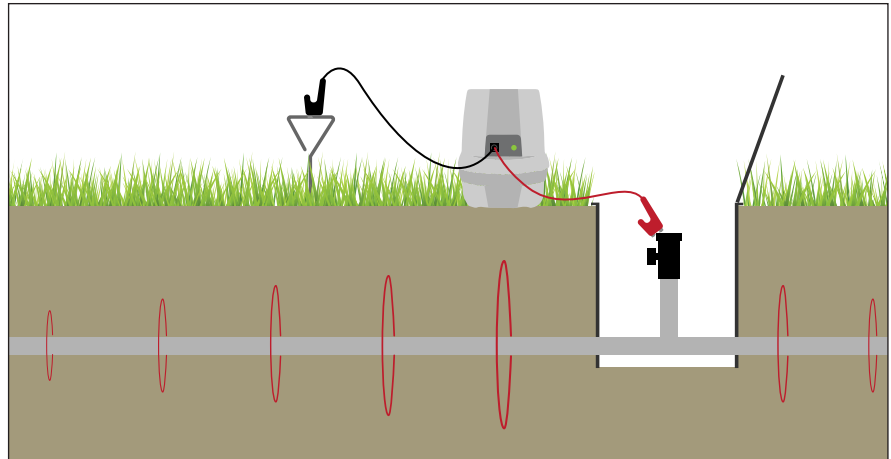
1. Move a few paces away from where the Signal Generator/Transmitter has been connected to the service. Turn the Mode Switch to Generator/Transmitter Mode. Hold the Locator so that the side of the Locator is facing towards the Signal Generator/Transmitter. *For MXT4 only, ensure that the Transmitter and Locator are set to the same frequency.*
2. Adjust the Locator sensitivity so it shows a minimal visual response and emits a minimal audible response.
3. If possible walk in a complete circle around the connection point trying to keep the same distance from this point at all times. When a signal is detected, 'pinpoint' that signal as shown in the 'Using the Locator' section.
4. Having pinpointed the first signal, do not adjust the Sensitivity Control but continue with the circle to see if any other signals are detected. If more signals are detected compare the strength of each signal by observing the bar display. The strongest signal will usually be coming from the service that the Signal Generator/Transmitter is connected to.



Using the Signal Generator/Transmitter: Tracing the Direct Connected Signal

The tracing technique used to follow the Signal Generator/Transmitter signal when applied by a direct connection method (Direct Connection Leads, Signal Clamp or Signal Injector) is almost exactly the same as the normal tracing technique used on Power, Radio or All/Scan Modes, except the signal the Locator is detecting will get weaker the further away from the Signal Generator/Transmitter that you go. It will be necessary to regularly increase the Locator Sensitivity Control to compensate for this.

For MXT4 only, having traced the signal for a short distance it may be worthwhile switching the MXT4 Transmitter to alternative frequencies to see if they give a stronger response. Choose the frequency that gives the strongest response and continue with the trace.



NOTE It is not possible to search for the signal above any leads connecting the Signal Generator/Transmitter to the service or above the Earth Lead connected to the Earth Stake.

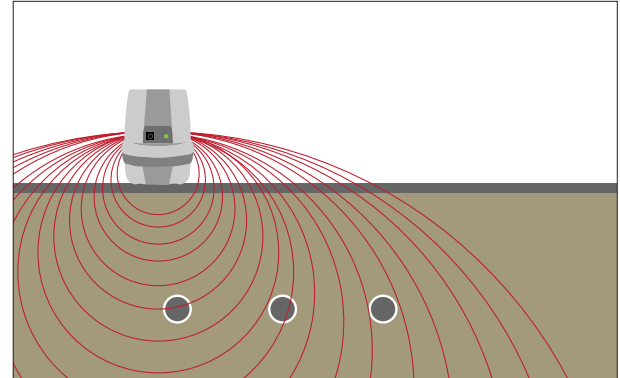
Using the Signal Generator/Transmitter: Induction

This is the standard method for inducing signals onto buried metallic services. It produces a strong signal directly below the Signal Generator/Transmitter but the signal strength drops off quite quickly either side of the Signal Generator/Transmitter.

1. Check that there are no accessories plugged into the Connection Socket. The Signal Generator/Transmitter switches automatically to Induction Mode when the socket is unused.
2. Place the Signal Generator/Transmitter upright on the ground where you suspect the services are buried. Make sure the Signal Generator/Transmitter is in line with the expected route of these services.
3. Turn the Signal Generator/Transmitter on and check that the batteries are OK.

For MXT4 only, select 8kHz, 33kHz, CF or 131kHz (HF). It is not possible to induce a 512Hz or 640Hz signal onto buried services.

4. The signal will be radiated into the ground immediately below and for approximately 3m (10') either side of the Signal Generator/Transmitter.



NOTE The closer the Signal Generator/Transmitter is to the position of the buried service then the stronger the signal will be on that service.

NOTE Only metallic services that are approximately in line with the Signal Generator/Transmitter orientation will be energised with a signal. Metallic services that are crossing the line of the Signal Generator/Transmitter will NOT be energised.

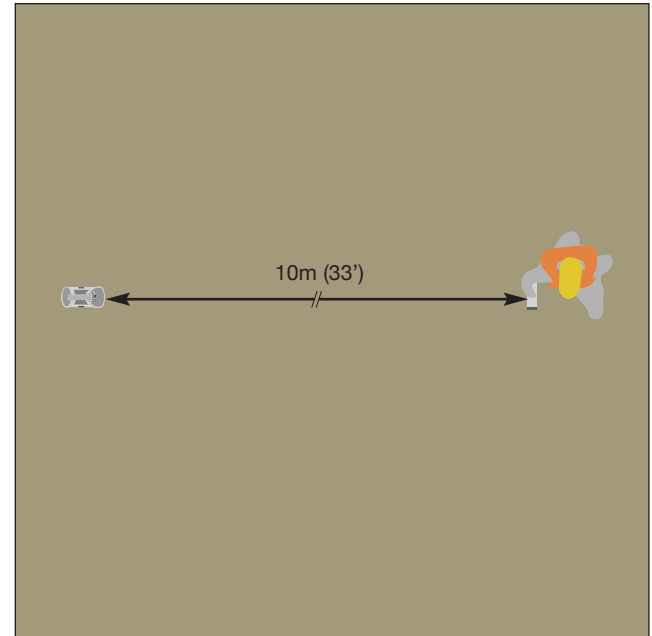
Using the Signal Generator/Transmitter: Searching for an Induced Signal

The search pattern used to find the Signal Generator/Transmitter signal when applied by Induction Mode is slightly different to the search pattern used on other modes.

1. Move AT LEAST 10m (33') away from the Signal Generator/Transmitter position with your Locator. This is to avoid the Locator picking up the airborne signal rather than the signal induced onto the buried service.
2. Stand so that you are roughly in line with the end of the Signal Generator/Transmitter and hold the Locator so that the side of the Locator is facing towards the Signal Generator/Transmitter.
3. Select Generator/Transmitter Mode.

The MXL4 Locator must be set to the same frequency as the MXT4 Transmitter.

4. Adjust the sensitivity so that the Locator shows a minimal visual response and emits a minimal audible response.



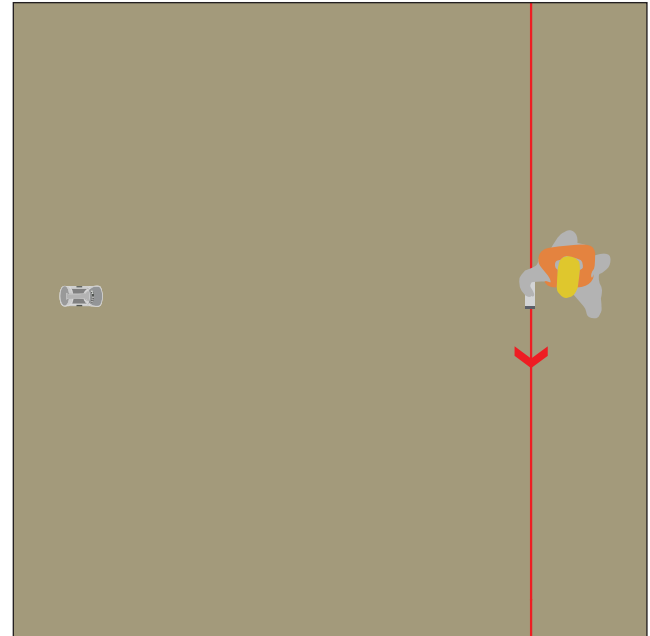
NOTE A Signal Generator/Transmitter will transmit a significant amount of signal into the air as well as into the ground. Keep the Locator upright at all times to reduce the risk of picking up the airborne signal.

Using the Signal Generator/Transmitter: Searching for an Induced Signal

5. Walk in a straight line across the end line of the Signal Generator/Transmitter. When a signal is detected 'pinpoint' that signal as shown in the 'Using the Locator' section.

If no signal is found move the Signal Generator/Transmitter 5 m (16') and try again. Continue this procedure moving the Signal Generator/Transmitter in 5 m (16') steps, following a grid pattern, until a signal can be found.

6. It may be possible to increase the strength of the induced signal on the buried service by improving the positioning of the Signal Generator/Transmitter. Once the buried service has been pinpointed, moving the position of the Signal Generator/Transmitter from side to side will give an increase or decrease in the Locator response. Remember, the closer the Signal Generator/Transmitter is to the position of the buried service then the stronger the signal will be on that service.

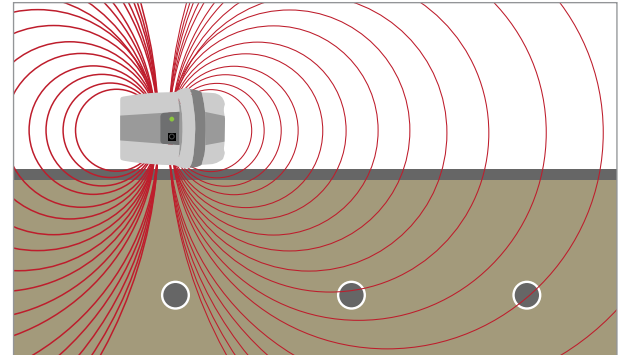


NOTE The Signal Generator/Transmitter signal that the Locator is detecting will get weaker the further away from the Signal Generator/Transmitter that you go. It will be necessary to regularly increase the sensitivity to compensate for this.

Using the Signal Generator/Transmitter: Induction: Multiple Services

It is important to check for the presence of adjacent services running close, or parallel, to the service that you have already located.

1. Check that there are no accessories plugged into the Connection Socket.
2. Turn the Signal Generator/Transmitter on and check that the batteries are OK.
3. Place the Signal Generator/Transmitter on the ground on one side over the previously located service. That service will not have a signal induced onto it.
4. Re-scan the area looking for another peak signal close to where the original signal was found. This operation should be repeated until you are satisfied that no further services can be located.



NOTE The signal will be radiated up to 3 m (9'9") either side of the Signal Generator/Transmitter but NOT directly below when the Signal Generator/Transmitter is on its side.

Limitations of Induction Method - There are limitations concerning what can be achieved when using a Signal Generator/Transmitter on the Induction Mode compared to the Connected Mode. It is not normally possible to identify what the service is that has been detected with an induced signal. If the signal can be followed far enough, a visible feature such as a valve cover or cable pit cover may be found that can indicate the identity of the service.

Cables with a very small cross section may not have enough signal induced onto them to make them detectable. It is often not possible to apply an induced signal onto just ONE specific buried service, in order to trace it alone, when other services are positioned in a close proximity.



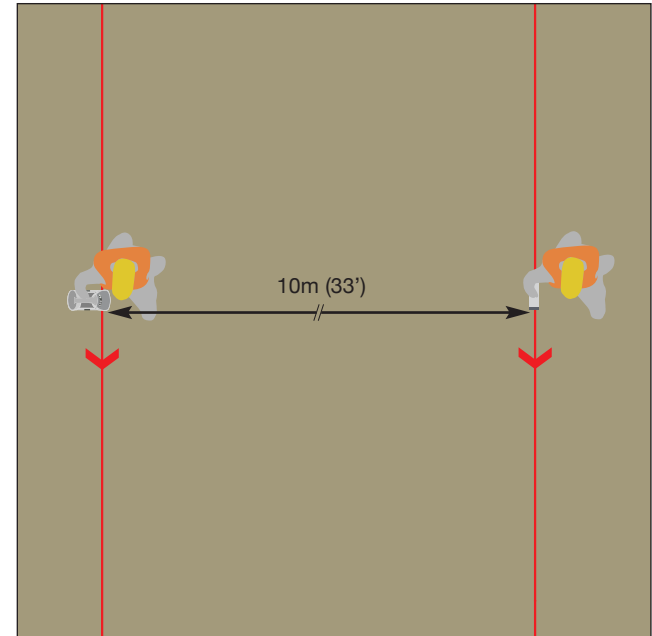
NOTE An induced signal cannot be applied to a buried service that lies beneath reinforced concrete. The reinforcing bars will re-radiate the induced signal masking any signal that has been induced onto the buried service below.

Using the Signal Generator/Transmitter: Inductive Sweep

If a large area needs to be searched for buried services then an 'Inductive Sweep' could be used. It is an ideal method for detecting the position of buried services as they cross the boundary of a large site.

An Inductive Sweep requires two people; one to operate the Locator and one to position the Signal Generator/Transmitter.

1. Stand about 10 m (33') apart.
2. The first person holds the Signal Generator/Transmitter, switched to it's lowest Output Power Level, close to the ground and 'end on' (see diagram) whilst the other holds the Locator switched to Generator/Transmitter Mode.
3. Adjust the sensitivity so that the Locator shows a minimal visual response and emits a minimal audible response.
4. Together, slowly walk across the site, staying the same distance apart and being careful to keep in line with each other. When the Signal Generator/Transmitter gets close to a buried metallic service the signal will be induced onto it and you should see this in the increased response on the Locator.
5. Immediately tell your colleague to stop and place the Signal Generator/Transmitter on the ground at that point. Now you can pinpoint the service and trace out it's route. Continue the sweep across the length and width of search area.



NOTE It is important to maintain the same distance and between the Locator and Signal Generator/Transmitter at all times.
NOTE Only metallic services that are approximately in line with the Signal Generator/Transmitter orientation will be energised with a signal. Metallic services that are crossing the line of the Signal Generator/Transmitter will NOT be energised.

Non-Metallic Pipe Tracing

Non-metallic pipes such as sewers or drains, service ducts, plastic gas and water pipes are not electrically conductive and so will not be detectable using a Locator on Power, Radio or *All* Scan Modes. It is also impossible to apply a detectable Signal Generator/Transmitter signal to the non-metallic pipe or, for that matter, to the water or gas within that pipe.

If access can be gained into the pipe then a C.Scope Sonde, Plastic Pipe Tracer or Flexible Tracer should make it possible to determine the pipes position and route.

Sondes

The C.Scope 8kHz and 33kHz General Purpose Sondes and the Duct Sonde are small, battery powered, waterproof transmitters that can be inserted into a pipe, such as a sewer, drain or cable duct. The position of the Sonde (and therefore the location of the pipe) can be pinpointed by using the Locator switched to Generator/Transmitter Mode.

The Sonde is inserted into and then moved along the pipe to the point at which the pipe needs to be located. This is normally done by fitting the Sonde to drain rods. Alternatively, the Sonde can be attached to a continuous fibreglass duct rodder, jetter hose or camera inspection system.

- The 33kHz General Purpose Sonde can be used in pipes as small as 50mm (2") in diameter and up to 7m (23') deep.
- The 33kHz Duct Sonde can be used in pipes as small as 30mm (1.1") in diameter and up to 5m (16') deep.
- The 512Hz and 640Hz Metal Pipe Sondes are able to transmit a signal from within a metal pipe. They can be used in pipes as small as 50mm (2") in diameter. The maximum depth the Metal Pipe Sonde can be detected will depend on the pipe material and wall thickness.



NOTE An 8kHz or 33kHz Sonde will NOT transmit a signal through a metal pipe.

Non-Metallic Pipe Tracing: Sonde Batteries

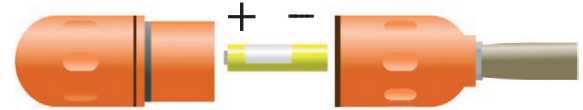
General Purpose Sonde and Metal Pipe Sonde

The General Purpose Sonde is available in two frequencies; 33kHz (orange casing) or 8kHz (green casing) and is powered by a single standard alkaline or Nickel-Metal Hydride rechargeable (NiMH) AA (LR6) size battery.

The Metal Pipe Sonde (red casing) is available in two frequencies; 512Hz and 640Hz, and is powered by a single alkaline AA (LR6) size battery. The frequency of the Sonde is indicated on the label within the battery compartment.

The 8kHz General Purpose Sonde and 512Hz or 640Hz Metal Pipe Sondes can only be used with the MXL4 Locator.

1. To turn the Sonde on, separate the two halves of the Sonde casing. Insert a new battery into the battery compartment with the positive end down.
2. Screw the two halves of the Sonde together being careful not to over tighten them. The Sonde is now transmitting a signal.
3. To turn the Sonde off the battery must be removed or reversed.



NOTE Only use an alkaline or Nickel-Metal Hydride rechargeable (NiMH) AA (LR6) size battery.

NOTE Dispose of the used battery safely in accordance with local regulations.

NOTE Always use a new battery in a Sonde if you expect to take a long time to trace the pipe or duct route.



WARNING The Locator must always be set to Generator/ Transmitter Mode when using the Sonde.

For the MXL4 Locator, the correct frequency must also be selected.

Non-Metallic Pipe Tracing: Duct Sonde Batteries

33kHz Duct Sonde

The Duct Sonde (yellow casing) transmits at 33kHz and is powered by a single AAA (LR03) size alkaline battery. Rechargeable batteries are not recommended for this product.



1. To turn the Duct Sonde on, use a large flat bladed screwdriver to unscrew the battery cover located within the hollow end of the Sonde casing. Insert a new battery into the battery compartment with the positive end down.
2. Replace the battery cover fully using the screwdriver to secure. The Duct Sonde is now transmitting a signal.
3. To turn the Sonde off the battery must be removed.



NOTE Only use an alkaline battery.

NOTE Dispose of the used battery safely in accordance with local regulations.

NOTE Always use a new battery in a Sonde if you expect to take a long time to trace the pipe or duct route.



WARNING The Locator must always be set to Generator/ Transmitter Mode when using the Sonde.

For the MXL4 Locator, the correct frequency must also be selected.

Non-Metallic Pipe Tracing: Tracing a Sonde

The technique used to determine the position of a Sonde is always the same irrespective of which Sonde is being used.

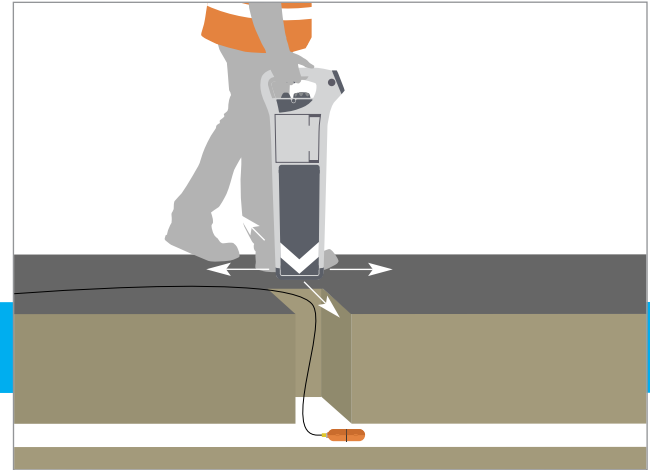
Before inserting the Sonde into the pipe it is best to set up the Locator so that the Sensitivity is correctly adjusted to suit the pipe depth. This is much easier to do when the Sonde is visible at the bottom of the manhole rather than already some distance up the pipe.

The blade of the Locator must be held **IN LINE** with the Sonde at all times.



NOTE This is at 90° to the way in which the Locator is held for most other locating tasks.

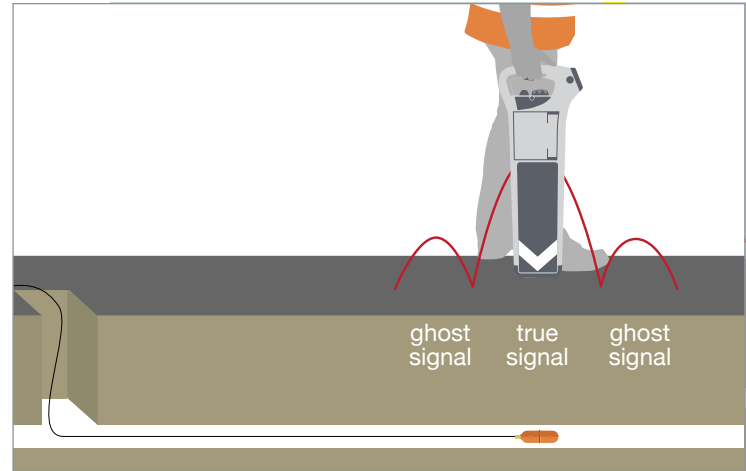
1. Turn the Locator to Generator/Transmitter Mode and switch on. *For the MXL4 Locator, the correct frequency must also be selected.* Check the Battery Level Indicator to confirm the Locator batteries are usable. Replace if necessary.
 2. Keeping the blade of the Locator in line with the Sonde, move the Locator **backwards and forwards** over the length of the Sonde. Adjust the Sensitivity until a clear peak response is shown on the display as the Locator passes directly over the position of the Sonde.
- Still keeping the blade of the Locator in line with the Sonde, now move the Locator from **side to side** over the position of the Sonde. A similar peak response should be seen on the display as the Locator passes directly over the position of the Sonde. The Locator is now set up ready for tracing the Sonde.
3. Push the Sonde up the pipe.



Non-Metallic Pipe Tracing using a Sonde: Tracing a Sonde

4. With the Locator turned on, walk from the pipe access point in the direction that the Sonde was pushed. A strong peak signal directly over the Sonde should be detected with two lesser 'ghost' signals found, one in front of and one behind the Sonde's true position. These ghost signals are always weaker than the main signal and should not be mistaken for the true Sonde signal.
5. Pinpoint the Sonde's exact position by moving the Locator first backwards and forwards and then from side to side to get the peak response on both occasions.
6. Push the Sonde further up the pipe and repeat the pinpointing process.

See page 48 for depth measurement using a Sonde.

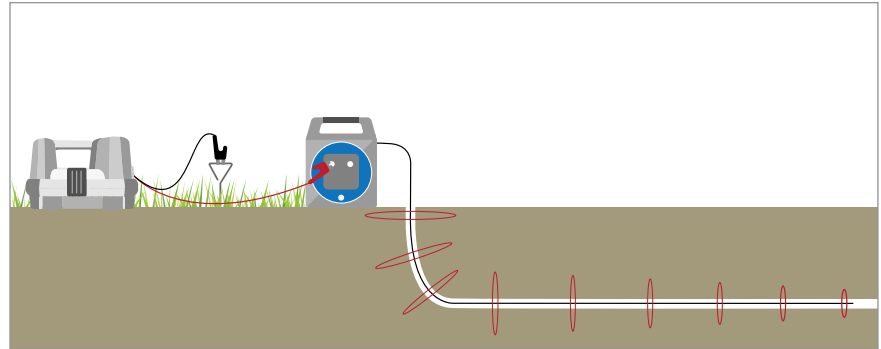


Non-Metallic Pipe Tracing: Plastic Pipe Tracers/Flexible Tracer

The Plastic Pipe Tracers and Flexible Tracer can be used in small diameter non-metallic pipes that normal Sondes cannot fit into. Two methods of detecting and tracing can be used: line tracing and end tracing.

For **Line Tracing**, the Plastic Pipe Tracer needs to be inserted into the pipe before a signal from the Signal Generator/Transmitter is applied to the length of the Tracer. The slip-ring mechanism of the Flexible Tracer allows the Signal Generator/Transmitter to be connected before it is inserted into the pipe.

The 33kHz, CF or HF Signal Generator/Transmitter signal is applied using the 'Direct Connection to a metal pipe' method. Connect the red Direct Connection Lead to the red terminal of the Plastic Pipe Tracer/ Flexible Tracer. Connect the black lead to the Earth Stake. Leave the other terminal of the Plastic Pipe Tracer/ Flexible Tracer unconnected.



WARNING Authorisation may be required before using the Plastic Pipe Tracer/ Flexible Tracer on some pipes or ducts.



NOTE It is important that a change of pitch is heard when making the connections to ensure that there is a detectable signal present on the Tracer.

NOTE The Signal Generator/Transmitter signal is unlikely to travel the entire length of the Tracer within the pipe. Never assume that you have located the end of the Tracer on Line Tracing Mode. Use End Tracing if required.

NOTE The Plastic Pipe Tracer and Flexible Tracer can be used inside a metal pipe or duct but the signal will transfer onto the pipe or duct itself.

Non-Metallic Pipe Tracing: Plastic Pipe Tracers/Flexible Tracer

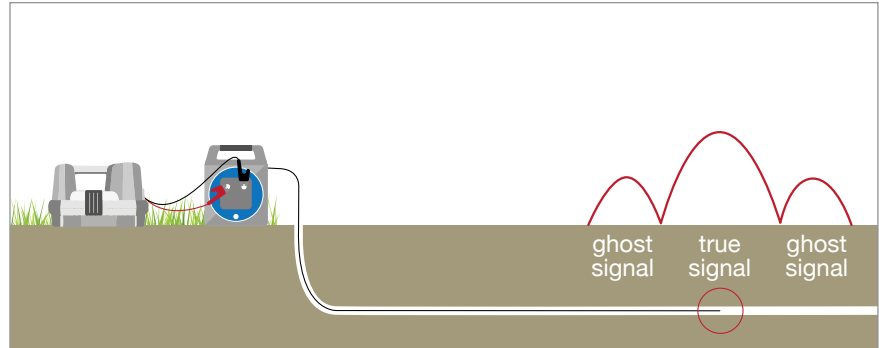
End Tracing

The very tip of the Plastic Pipe Tracer/ Flexible Tracer can be energised with the signal from a Signal Generator/ Transmitter. It is acting much like a Sonde and offers a very reliable way of pinpointing the position of the tip. Pipes and ducts up to 4 m (13') deep can be traced.

The Signal Generator/Transmitter signal is applied by connecting the red Direct Connection Lead to the red terminal on the Tracer and the black Earth Lead to the other terminal. As the second connection is made a change of pitch should be heard from the Signal Generator/Transmitter signal indicating successful connection.

For MXT4 only, select 33kHz or CF frequency.

The tip of the Plastic Pipe Tracer/ Flexible Tracer is then pinpointed using the same technique as for Sonde tracing with the Locator blade always in line with the Tracer.



WARNING Authorisation may be required before using the Plastic Pipe Tracer/ Flexible Tracer on some services.



NOTE It is important that a change of pitch is heard when making the connections to ensure that there is a detectable signal present on the Tracer.

NOTE End Tracing is the ideal method to determine where the end of the pipe is but does not give the route of the pipe.

NOTE The Plastic Pipe Tracers and Flexible Tracer do not work on End Tracing mode when inside a metal pipe or duct.

Depth Measurement: Metallic Services (DXL4 and MXL4 Locators only)

The DXL4 and MXL4 Locators can be used in conjunction with the Signal Generator/Transmitter, Sonde, Plastic Pipe Tracer or Flexible Tracer to indicate the depth of a buried service.

Depth cannot be measured on the Power, Radio or AllScan Modes.

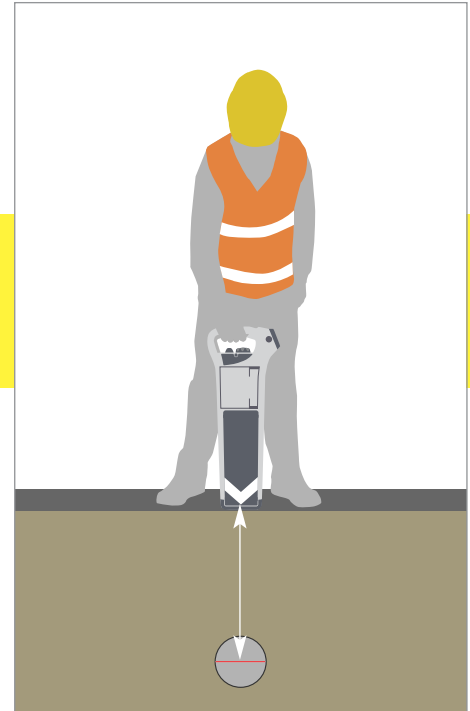
For the MXL4 Locator, depth measurements can be taken from a 512Hz, 640Hz, 8kHz, 33kHz, CF or HF (131kHz) signal.



WARNING The depth indication **MUST NOT** be used to decide if mechanical digging over the buried service is appropriate.

WARNING If the following procedure for Depth Measurement is not followed then an inaccurate depth may be indicated. This is worse than having no depth information at all.

1. The Signal Generator/Transmitter must be set to 'Continuous' signal output, not 'Pulsed' output.
2. It is vital that the signal being measured is a good quality signal. This is best achieved by using the Signal Generator/Transmitter in Connected Mode rather than Induced Mode.
3. Set the Locator to Generator/Transmitter Mode and pinpoint the position of the buried service. Make sure the Locator is directly over, and at right angles to the route of, the buried service. Rest the Locator on the ground with the body vertical.



WARNING If the pinpointing of the service is inaccurate then the Depth Measurement will be inaccurate.



NOTE A poor quality signal is indicated by an unstable visual response on the Locator. Depth Measurement may be inaccurate in these circumstances.

Depth Measurement: Metallic Services (DXL4 and MXL4 Locators only)

4. Press and hold down the depth button. The depth will be shown on the display.
5. The depth can be verified by lifting up the Locator whilst keeping the depth button depressed. The depth indication should increase by the same amount that the Locator has been raised.

Limitations of Depth Measurement

There are some situations where it is not possible to gain accurate depth information:

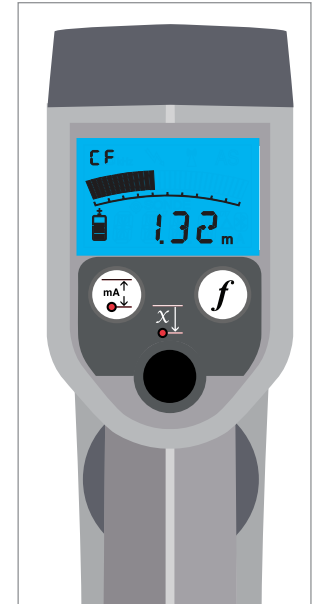
- A curve or bend in the route of the service.
- Close to where the service changes in depth.
- Near to a 'T' junction in the service.
- At the very end point of a service.
- At any point where the signal has coupled onto an adjacent service.
- Close to any large metallic objects such as metal fences or vehicles.
- Within 25 m (82') of the position of the Signal Generator/ Transmitter if used on Induction Mode.
- Under reinforced concrete.
- The signal is of poor quality.
- Too close to the Signal Generator/ Transmitter or leads if used in Connected Mode.

Depth Measurement: Error Readings of Metallic Services

The Locator may show the following error codes when attempting a Depth Measurement:

1. 000 - The metallic service is too shallow for the Locator to obtain an accurate depth, less than 0.1m (4"). It should be possible to calculate the depth by raising the Locator a set amount and then carrying out the Depth Measurement again. The '000' Error will also display if the signal is not strong enough for the Locator to give a reliable depth measurement.
2. 888 - The metallic service is too deep for the Locator to measure its depth or there is no signal present.
3. OVER - Overload. The signal is too strong for the Locator to give a reliable depth measurement.

Note: Metric MXL4 pictured



NOTE The depth shown will be to the centre of the service and is not the depth of cover. This is of greater significance on large diameter pipes. Reading is to the nearest 0.01m.

NOTE AlarmZone™ will activate if the service is too close to the Locator. To measure shallow depths turn AlarmZone™ off temporarily as described on page 17.

Depth Measurement: Non-Metallic Pipes using Sondes/Plastic Pipe Tracers/Flexible Tracer (*DXL4 and MXL4 Locators only*)

i NOTE The following instructions apply equally to all Sondes, Plastic Pipe Tracers and the Flexible Tracer in End Tracing Mode.

1. Pinpoint the exact position of the Sonde or Plastic Pipe Tracer/Flexible Tracer tip. Take care to ensure that you are not over one of the two 'ghost' signals in front of and behind the true position.
2. Rest the Locator on the ground, keeping it vertical and IN LINE with the Sonde or Tracer tip.
3. **IMPORTANT. Push the depth button TWICE and hold on the second push, to select Sonde Depth Mode.** The word 'SONDE' will flash on the display and the depth will then be displayed (see picture). If the word 'SONDE' is not displayed then the depth reading will be inaccurate.

i NOTE The depth shown is that of the Sonde and NOT of the pipe.

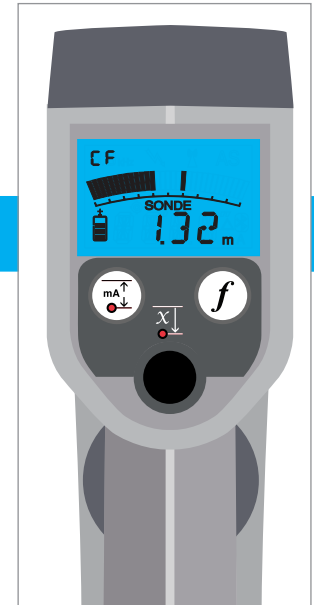
Depth Measurement: Error Readings of Non-Metallic Pipes using Sondes/Plastic Pipe Tracers/ Flexible Tracer

The Locator may show the following error codes when attempting a Depth Measurement to a Sonde or the tip of a Plastic Pipe Tracer or Flexible Tracer:

1. 000 - The Sonde/Plastic Pipe Tracer/ Flexible Tracer is too shallow for the Locator to obtain an accurate depth, less than 0.1m (4"). It should be possible to calculate the depth by raising the Locator a set amount and then carrying out the Depth Measurement again. The '000' Error will also display if the signal from the Sonde/Plastic Pipe Tracer/ Flexible Tracer is not strong enough for the Locator to give a reliable depth measurement.
2. 888 - The Sonde/Plastic Pipe Tracer/ Flexible Tracer is too deep for the Locator to measure its depth or there is no signal at all present.
3. OVER - Overload. The signal from the Sonde/Plastic Pipe Tracer/ Flexible Tracer is too strong for the Locator to give a reliable depth measurement.

i NOTE AlarmZone™ will activate if the Sonde/Plastic Pipe Tracer/Flexible Tracer is too close to the Locator. To measure shallow depths turn AlarmZone™ off temporarily as described on page 17.

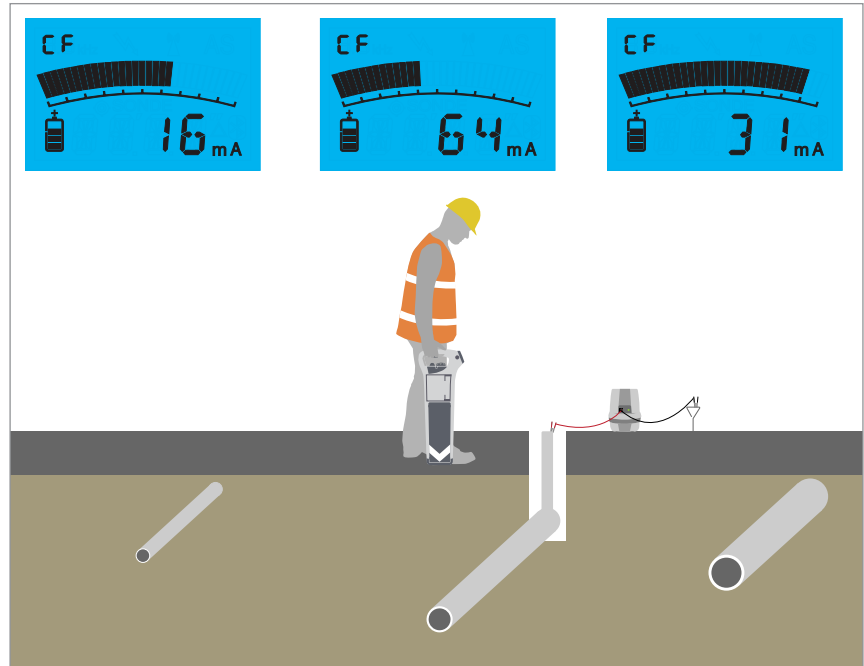
Note: Metric MXL4 pictured



Signal Current Measurement (MXL4 Locator only)

For MXL4 Locator only, Signal Current Measurement is a feature by which it is possible to measure the TRUE strength of the MXT4 Transmitter signal on a buried metal pipe or cable irrespective of depth. This is a useful aid for the correct identification of specific pipes and cables and may also help to determine the layout and condition of a pipe or cable network.

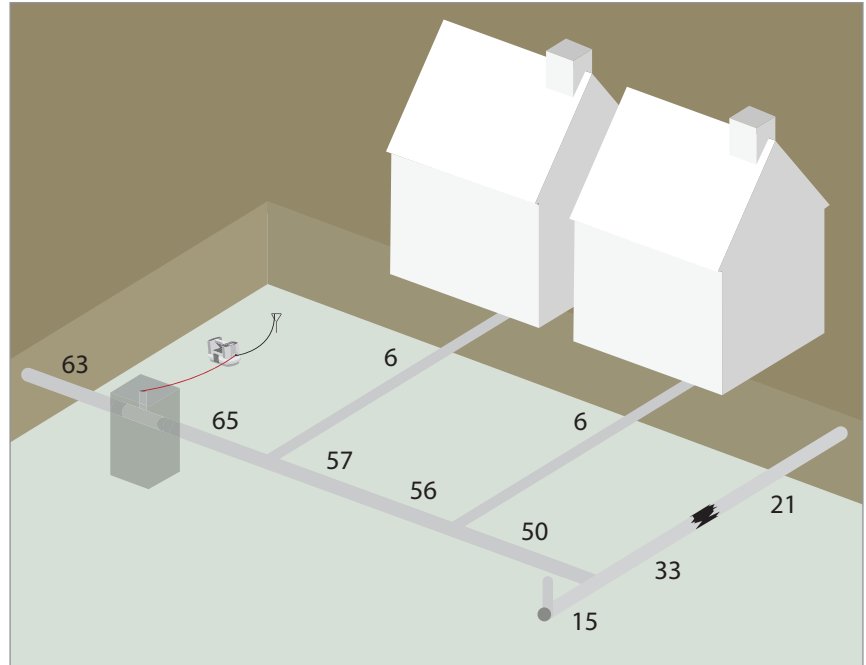
When the Transmitter has been connected to a particular "target" service, the Locator may not always show the strongest response over that service. If the target pipe or cable happens to be much deeper than other services, which have picked up some of the Transmitter signal, these other services may show similar responses. However, the Signal Current reading will invariably be highest on the target pipe or cable therefore aiding correct identification.



Signal Current Measurement (*MXL4 Locator only*)

Signal Current Measurement can also help to identify the layout of pipe and cable networks as the main line after a 'T' will have most of the Signal Current remaining on it whereas the shorter connection will have correspondingly less.

The Signal Current reading should also reduce at a uniform rate as the distance from the Transmitter increases. A sudden drop in Signal Current, in a short distance, indicates a change to that service such as an unknown connection, an insulated joint or a break in the pipe or cable.

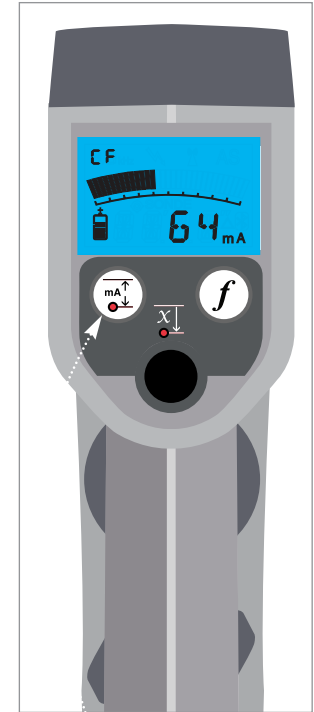
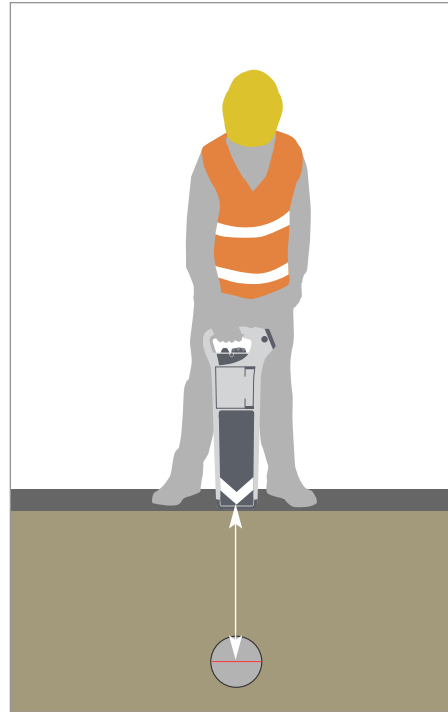


Signal Current Measurement (*MXL4 Locator only*)

To ensure reliable Signal Current readings it is vital to adhere to the same best practises as are used to give accurate Depth Measurement readings.

1. Only apply the signal by a Connection method (Direct Connection, Signal Clamp or Signal Injector) to the target service.
2. The Transmitter must be set to Continuous signal output, NOT Pulsed output.
3. Set the Locator to Transmitter Mode, select the correct frequency and pinpoint the position of the buried service. Make sure the Locator is directly over the buried service and at right angles to it's route. Rest the Locator on the ground with the body vertical.
4. Press and hold down the Signal Current button. The Signal Current reading will be shown on the display, measured in mA.

Allow the Signal Current reading to stabilise.



Signal Current Button



NOTE The Signal Current figure alone does not provide any useful information. It is how this figure compares to other Signal Current readings taken on other services or at different points along the target service that can indicate the layout and identity of the network.

Signal Current Measurement (*MXL4 Locator only*)

Limitations of Signal Current Measurement

There are some situations where it may not be possible to gain an accurate Signal Current Measurement reading:

- *At a sharp curve or bend in the route of the service.*
- *At a T junction in the service.*
- *At the very end point of the service.*
- *Close to any large metallic objects such as metal fences or vehicles.*
- *Within 25 m (82') of the position of the Transmitter.*
- *If the signal is of poor quality.*

Locator: Function Checks

The CXL4, DXL4 and MXL4 Locators have an in-built Self Test feature that automatically tests the Locator's circuits and receiving aerials for correct performance each day (see pages 12-13).

If you wish to carry out additional checks or to test the Locator's functionality more than once a day then the following procedures can be used:

Battery Condition

Check the Locator battery condition by depressing the On/Off Switch beneath the handle.

The display will show at least two solid segments if the batteries are OK. Ensure power on tone is heard.

Power Mode

Select Power Mode. Set sensitivity fully clockwise and point the base of the Locator at a fluorescent light from a distance of 1 m (3'). Switch the light on. A loud tone should be heard and the display should read greater than 50% full scale. Reducing the sensitivity should cause the displayed reading to reduce and the tone to cut out.

Radio Mode

Select Radio Mode. Set the sensitivity fully clockwise and, from a distance of less than 0.25m (10"), point the base of the Locator at a metal conductor of length greater than 100 m (330'), for example a metal pipe or cable. A warbling tone should be heard. The display should read greater than 50% full scale.

All Scan Mode

Select All Scan Mode. Repeat the same tests that were used to function check the Power and Radio Modes.



NOTE These Function Checks are approximate only. If a deterioration in performance is suspected for any reason, the equipment should not be used. It should be returned to C.Scope or a C.Scope Authorised Service Centre for more thorough investigation.

Locator: Function Checks

Generator/Transmitter Mode

Locate an outdoor test area that is free from overhead and underground cables and metal pipes.

The area should also not be near fences, steel framed buildings, or on reinforced concrete.

Place the Signal Generator/Transmitter on the ground and switch on - a tone should be heard.

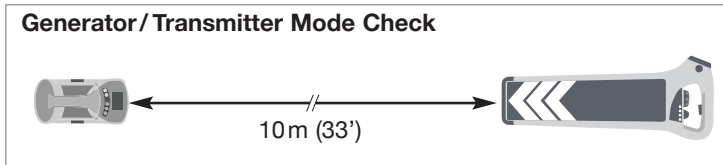
Set to Continuous and ensure lowest Output Power is selected. *For the MXT4 Transmitter, set to CF frequency.*

With the Locator in the orientation shown, select Generator/Transmitter Mode. *For the MXL4 Locator, set to CF frequency.*

Rotate sensitivity fully clockwise. The results in the table below should be indicated.

Reducing the sensitivity should cause the displayed reading to reduce and the tone to cut out.

For the MXL4 Locator only, repeat with both Transmitter and Locator set to 8kHz. The results should be the same.



DISTANCE	MODE	AUDIO	METER
6 m (20')	Generator/Transmitter	Present	Full scale
24 m (80')	Generator/Transmitter	Less than at 6m (20')	Less than Full scale



NOTE These Function Checks are approximate only. If a deterioration in performance is suspected for any reason, the equipment should not be used. It should be returned to C.Scope or a C.Scope Authorised Service Centre for more thorough investigation.

Signal Generator/Transmitter: Function Checks

The SGV4 Signal Generator and MXT4 Transmitter have an in-built Self Test feature that automatically tests the Locator's circuits and transmitting aerials for correct performance each day (see pages 24-25). A Self Test can also be initiated manually by holding down the Pulse/Continuous button while the Signal Generator/Transmitter is switched on.

If you wish to carry out additional checks or to test the Signal Generator/Transmitter functionality more than once a day then the following procedures can be used:

Battery Condition

Turn the Signal Generator/Transmitter on and check batteries are in good condition (see pages 22-23). Replace or recharge batteries if necessary.

Induced Mode

This can only be checked in conjunction with a Locator as described on the previous page. If the unit does not meet the performance expected, repeat the test with another Locator to determine whether the Signal Generator/Transmitter is at fault.

Connected Mode

Set the minimum Output Power Level, insert the Direct Connection Lead and the 10 metre Auxiliary Earth Lead and then connect the red lead Crocodile Clip to the Auxiliary Earth Lead Crocodile Clip. The pitch should change to a low tone.

The leads should be arranged to create an open loop on the ground of approximately 1m (3') in diameter. Check that a signal can be detected by the Locator in Generator/Transmitter Mode when pointed closely at the loop.



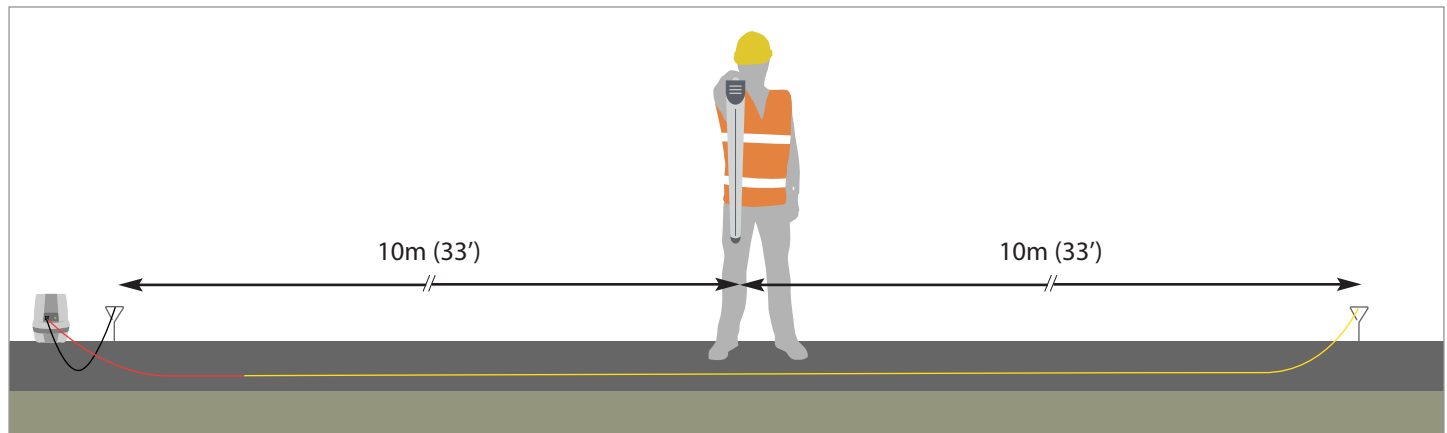
NOTE These Function Checks are approximate only. If a deterioration in performance is suspected for any reason, the equipment should not be used. It should be returned to C.Scope or a C.Scope Authorised Service Centre for more thorough investigation.

Locators: Depth Measurement Function Checks (*DXL4 and MXL4 only*)

An area clear of services and metal structures should be chosen (beware of reinforced concrete car parks). A search with the DXL4 or MXL4 in all modes will help confirm the absence of other services. An insulated cable or wire (not supplied) over 20 m (70') long is laid out on the ground and the far end connected to a ground stake and earthed. The near end is connected to the red Direct Connection Lead.

The black Earth Lead should be laid at right angles to the 20 m (70') cable and earthed at the far end with the Earth Stake. The plug should be inserted in the Direct Connection Socket of the Signal Generator/Transmitter.

The Signal Generator/Transmitter is turned on to the lowest Output Power Level and Continuous Mode. The Locator should then be held vertically above the longer cable, approximately midway along it and the depth can then be measured. It is best to make a few readings at different depths. *For MXL4 Locators only, this procedure can then be repeated using 512Hz, 640Hz or 8kHz.*



NOTE These Function Checks are approximate only. If a deterioration in performance is suspected for any reason, the equipment should not be used. It should be returned to C.Scope or a C.Scope Authorised Service Centre for more thorough investigation.

Data Logging: Locators

Data Logging

All CXL4, DXL4 and MXL4 Locators automatically record and store how they are being operated. Over 12 months of data (in normal use) can be stored before being overwritten. This data records exactly **how** the Locator has been used, precisely **when** and for **how long**. *The CXL4-DBG, DXL4-DBG and MXL4-DBG models have in-built GPS technology which records **where** they are being used.*

All models also record every automatic Daily Self Test undertaken.

It is therefore possible to keep a full audit trail of both the activity of the Locator and its functionality.

This data can be transferred to a PC, for immediate analysis and storage, using a USB A male to mini B cable connected to the on-board data connection socket, situated inside the Battery Compartment. *The CXL4-DBG, DXL4-DBG and MXL4-DBG model Locators also have additional Bluetooth™ technology allowing this data to be wirelessly transferred to a smartphone or tablet and then emailed to a PC for analysis.*

More detailed information on Data Logging is available at cscopelocators.com/data-logging/.

Data Analysis using PC Toolkit

The C.Scope PC Toolkit is capable of storing and analysing data from a single Locator or a fleet of Locators. The PC Toolkit tabulates the downloaded data and then creates simple charts and tables that summarise the activity patterns. This can help to quickly identify correct or incorrect usage patterns and any potential training requirements.

The C.Scope PC Toolkit and User Guide is available and free to download at cscopelocators.com/toolkit.

C.Scope Relay App to transfer stored data using Bluetooth™ technology

(CXL4-DBG, DXL4-DBG and MXL4-DBG model Locators only). The Relay App allows immediate on-site transfer of data from a Locator via a smartphone or tablet to a PC. Data can be transferred live or it can be downloaded after a survey is complete. The App shows the locator data on maps and supports exports to Google Maps or Google Earth which can be viewed on most devices.

The C.Scope Relay App is free-to-download on Google Play and App Store. Open the appropriate Application store on a smartphone or tablet and search for 'C.Scope Relay'. The User Guide for C.Scope Relay App is available to download at cscopelocators.com/technical-support/#documentation.



NOTE We recommend that you regularly use the PC Toolkit with your locator to get the latest features and improvements from C.Scope. The PC Toolkit automatically checks and updates the firmware on your locator each time you use it. Download the PC Toolkit from cscopelocators.com/toolkit.

Data Logging: Signal Generators/Transmitters

Data Logging

The SGV4 Signal Generators and MXT4 Transmitters automatically record and store how they are being operated. Over 12 months of data (in normal use) can be stored before being overwritten.

*This data records **how** the Signal Generator/Transmitter has been used, precisely **when** and for **how long**.*

The SGV4 and MXT4 also record every Automatic Daily Self Test and any manual Self Test.

It is therefore possible to keep a full audit trail of both the activity of the Signal Generator/Transmitter and its functionality.

This data can be transferred to a PC, for immediate analysis and storage, using a USB A male to mini B cable connected to the on-board data connection socket, situated on the underside of the Signal Generator/Transmitter.

This socket is easily accessible by removing the Accessory Tray. After data transfer, always replace the protective cover over the connection socket.

More detailed information on Data Logging is available at cscopelocators.com/data-logging/ .

Data Analysis using PC Toolkit

The C.Scope PC Toolkit is capable of storing and analysing data from a single Signal Generator/Transmitter or a fleet of Signal Generators/Transmitters. The PC Toolkit tabulates the downloaded data and then creates simple charts and tables that summarise the activity patterns. This can help to quickly identify correct or incorrect usage patterns and any potential training requirements.

The C.Scope PC Toolkit and User Guide is available and free to download at cscopelocators.com/toolkit .

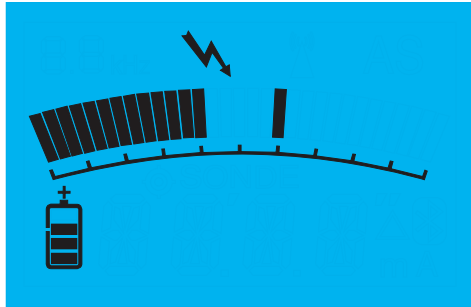
GPS and Bluetooth™: Locators

The CXL4-DBG, DXL4-DBG and MXL4-DBG Locators have in-built GPS and Bluetooth™ technology.

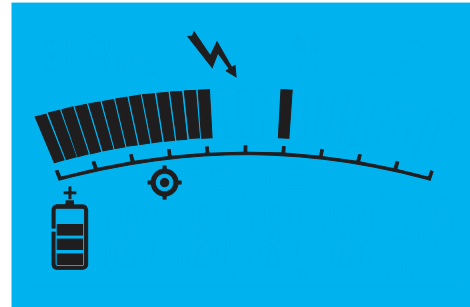
In-built GPS

The GPS technology allows the geographical position of the Locator to be recorded. To allow this to happen the Locator will first need to detect and then lock on to a signal from a suitable satellite. This process can sometimes take a little time to complete but will not interfere with the Locator's ability to detect underground pipes and cables.

If the GPS symbol does not appear on the Locator display then the Locator is in the process of acquiring a GPS signal.



When the Locator has acquired a GPS signal, the GPS symbol will flash on the Locator display.



External GPS

Locators with Bluetooth™ can be connected to external GPS units. Consult the external GPS unit manufacturer for further instruction.

Bluetooth™

The Bluetooth™ symbol will appear on the display when the Locator has Bluetooth™ connectivity.

More detailed information on GPS is available from the C.Scope website at cscopelocators.com/gps/.



NOTE GPS data is logged by the Locator and can be transferred to a PC via USB or to a smartphone via Bluetooth™.

NOTE To acquire a GPS signal, place the Locator somewhere with a clear view of the sky and leave it turned on until the Locator display indicates that a GPS signal has been acquired. When the Locator is used for the first time or at a significant distance from the place it last received a GPS signal it could take appreciably longer to identify a location accurately.

General Symbols

Warning - Refer to manual.



Waste electrical products should not be disposed of with household waste. Please recycle where facilities exist. Check with your local authority or retailer for recycling advice.
(In the UK visit www.recycle-more.co.uk)



Conforms to EC safety requirements.



Tested to harmonised standards.
Some restrictions on use in some EC countries.
Contact Local Authorities.



Double Insulated.



CXL4 and DXL4 Locators: Technical Specifications

Controls	On/Off Switch: Spring loaded trigger switch under handle Function Select Switch (FOUR position): P. Power Mode; R. Radio Mode; G. Generator Mode; A. All Scan Mode Sensitivity Control <i>For DXL4 only Depth Button. Push button for live display of depth</i>
Audio Indication	Removable and user replaceable loudspeaker module
Visual Indication	Multi-segment Liquid Crystal Display indicating: Signal Strength; Mode selected; AlarmZone™; Battery Condition; Self Test Indicator <i>For CXL4-DBG and DXL4-DBG only, GPS signal detected, Bluetooth™ activated</i> <i>For DXL4 only in Generator Mode, Depth Measurement</i>
Data Logging	Internal capacity for storing over 12 months of data (in normal use) logged once per second Data logged includes Time/Date, Mode, Sensitivity Level, Received Signal Level, Frequency, Depth, Self Test Result, Swing Indicator <i>For CXL4-DBG and DXL4-DBG only, GPS position</i>
Bluetooth™	Bluetooth 2.1
GPS	GPS/QZSS/GLONASS/SBAS
Data Connector	Standard USB Mini B connector in battery compartment. USB 2.0 Compatible
Self Test	Automatic Daily Self Test
Swing Indicator	Audio beep to indicate incorrect use of the Locator
Generator Mode Frequencies	Simultaneous 131,072Hz and 32,768Hz
Construction	Case moulded from high impact plastic. Designed to withstand 1m (3'3") drop onto a hard surface
Weight (including batteries)	2.65kg (5lb 13oz)
Dimensions	720mm x 280mm x 65mm (28.3" x 11" x 2.5")
Performance	Locate Accuracy: better than 10% of depth Depth Accuracy: ±5% @ 1m (3'3") Line Depth Measurement Range: 0.1m to 9.99m (4" to 32') Line Depth Resolution: 0.01m (0.4") Sonde Depth Measurement Range: 0.1m to 9.99m (4" to 32') depending on Sonde type Sonde Depth Resolution: 0.01m (0.4")
Battery Type	Internal 8 x 'AA' (LR6) cells (either alkaline non-rechargeable or NiMH rechargeable)
Battery Life	40 hours intermittent use at 20°C (68°F) using alkaline cells
IP Rating	65

Notes: Performance figures stated can be affected by site parameters such as ground conditions, temperature, and strong electromagnetic fields.

Specification may be subject to change.

All C.Scope Locators are in compliance with the essential requirements and other relevant provisions of Council Directive 2014/30/EU (EMC).

Compliance has been demonstrated by testing representative samples to the relevant harmonised standards.

All C.Scope Locators comply with the essential requirements and other provisions of Council Directive 2011/65/EU (RoHS).

MXL4 Locator: Technical Specifications

Controls	On/Off Switch: Spring loaded trigger switch under handle Function Select Switch (FOUR position): P. Power Mode; R. Radio Mode; T. Transmitter Mode; A. All Scan Mode Sensitivity Control Depth Measurement Button. Push button for live display of depth Current Measurement Button. Pushbutton for live display of Transmitter current Frequency Select Button. Pushbutton for Transmitter Mode frequency selection
Audio Indication	Removable and user replaceable loudspeaker module
Visual Indication	Multi-segment Liquid Crystal Display indicating: Signal Strength; Mode selected; AlarmZone™; Battery Condition; Self Test Indicator In Transmitter Mode, Frequency selected; Depth Measurement; Signal Current Measurement <i>For MXL4-DBG only, GPS signal detected, Bluetooth™ activated</i>
Data Logging	Internal capacity for storing over 12 months of data (in normal use) logged once per second Data logged includes Time/Date, Mode, Sensitivity Level, Received Signal Level, Frequency, Depth, Signal Current Measurement, Self Test Result, Swing Indicator <i>For MXL4-DBG only, GPS position</i>
Bluetooth™	Bluetooth 2.1
GPS	GPS/QZSS/GLONASS/SBAS
Data Connector	Standard USB Mini B connector in battery compartment. USB 2.0 Compatible
Self Test	Automatic Daily Self Test
Swing Indicator	Audio beep to indicate incorrect use of the Locator
Transmitter Mode Frequencies	Simultaneous 131,072Hz and 32,768Hz; 131,072Hz, 32,768Hz; 8,192Hz; 640 and 512Hz
Construction	Case moulded from high impact plastic. Designed to withstand 1m (3'3") drop onto a hard surface
Weight (including batteries)	2.65kg (5lb 13oz)
Dimensions	720mm x 280mm x 65mm (28.3" x 11" x 2.5")
Performance	Locate Accuracy: better than 10% of depth Depth Accuracy: ±5% @ 1m (3'3") Line Depth Measurement Range: 0.1m to 9.99m (4" to 32') Line Depth Resolution: 0.01m (0.4") Sonde Depth Measurement Range: 0.1m to 9.99m (4" to 32') depending on Sonde type Sonde Depth Resolution: 0.01m (0.4") Current Measurement: 0.01mA to 100mA
Battery Type	Internal 8 x 'AA' (LR6) cells (either alkaline non-rechargeable or NiMH rechargeable)
Battery Life	40 hours intermittent use at 20°C (68°F) using alkaline cells
IP Rating	65

Notes: Performance figures stated can be affected by site parameters such as ground conditions, temperature, and strong electromagnetic fields.

Specification may be subject to change.

All C.Scope Locators are in compliance with the essential requirements and other relevant provisions of Council Directive 2014/30/EU (EMC).

Compliance has been demonstrated by testing representative samples to the relevant harmonised standards.

All C.Scope Locators comply with the essential requirements and other provisions of Council Directive 2011/65/EU (RoHS).

SGA4/SGV4 Signal Generators: Technical Specifications

Controls	All operation is by push button control as follows: On/Off Power Level: For SGA4, 2 available power levels via High and Low Power buttons. For SGV4, 4 available power levels via Increase and Decrease Power buttons Pulse/Continuous Output: toggles between pulse or continuous output using one push button Audio/Mute: toggles between loud or muted audio output using one push button For SGV4, Audio Output: toggles between loud, muted and silent audio output using one push button
Audio Indications	Audio Feedback on button push Audio pitch drops with increasing load current in Connected Mode Audio pitch changes with power level in Induced Mode Audio output pulses to indicate Pulsed Mode Low battery indicated by interrupted Audio and output signal
Visual Indication (for SGV4 only)	Multi-segment Liquid Crystal Display indicating: Output Frequency; Pulse Mode; Continuous Mode; Battery Condition; Output Level (bargraph); Speaker Mute, Self Test Result
Data Connector (for SGV4 only)	Standard USB Mini B connector. USB 2.0 Compatible
Self Test (for SGV4 only)	Automatic Daily Self Test and manual Self Test function
Output	Induced: For SGA4 = 32,768Hz. For SGV4 = 131,072Hz and 32,768Hz Connected = 131,072Hz and 32,768Hz Carrier Pulse Frequency: 7.5Hz (pulsed mode)
Connected Mode	Connection Mode automatically selected when lead is plugged into socket Maximum Output Voltage (open circuit): 28V rms Maximum Output Current (short circuit): 65mA rms Maximum Power: 1W into 400Ω load
Construction	Case moulded from high impact plastic. Designed to withstand 1m (3'3") drop onto a hard surface Incorporates clip on accessory storage compartment
Weight (including batteries, Connection Leads and Earth Stake)	3.4kg (7lb 7 oz)
Dimensions (with Accessory Tray fitted)	360mm x 180mm x 230mm (14.1" x 7" x 9")
Battery Type	Internal 4 x 'D' (LR20) cells (either alkaline non-rechargeable or NIMH rechargeable)
Battery Life	up to 40 hours intermittent use at 20°C (68°F) using alkaline cells
IP Rating	65

Notes: Performance figures stated can be affected by site parameters such as ground conditions, temperature, and strong electromagnetic fields.

Specification may be subject to change.

All C.Scope Signal Generators are in compliance with the essential requirements and other relevant provisions of Council Directive 2014/53/EU (EMC).

Compliance has been demonstrated by testing representative samples to the harmonised standards EN300-330 and EN301-489.

The essential radio test suites have been carried out and the equipment is in conformity with all applicable directives.

All C.Scope Signal Generators comply with the essential requirements and other provisions of Council Directive 2011/65/EU (RoHS).

MXT4 Transmitter: Technical Specifications

Controls	All operation is by push button control as follows: On/Off Power Level: Cycles through four available power levels Frequency: cycles through six available output frequencies Pulse/Continuous Output: toggles between pulse or continuous output using one push button Audio Output: toggles between loud, muted and silent audio output using one push button
Audio Indications	Audio Feedback on button push Audio pitch drops with increasing load current in Connected Mode Audio pitch changes with power level in Induced Mode Audio output pulses to indicate Pulsed Mode Low battery indicated by interrupted Audio and output signal
Visual Indication	Multi-segment Liquid Crystal Display indicating: Output Frequency; Pulse Mode; Continuous Mode; Battery Condition; Output Level (bargraph); Speaker Mute, Self Test Result
Data Connector	Standard USB Mini B connector. USB 2.0 Compatible
Self Test	Automatic Daily Self Test and manual Self Test function
Output	Induced = 131,072Hz and 32,768Hz; 131,072Hz, 32,768Hz and 8,192Hz Connected = 131,072Hz and 32,768Hz; 131,072Hz, 32,768Hz; 8,192Hz; 640 and 512Hz Carrier Pulse Frequency: 7.5Hz (pulsed mode)
Connected Mode	Connection Mode automatically selected when lead is plugged into socket Maximum Output Voltage (open circuit): 30V rms Maximum Output Current (short circuit): 65mA rms Maximum Power: 1W into 400Ω load
Construction	Case moulded from high impact plastic. Designed to withstand 1m (3'3") drop onto a hard surface Incorporates clip on accessory storage compartment
Weight (including batteries, Connection Leads and Earth Stake)	3.4kg (7lb 7oz)
Dimensions (with Accessory Tray fitted)	360mm x 180mm x 230mm (14.1" x 7" x 9")
Battery Type	Internal 4 x 'D' (LR20) cells (either alkaline non-rechargeable or NIMH rechargeable)
Battery Life	up to 40 hours intermittent use at 20°C (68°F) using alkaline cells
IP Rating	65

Notes: Performance figures stated can be affected by site parameters such as ground conditions, temperature, and strong electromagnetic fields.

Specification may be subject to change.

All C.Scope Transmitters are in compliance with the essential requirements and other relevant provisions of Council Directive 2014/53/EU (EMC).

Compliance has been demonstrated by testing representative samples to the harmonised standards EN300-330 and EN301-489.

The essential radio test suites have been carried out and the equipment is in conformity with all applicable directives.

All C.Scope Transmitters comply with the essential requirements and other provisions of Council Directive 2011/65/EU (RoHS).

Maintenance

Handling

C.Scope Locators and Signal Generators/Transmitters are rugged instruments designed for the rigours of every day use. However, to ensure that the specified accuracy is maintained, it is essential to treat the instruments with care by avoiding shocks, vibration and excesses of temperature.

The construction of C.Scope Locators and Signal Generators/Transmitters incorporate weather proof seals, however, they are not guaranteed to prevent water ingress if the equipment is immersed.

Cleaning

The equipment can be cleaned with a sponge dampened with warm water. A mild soap may be used if required. The use of solvents should be avoided.

Do not allow moisture in the battery compartments or near the connectors.

Storage

The equipment should be stored in a clean and dry environment. The temperature should not exceed the range -10°C to +50°C (14°F to 122°F). If stored for long periods the batteries should be removed.

Support Services: Training/ Servicing/ Repairs

Training

This Instruction Manual is comprehensive but cannot fully replace expert tuition. Excellent training is available directly from C.Scope and via authorised C.Scope agents, cost effectively, at your chosen location. C.Scope recommend operators are trained before using the equipment.

Warranty

Details of the C.Scope Warranty Terms and Conditions and how to register the warranty for your C.Scope product are available from the C.Scope website (csclocators.com/warranty/).

Calibration

The C.Scope CXL4, DXL4 and MXL4 and SGA4, SGV4 and MXT4 do not require periodic calibration. Where independent validation and certification is a requirement, this is available from C.Scope and C.Scope Authorised Service Centres.

Servicing

Routine servicing is available from C.Scope and C.Scope Authorised Service Centres.

Repairs

If you suspect equipment is faulty, please check it carefully with a fresh set of batteries. Check the battery connections and rotate the batteries in the holder. Refer to the section in this manual on Function Checks and if possible compare performance with equipment known to be in good working order.

If the problem persists then contact the company from whom you purchased the equipment, or contact C.Scope indicating the nature of the fault. Advice on the best course of action can then be given.



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C.SCOPE CXL4, CXL4-D, CXL4-DBG, DXL4-D, DXL4-DBG, SGA4, SGV4, MXL4-D, MXL4-DBG and MXT4
Instruction Manual - Part no. B1094E Issue 2

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Attachment 3

**Portable ultrasonic flowmeter
(PF330) user manual**

PORTAFLOW 330

Portable Ultrasonic Flowmeter User Manual



micronics
Through measurement comes control

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1: *General Description*

1.1 Introduction

This manual describes the operation of the Micronics Portaflow 330 portable flowmeter. The flowmeter is designed to work with clamp-on transducers to enable the flow of a liquid within a closed pipe to be measured accurately without needing to insert any mechanical parts through the pipe wall or protrude into the flow system.

Using ultrasonic *transit time* techniques, the Portaflow 330 is controlled by a micro-processor system which contains a wide range of data that enables it to be used with pipes with an outside diameter ranging from 13mm up to 5000mm and constructed of almost any material. The instrument will also operate over a wide range of fluid temperatures.

Easy to operate, the Portaflow 330 standard features are:

- Large, easy to read graphic display with backlighting.
- Simple to follow dual function keypad.
- Simple 'Quick Start' set up procedure.
- 98k stored data points.
- Continuous signal monitoring.
- RS232 output.
- USB output.
- Pulse output (volumetric or frequency).
- 4-20mA, 0-20mA or 0-16mA output.
- Rechargeable battery.
- Battery management.
- Diagnostics.

Volumetric flow rates are displayed in l/h, l/min, l/sec, gal/min, gal/h, USgals/min, USgals/h, Barrel/h, Barrel/day, m³/s, m³/min, m³/h. Linear velocity is displayed in metres or feet per second.

When operating in the 'Flow Reading' mode the total volumes, both positive and negative, are displayed up to a maximum 12-digit number.

The flowmeter can be used to measure clean liquids or oils that have less than 3% by volume of particulate content. Cloudy liquids such as river water and effluent can be measured along with cleaner liquids such as demineralised water.

Typical Portaflow 330 applications include:

- River water.
- Seawater.
- Potable water.
- Demineralised water.
- Treated water.

1.2 Principles of Operation

When ultrasound is transmitted through a liquid the speed at which the sound travels through the liquid is accelerated slightly if it is transmitted in the same direction as the liquid flow and decelerated slightly if transmitted against it. The difference in time taken by the sound to travel the same distance but in opposite directions is therefore directly proportional to the flow velocity of the liquid.

The Portaflow 330 system employs two ultrasonic transducers attached to the pipe carrying the liquid and compares the time taken to transmit an ultrasound signal in each direction. If the sound characteristics of the fluid are known, the Portaflow microprocessor can use the results of the transit time calculations to compute the fluid flow velocity. Once the flow velocity is known the volumetric flow can be easily calculated for a given pipe diameter.

The Portaflow system can be set up to operate in one of four modes determined mainly by the pipe diameter and the type of transducer set in use. The diagram below illustrates the importance of applying the correct separation distance between the transducers to obtain the strongest signal.

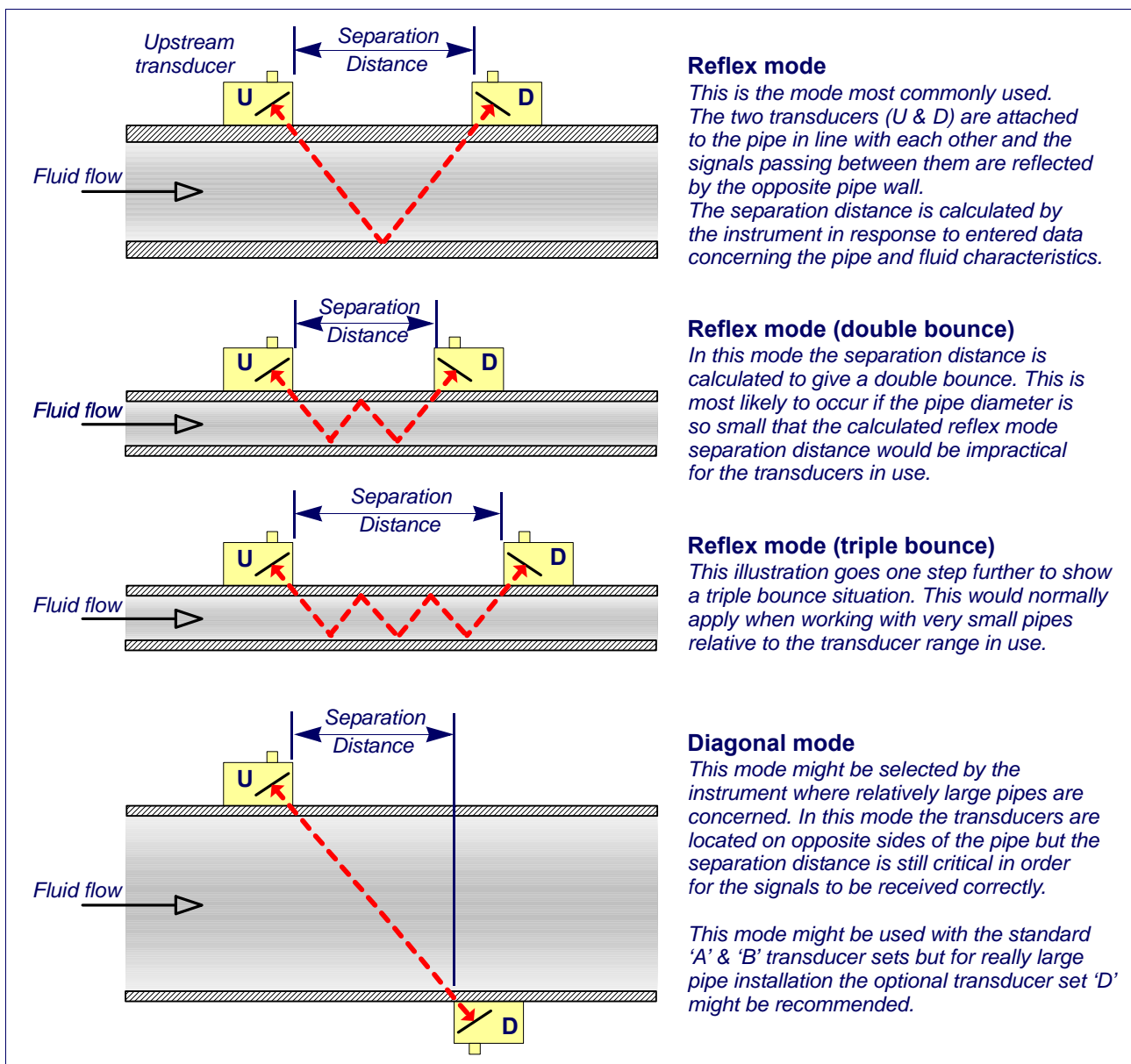


Figure 1.1 Operating modes

1.3 Supplied Hardware

The Portaflow equipment is supplied in a rugged IP67 carrying case fitted with a foam insert to give added protection for transportation. The supplied components are shown in [Figure 1.2](#).



Figure 1.2 Standard Portaflow equipment

Standard equipment

- Portaflow 330 instrument with backlit graphic display.
- Power supply - with UK, US, European adaptors. 110/240VAC.
- 4-20mA/Pulse Output cable, USB cable and RS232-C cable.
- 2 lengths of chain each at 3.3 metres long.
- Test block.
- Transducer cables (x2) 2 metres long.
- Transducer set 'A' (Transducers x2).
- Transducer set 'B' (Transducers x2).
- Set of guide rails for use with 'A' or 'B' transducers.
- Ruled separation bar (2-piece).
- Ultrasonic couplant.
- Manual.

Optional equipment

- Transducer set 'D' – used for monitoring pipes of 1500mm to 5000mm diameter, over a temperature range -20°C to +80°C. Kit is supplied in a separate case and includes the sensors together with ratchet straps and guide rails for attaching to the pipe.
- Magnetic guide rail kit (see [Figure 1.3](#)).



Figure 1.3 Magnetic guide rail

1.4 Portaflow 330 Instrument

The Portaflow 330 is a microprocessor controlled instrument operated through a menu system using an inbuilt LCD display and keypad. It can be used to display the instantaneous fluid flow rate or velocity, together with totalised values, or act as a data logger. When operating in the data logger mode the logged data can be output directly to a PC or printer using the RS232/USB interface or stored in the instrument's non-volatile memory for downloading at a later time. Up to 98k logging events can be stored internally.

The instrument can also provide a variable current or variable 'pulse' (volumetric or frequency) output that is proportional to the detected flow rate. This output can be calibrated to suit a particular flow range and used with a range of external interface devices, such as those found in BMS or site monitoring systems.

1.4.1 Connectors

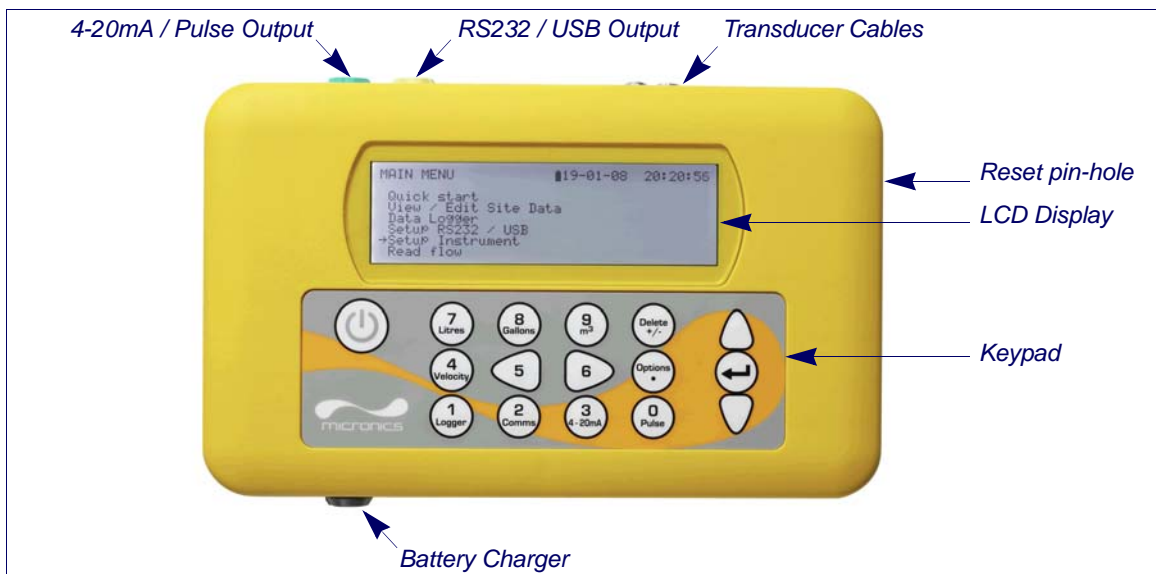


Figure 1.4 Instrument details

Transducer connections

The transducers are connected to two colour-coded miniature coaxial sockets located on the top of the instrument. Using the red/blue connector cables provided, the upstream transducer should always be connected to the RED socket and the downstream transducer to the BLUE one for a positive flow reading. It is safe to connect or disconnect the cable while the instrument is switched on.

RS232 and USB connections

RS232 and USB cables are included as part of the Portaflow 330 kit. These can be connected to the yellow 8-pin connector on the top of the flowmeter as shown in [Figure 1.4](#). The RS232 cable is terminated with a 9-pin 'D-type' connector.

4-20mA and Pulse output connection

The 4-20mA / 'pulse' output cable should be connected to the green 7-pin connector on the top of the flowmeter, as shown in [Figure 1.4](#). A single cable that can be adapted for use for either of these output functions is included in the Portaflow 330 kit. The 'tails' on the free end of the cable must be terminated to suit the intended application.

- Red – 4-20mA positive
- Black – 4-20mA negative
- White – Pulse output
- Green – Pulse return
- Thick Black – Cable screen

Battery charger connection

The supplied battery charger is connected to the instrument by means of the grey 2-pin connector on the bottom of the unit, as shown in [Figure 1.4](#).

Note: The above connectors have different key-ways to prevent incorrect cable connection.

1.4.2 Keypad

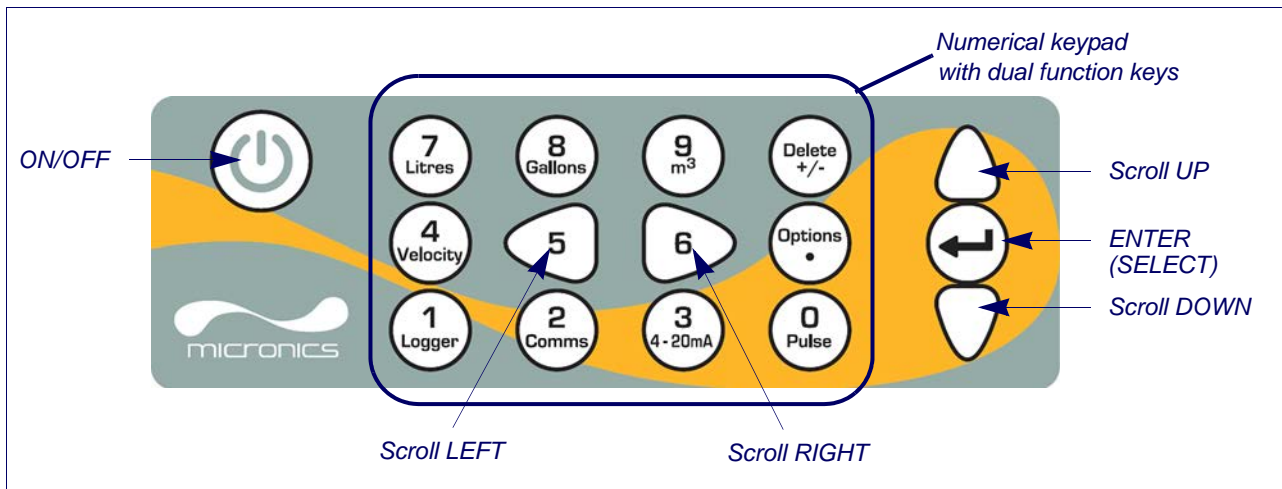


Figure 1.5 Keypad

The instrument is configured and controlled via a 16-key tactile membrane keypad, as shown in [Figure 1.5](#).

ON/OFF Key

The ON/OFF key is shown on the top left of the keypad. When turned ON an initialisation screen is displayed on the LCD showing the instrument's serial number and software revision. Once this appears, the instrument can be started by pressing the ENTER key once – the initialization screen is then replaced by a MAIN MENU which provides access to the remaining functions.

Menus and the menu selection keys

The Portaflow 330 menus are arranged hierarchally with the MAIN MENU being at the top level. Menu navigation is achieved by three keys on the right hand side of the keypad which are used to scroll UP and DOWN a menu list and SELECT a menu item. When scrolling through a menu an arrow-shaped cursor moves up and down the left hand side of the screen to indicate the active menu choice which can then be selected by pressing the ENTER (SELECT) key.

Some menus have more options than can be shown on the screen at the same time, in which case the 'overflowed' choices can be brought into view by continuing to scroll DOWN past the bottom visible item. Menus generally 'loop around' if you scroll beyond the first or last items.

If you select `Exit` it usually results in taking you back one level in the menu hierarchy, but in some cases it may go directly to the 'Flow Reading' screen.

Some screens require you to move the cursor left and right along the display as well as up and down. This is achieved using keys 5 (scroll LEFT) and 6 (scroll RIGHT).

Dual function numerical keypad

The block of keys shown in the centre of the keypad in [Figure 1.5](#) are dual function keys. They can be used to enter straight-forward numerical data, select the displayed flow units or provide quick access to frequently required control menus.

1.4.3 Power supply and battery charging

Operating power is provided by an internal battery that can be charged from the utility supply using the supplied external charger. When you first receive the unit you must put the battery on charge for a minimum of 6.5hrs before use. A fully charged battery will power the instrument for up to 20hrs depending on the output utilisation and backlight usage.

The backlight can be selected to be either permanently OFF, illuminated for 10 seconds, 30 seconds or 1 minute every time a key is pressed, or permanently ON – as configured in the Setup Instrument menu. If the backlight is active continuously it will reduce the available battery operating time to 8hrs. Similarly, if the 4-20mA output is used constantly at 20mA, the battery life would reduce by 50%. It is therefore beneficial to turn off the backlight and 4-20mA output facilities when they are not required.

When the instrument is operating in the 'Flow Reading' mode the percentage battery charge level is displayed symbolically on the LCD screen. A warning message is triggered if the charge falls to approximately 30%, at which point there is up to four hours of battery operation remaining, depending on usage. The battery can be charged both while the instrument is in use or when switched off. The instrument's internal data is stored in non-volatile memory and will not be lost even if the battery discharges completely.



Key Point: The battery is not a user-changeable item. The instrument must be returned to your distributor if the battery needs replacing.



Key Point: Only use the supplied charger, or special adaptor lead. Failure to comply with this will invalidate your warranty.

1.5 Transducers

Two sets of ultrasonic transducers are provided as standard. When setting up the instrument it will indicate the appropriate transducer set to use for a particular application, depending on data entered by the user. Default pipe ranges are programmed into the instrument and most of the time there will be no need to use an alternative transducer set to the one suggested by the instrument. However, if circumstances dictate that a different set must be used it is possible to manually programme the instrument to accept the alternative set.

Transducer set 'A'

Supplied as standard for use on pipes 13mm to 115mm outside diameter.

Transducer set 'B'

Supplied as standard for use on pipes 50mm to 2000mm outside diameter.

Transducer set 'D'

Type 'D' transducers are optional equipment that can be used by the Portaflow 330 on pipes from 1500mm to 5000mm. They are supplied complete with ratchet straps for 'diagonal mode' attachment.

2: Installation

2.1 Transducer Positioning

In many applications an even flow velocity profile over a full 360° is unattainable due, for example, to the presence of air turbulence at the top of the flow and possibly sludge in the bottom of the pipe. Experience has shown that the most consistently accurate results are achieved when the transducer guide rails are mounted at 45° with respect to the top of the pipe.

The Portaflow equipment expects a uniform flow profile as a distorted flow will produce unpredictable measurement errors. Flow profile distortions can result from upstream disturbances such as bends, tees, valves, pumps and other similar obstructions. To ensure a uniform profile the transducers must be mounted far enough away from any cause of distortion such that it no longer has an effect.

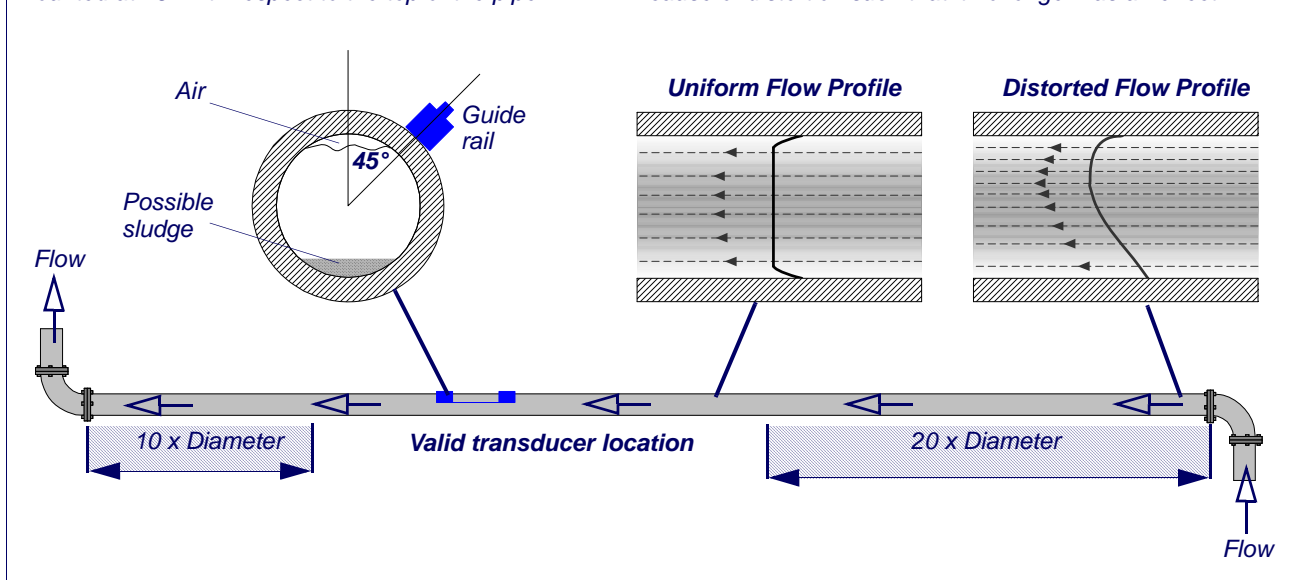


Figure 2.1 Locating the transducers

To obtain the most accurate results the condition of both the liquid and the pipe wall must be suitable to allow the ultrasound transmission along its predetermined path. It is important also that the liquid flows uniformly within the length of pipe being monitored and that the flow profile is not distorted by any upstream or downstream obstructions. This is best achieved by ensuring there is a straight length of pipe upstream of the transducers of at least 20 times the pipe diameter and 10 times the pipe diameter on the downstream side, as shown in [Figure 2.1](#). Flow measurements can be made on shorter lengths of straight pipe, down to 10 diameters upstream and 5 diameters downstream, but when the transducers are positioned this close to any obstruction the resulting errors can be unpredictable.



Key Point: Do not expect to obtain accurate results if the transducers are positioned close to any obstructions that distort the uniformity of the flow profile.

Micronics Limited accepts no responsibility or liability if product has not been installed in accordance with the installation instructions applicable to the product.

2.2 Transducer Attachment (Type 'A' and 'B')

Note: The use of chains to fix the guide rail to the pipe can be eliminated on steel pipes by using the optional magnetic guide rails. In all other respects the setting up of the sensors is the same as for standard guide rails.

Type 'A' & 'B' transducers are fitted to adjustable guide rails which are secured to the pipe using wrap-around chains and mechanically connected together by a steel separation bar. The separation bar also acts as a ruler to allow the distance between the transducers to be accurately set to the value determined by the Portaflow instrument.

When fitting the guide rails it is easiest to assemble them onto the separation bar and adjust to the required separation distance before attaching them to the pipe.

2.2.1 Preparation

1. Before you attach the transducers you should first ensure that the proposed location satisfies the distance requirements shown in [Figure 2.1](#) otherwise the resulting accuracy of the flow readings may be affected.
2. Prepare the pipe by degreasing it and removing any loose material or flaking paint in order to obtain the best possible surface. A smooth contact between pipe surface and the face of the transducers is an important factor in achieving a good ultrasound signal strength and therefore maximum accuracy.

2.2.2 Attaching the guide rails

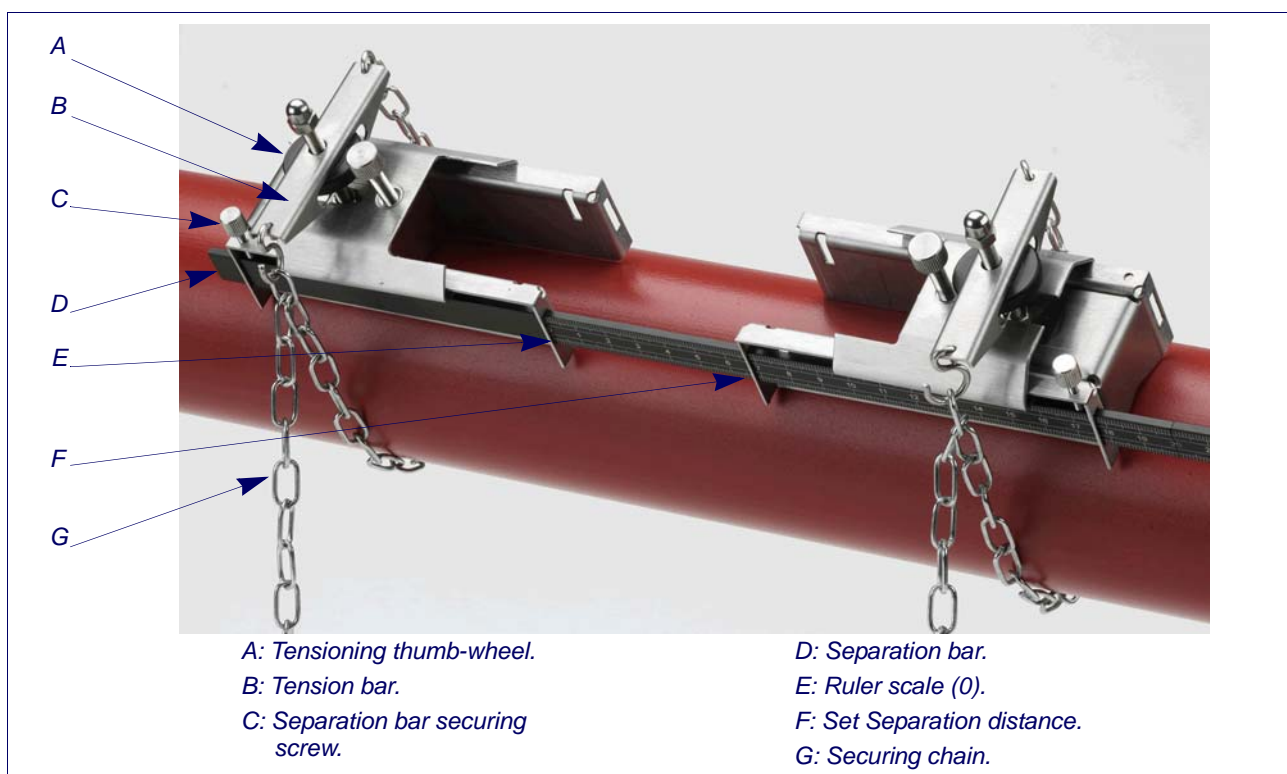


Figure 2.2 Guide rail attachment

1. Slide the separation bar (D) into the front of the left hand guide rail, align the front edge of the guide rail with '0' on the ruler scale (E) and secure it in place by tightening the thumbscrew (C).
2. Slide the other end of the separation bar into the front of the right hand guide rail, align the front edge of the guide rail to the required separation distance (obtained from the Portaflow instrument) on the ruler (F), then secure it in place by tightening the thumbscrew.

Note: If magnetic guide rails are used on steel pipes then only the location at 45° on the pipe apply on the next two sections.

3. On each guide rail, attach one end of a securing chain to a hook on the tensioning bar (B), wrap the chain around the pipe (G) and then attach it to the hook on the other end of the tensioning bar whilst keeping the chain as tight as possible.
4. Rotate the complete guide rail assembly so that it is approximately 45° with respect to the top of the pipe. Then tighten the chain by turning the tensioning thumb-wheel (A) on each guide block until the assembly is securely attached to the pipe.

Note: If you are unable to get sufficient tension on the chain to hold the assembly in place, fully slacken the tensioning thumb-wheel and shorten the effective length of the chain wrapped around the pipe by connecting the tensioning bar to the next link in the chain, then re-tension.

2.2.3 Fitting the transducers

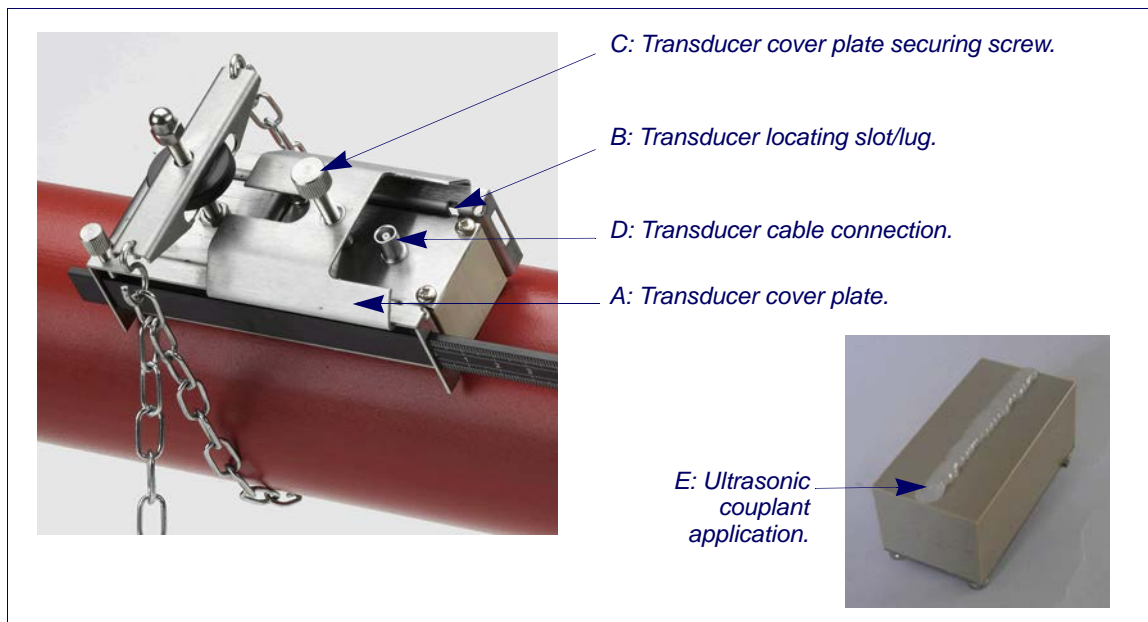


Figure 2.3 Fitting the transducers

1. Slide the transducer cover plate (A) fully towards the outside of the guide assembly to allow sufficient access to fit the transducer.
2. Clean the face of the transducer, removing all traces of dirt and grease.
3. Apply a 3mm bead of ultrasonic couplant along the centre length of the transducer (E).
4. Fit the transducer into the guide block – ensuring the lugs on the sides of the transducer are correctly located into the slots on the sides of the guide block (B).
5. Slide the transducer cover plate (A) over the top of the transducer and tighten the thumbscrew (C) finger tight to secure the transducer in place. When securing the cover plate take care to leave sufficient room around the transducer connector (D) to connect the cable.
6. Repeat the above steps for the second transducer.
7. Connect the transducers to the Portaflow instrument using the coaxial cables provided. The RED cable must be connected to the upstream transducer and the BLUE cable to the downstream transducer. If you observe negative flow, swap the red and blue cables at the sensor end.

2.3 Installing the USB Virtual Com. Port

If you have the CD supplied with the instrument then the USB drivers are included. Refer to the installation instructions for Portagraph III on the CD.

If you do not have the CD then follow the instructions below.

The USB connection requires a virtual com port to be installed on the computer. The necessary driver can be provided by Micronics or downloaded from <http://www.ftdichip.com/Drivers/VCP.htm>.

1. Access the above url and download the driver for your particular operating system. The download takes the form of a zip file.
2. Extract all the files from the zip file into a folder and note its location (e.g. Desktop\USBDriver).
3. Switch ON the Portaflo 330 instrument and connect it to the USB port on the PC.
4. A “New device found” message will appear and ask you for the location of the software installation files for the new device.
5. Use the Browse button to select the path to the unzipped driver files and then click OK.
6. Follow the on-screen instructions to install the driver.
7. At the end of the driver installation routine you must carry out a minor configuration change to the newly installed virtual com port. The way in which you gain access to the com port set-up window will vary depending on your operating system. The following example applies to Windows XP.
8. Select Control Panel>System to open the SYSTEM PROPERTIES window.
9. Click the Device Manager button to open the DEVICE MANAGER window.
10. Scroll down to the Ports region and you will find the new FDTI port installed (e.g. USB Serial Port with a high port number).
11. Right-click on the com port and select Properties.
12. From the PROPERTIES window select the Port Settings tab then click the Advanced button. The ADVANCED SETTINGS window should open similar to that shown below.

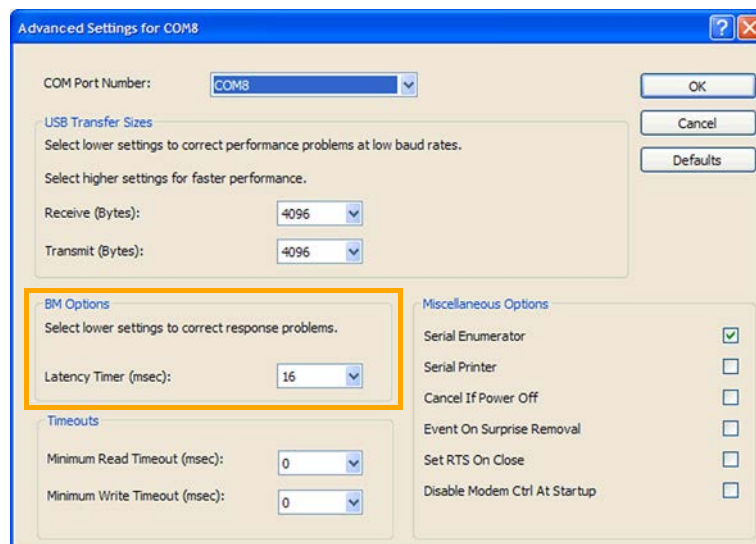
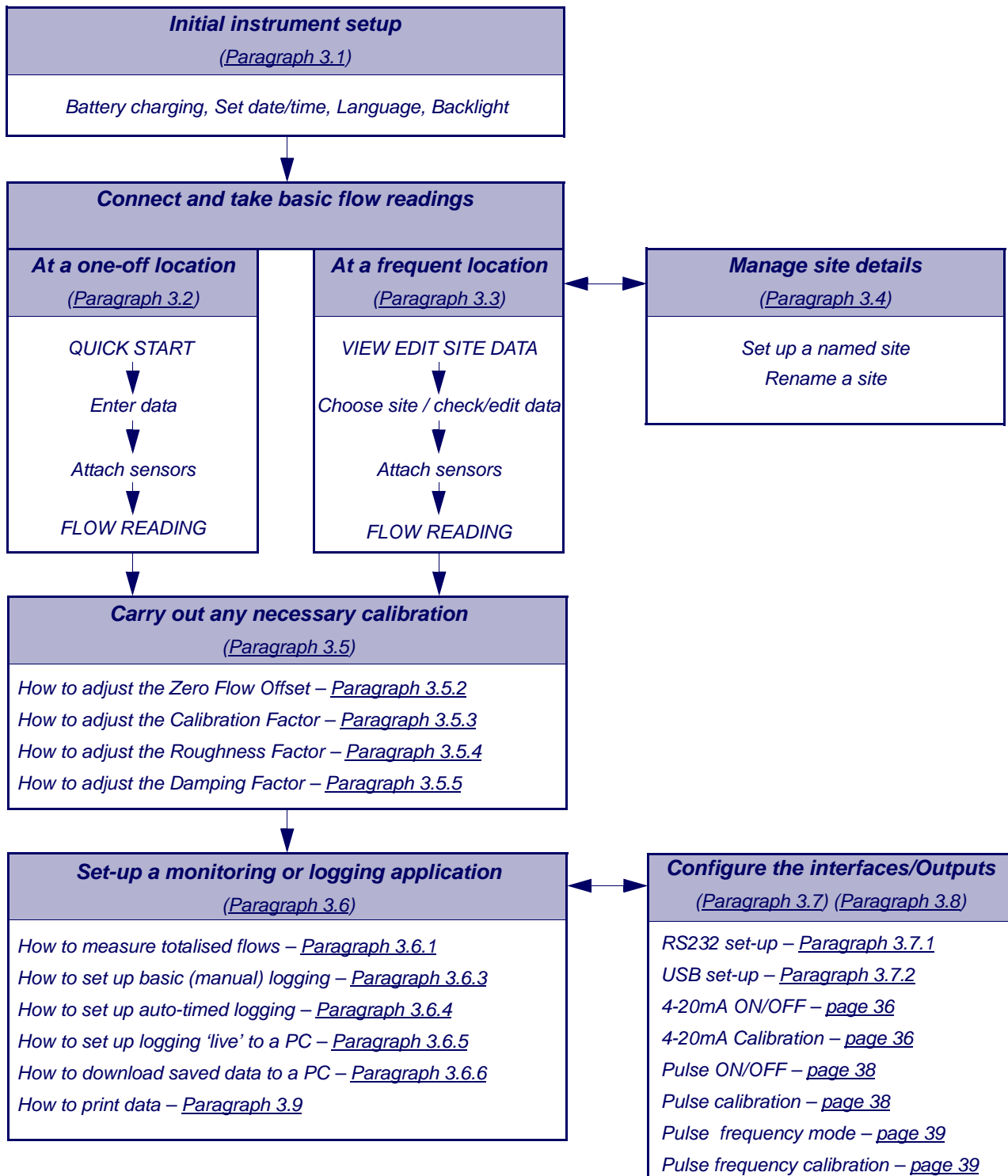


Figure 2.4 Com. Port configuration

13. In the BM Options area change the Latency Timer value from 16 msec (default) to 1 msec.
14. Select OK to implement the change, and then close the remaining windows that were opened.
15. Your computer should now be able to communicate with the Portaflo 330 instrument via the USB port in the same way as any other standard USB device.

3: Operating Procedures



3.1 Setting-up the Instrument

3.1.1 Using the instrument for the first time

Before you use your Portaflow 330 for the first time you should first charge the battery, then select the display language and set-up the internal clock, as described below.

Charging the battery

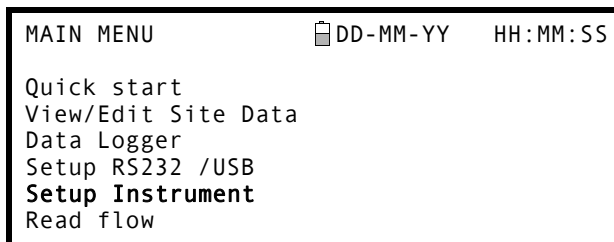
1. Connect the external battery charger to the charger socket at the bottom of the instrument then switch on the utility supply.
2. The instrument should indicate CHARGING and an animated battery symbol indicates that the battery is taking on charge.
3. Leave the instrument on charge for 6.5 hours before using it for the first time.



Selecting a language

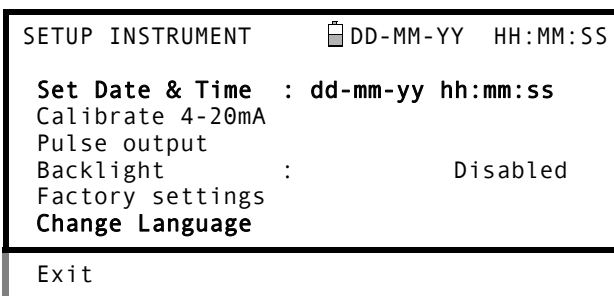
The first time you switch on the instrument you may be asked to select a user language.

1. Switch on the instrument by pressing the ON/OFF button.
2. If necessary, select the required language using the UP/DOWN scroll keys then press the ENTER key.
3. The selected language will be the default when the instrument is next used. To change the language again select the Change Language option in the SETUP INSTRUMENT screen (see below)
4. The initialisation screen will be displayed, giving details of the instrument's serial number and software revision details.
5. Press the ENTER key to start the instrument.
6. This is the MAIN MENU and is the starting point for all the operations described in this chapter.



Setting the Date & Time

1. Select Setup Instrument from the MAIN MENU. The screen shown here should be displayed.
2. Select Set Date & Time and click ENTER.
3. A flashing cursor should appear under the first date number. Enter the date sequence in dd-mm-yy order then press the ENTER key.
4. Repeat this action to set the time.
5. Select Exit then press the ENTER key to return to the MAIN MENU.

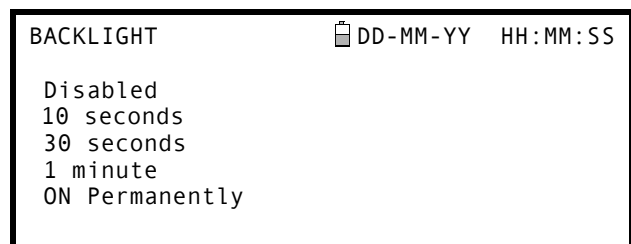
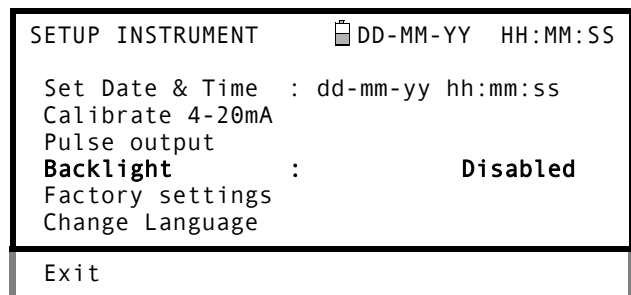


Note: If you make a mistake when entering the data press the Delete key to move the cursor back to the number you wish to change, then continue. If you enter an invalid number an 'ERR:Invalid Date or Time!' error message is displayed on the second line of the screen. If this occurs repeat the set date/time procedure.

3.1.2 Enabling/disabling the backlight

The backlight can be selected to be either Disabled, illuminated for 10 seconds, 30 seconds or 1 minute every time a key is pressed, or ON permanently. If the backlight is not required it is recommended that you disable it to prolong the battery discharge time.

1. Select Setup Instrument from the MAIN MENU.
2. Select Backlight from the SETUP INSTRUMENT screen then press the ENTER key.
3. Select the required backlight operation.
4. Press the ENTER key to return to the SETUP INSTRUMENT screen.
5. Select Exit then press the ENTER key to return to the MAIN MENU.



3.2 Using the Quick Start Menu

If you want to perform a 'one-off' flow reading at a particular pipe location the Quick Start menu provides the quickest way to set up the Portaflow system and access the FLOW READING screen.

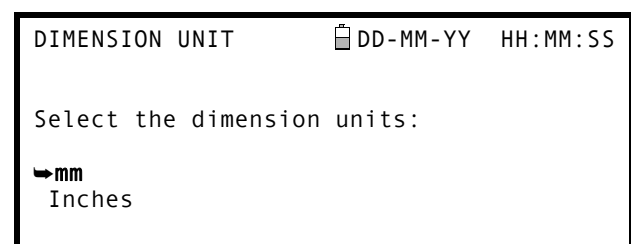
If the point at which you intend to take the measurement is likely to require regular monitoring it is best to set it up as a 'Site' within the Portaflow 330, which then stores the site parameters (See [Paragraph 3.4](#)).

Before you can use the Portaflow system you need to obtain the following details (this information will be required when setting up the Quick Start menu):

- The pipe outside diameter.
- The pipe wall thickness and material.
- The pipe lining thickness and material.
- The type of fluid.
- The fluid temperature.

Entering the site data

1. Select Quick Start from the MAIN MENU and press the ENTER key. You will then be presented with a series of screens in which to enter the data mentioned above.
2. Select the dimension units (millimetres or inches) used to measure the pipe, then press the ENTER key.



3. Enter the pipe outside diameter dimension, then press the ENTER key.

```

OUTSIDE DIAMETER DD-MM-YY HH:MM:SS
Dimension: mm
Pipe outside diameter? 58.0
    
```

4. Enter the pipe wall thickness dimension, then press the ENTER key.

```

PIPE WALL THICKNESS DD-MM-YY HH:MM:SS
Dimension: mm
Pipe outside diameter? 58.0
Pipe wall thickness? 4.0
    
```

5. If the pipe has a lining, enter the lining thickness. If nothing is entered the instrument automatically assumes there is no lining.
6. Press the ENTER key to continue.

```

PIPE LINING THICKNESS DD-MM-YY HH:MM:SS
Dimension: mm
Pipe outside diameter? 58.0
Pipe wall thickness? 4.0
Pipe lining thickness? 0.0
    
```

7. Select the pipe wall material from the list provided, then press the ENTER key.

If the material is not listed select Other and enter the propagation rate of the pipe wall material in metres/sec. Contact Micronics if this is not known.

```

PIPE WALL MATERIAL DD-MM-YY HH:MM:SS
Select pipe wall material
Mild Steel
S' less Steel 316
S' less Steel 303
Plastic
Cast Iron
Ductile Iron
Copper
Brass
Concrete
Glass
Other (m/s)
    
```

8. If a lining thickness value was entered earlier, this screen is displayed to request that you enter the lining material type. If no lining thickness was entered this screen will be bypassed.

```

PIPE LINING MATERIAL DD-MM-YY HH:MM:SS
Select pipe lining material
Steel
Rubber
Glass
Epoxy
Concrete
Other (m/s)
    
```

9. Select the lining material from the list provided then press the ENTER key.

If the material is not listed select Other and enter the propagation rate of the lining material in metres/sec. Contact Micronics if this is not known.

- Select the fluid type from the list provided and press the ENTER key.

If the liquid is not listed select Other and enter a propagation rate in metres/second.

```

FLUID TYPE          DD-MM-YY  HH:MM:SS
Select fluid type
Water
Glycol/water 50/50
Glycol/water 30/70
Lubricating oil
Diesel
Freon
Other (m/s)
    
```

- If you need to alter the fluid temperature from that shown select either °C or °F with the cursor and press the ENTER key.
- Enter the new temperature value and press the ENTER key.
- The new temperature should now be indicated in both °C and °F.
- Select Continue.. then press the ENTER key.

```

FLUID TEMPERATURE  DD-MM-YY  HH:MM:SS
Enter Fluid Temperature
°C: 5.00
°F: 41.00
Continue..
    
```

- The SENSOR SEPARATION screen now displays a summary of the entered parameters and informs you of the type of sensor to be used, the mode of operation and the distance to set up between the sensors.
In this example it recommends type A-ST (A standard) sensors operating in the 'Reflex' mode spaced at 32.2mm apart.

```

SENSOR SEPARATION  DD-MM-YY  HH:MM:SS
Site               : Quickstart
Pipe               : 58.00 mm
Wall               : 4.00
Sensors            : A-ST      Reflex
Temperature        : 10.00°C 50.00°F
Set sensor separation to 32.2 mm
Press ← to continue, Δ▽ to select sens.
    
```

- Take a note of the displayed parameters, then press the ENTER key.
- The ATTACH SENSORS screen displays, giving instructions to attach the sensors.

```

ATTACH SENSORS     DD-MM-YY  HH:MM:SS

Attach Sensor Set

Red Connector UpStream
Press ← key to go to Flow Reading
    
```

Note: The SENSOR SELECTION menu can be entered by use of the Up/Down scroll keys. This allows the type and mode of the sensors being used to be selected. This menu will be entered automatically if the entered pipe OD and/or temperature are not valid for the currently selected sensors.

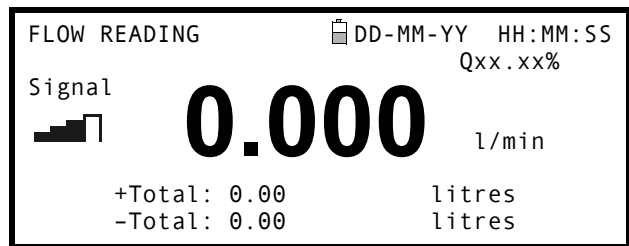
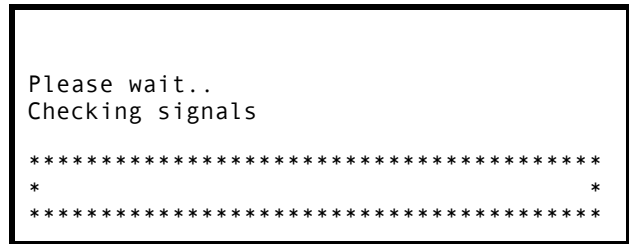
Note: Do not press the ENTER key until the transducers are fitted and connected to the instrument.

Attaching and connecting the transducers

- Fit the designated sensors to the pipe using the appropriate guide rails as described in [Paragraph 2.2](#). Take great care to set the separation distance as accurately as possible.
- Connect the red and blue coaxial cables between the sensors and the test instrument, ensuring that the red connector on the instrument is connected to the 'upstream' sensor.

Taking a flow reading

- 20. Once the transducers have been fitted and connected, press the ENTER key on the ATTACH SENSORS screen.
- 21. This will take you to the FLOW READING screen via a signal-checking screen (shown here).
- 22. Check that the indicated signal strength on the left of the screen is at least 2 bars (ideally 3 or 4). If less than 2 bars are shown it indicates there could be a problem with the transducer spacing, alignment or connections; or it could be due to an application problem.
- 23. Qxx .xx% indicates the signal quality and should have a value of 60% or greater.



Flow monitoring

The FLOW READING screen is the one most used during normal monitoring operation. It shows the instantaneous fluid flow together with totalised values (when enabled). In this mode you can select the flow rate measurement units by pressing keys 7 (litres), 8 (Gallons, Barrels) or 9 (m³), or change the display to show velocity by pressing key 4.

If the flow reading exceeds a value of +/-9999 in the current units then a *10 multiplier will be displayed above the units and the value displayed will be a tenth of the actual value. Similarly a * 100 and *1000 may be displayed on very large flow rates.

There are limitations on the use of these larger flow values with regards to logging of data and setting the current and pulse outputs. If the flow reading is less than 32000 m³/hour then the value can be logged and downloaded via Portagraph III.

3.3 Using the System at a Regularly Monitored Location

Setting up the Portaflow system using the Quick Start method described in [Paragraph 3.2](#) is easy and the recommended method to use in a 'one-off' situation. But if you have a site location that you want to monitor on a frequent basis it is better to set up a named 'Site' for that location so that you can recall it when needed and so avoid the need to re-enter the site details every time you want to install the equipment there.

Note: See [Paragraph 3.4](#) for details of how to set-up and manage site details.

Use this procedure to install the equipment at a named site.

1. Select View Edit Site Data from the MAIN MENU.
2. Select Choose from list of sites.
3. Select one of the sites listed and press the ENTER key.
4. The Site name will show the selected site and the site parameters will be listed on the screen.
5. Scroll down through the menu list and enter/change the data that might have changed since the last time the site was accessed.
6. When you are satisfied that the parameters are correct select Save current site & read flow.

```
VIEW EDIT SITE DATA  DD-MM-YY  HH:MM:SS
```

Choose from list of sites

```
Site name      : MySite
Dimensions     : mm
Pipe outside diameter: 58.00
Pipe wall thickness : 4.00
Pipe lining thickness: 0.00
```

```
Pipe wall material : Mild Steel
Lining material    : -----
Sensor set        : A-ST (see note)
Sensor mode       : Reflex
Fluid type        : Water
Save current site & read flow
Delete this Site
Download & save current site
Exit
```

Note: If you select a different Sensor set (e.g. A-ST) when entering new site data you could receive an "invalid" error message if the previous Sensor set was operating at a temperature above 135°C. If this occurs, ignore the warning as it will disappear when you enter a temperature in the correct range for new sensors.

7. If you need to alter the fluid temperature from that shown select either °C or °F with the cursor and press the ENTER key.
8. Enter the new temperature value and press the ENTER key.
9. The new temperature should now be indicated in both °C and °F.
10. Select Continue.. and then press the ENTER key.
11. The SENSOR SEPARATION screen now displays a summary of the entered parameters and informs you of the type of sensor to be used, the mode of operation and the distance to set up between the sensors.
In this example it recommends type A-ST (A standard) sensors operating in the 'Reflex' mode spaced at 32.2mm apart.
12. Take a note of the displayed parameters, then press the ENTER key.
13. The ATTACH SENSORS screen displays, giving instructions to attach the sensors.

```
FLUID TEMPERATURE  DD-MM-YY  HH:MM:SS
```

Enter Fluid Temperature

```
°C: 5.00
°F: 41.00
Continue..
```

```
SENSOR SEPARATION  DD-MM-YY  HH:MM:SS
```

```
Site      : MySite
Pipe      : 58.00 mm
Wall      : 4.00
Sensors   : A-ST      Reflex
Temperature : 10.00°C 50.00°F
Set sensor separation to 32.2 mm
Press ← to continue,△▽ to select sens.
```

```
ATTACH SENSORS  DD-MM-YY  HH:MM:SS
```

Attach Sensor Set

```
Red Connector UpStream
Press ← key to go to Flow Reading
```

Note: The SENSOR SELECTION menu can be entered by use of the Up/Down scroll keys. This allows the type and mode of the sensors being used to be selected. This menu will be entered automatically if the entered pipe OD and/or temperature are not valid for the currently selected sensors.

Note: Do not press the ENTER key until the transducers are fitted and connected to the instrument.

Attaching and connecting the transducers

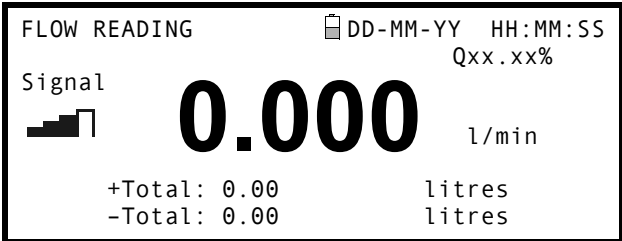
14. Fit the designated sensors to the pipe using the appropriate guide rails as described in [Paragraph 2.2](#). Take great care to set the separation distance as accurately as possible.
15. Connect the red and blue coaxial cables between the sensors and the test instrument, ensuring that the red connector on the instrument is connected to the 'upstream' sensor.

Taking a flow reading

16. Once the transducers have been fitted and connected, press the ENTER key on the ATTACH SENSORS screen.
17. This will take you to the FLOW READING screen via a signal-checking screen (shown here).



18. Check that the indicated signal strength on the left of the screen is at least 2 bars (ideally 3 or 4). If less than 2 bars are shown it indicates there could be a problem with the transducer spacing, alignment or connections; or it could be due to an application problem.



Flow monitoring

The FLOW READING screen is the one most used during normal monitoring operation. It shows the instantaneous fluid flow together with totalised values (when enabled). In this mode you can select the flow rate measurement units by pressing keys 7 (litres), 8 (Gallons, Barrels) or 9 (m³), or change the display to show velocity by pressing key 4.

3.4 Managing Named Sites

If you want to monitor a particular site location frequently you can set up a named 'Site' to store the installation details, such as pipe dimensions and material, required to set-up the Portaflow 330 system. These can then be recalled later when revisiting that particular location.

The instrument can store up to 20 sites, the first site is reserved for QUICK START and cannot be renamed; subsequent sites are initially named EmptySite1 through to EmptySite19.

3.4.1 Setting up a new site



Key Point: Once you have set up a named site you are advised to log some data to the site in order to avoid the possibility of the site name being overwritten when the QuickStart data is saved. See [Paragraph 3.6.3](#) for details.

1. Select View Edit Site Data from the MAIN MENU.
2. Select Choose from list of sites.
3. Select one of the EmptySites from the presented list (e.g. EmptySite 1 as shown).
4. Select Site name and press the ENTER key.

```
VIEW EDIT SITE DATA  DD-MM-YY HH:MM:SS
Choose from list of sites
Site name           : EmptySite1
Dimensions           : mm
Pipe outside diameter: 58.00
Pipe wall thickness  : 4.00
Pipe lining thickness: 0.00
```

5. This opens the ALTER NAME screen.
6. Select Alter the Site Name and you will be presented with a screen which allows you to enter a new name in much the same way as when composing a mobile text message.
7. On completion press the ENTER key then select Exit. This will take you back to the VIEW EDIT SITE DATA screen.

```
ALTER NAME  DD-MM-YY HH:MM:SS
Site name   : EmptySite1
Do you wish to:-
  Alter the Site Name
  Exit
```

8. Scroll down through the menu list and enter/change the pipe parameters and other data pertaining to the site.
Note that this menu allows you to choose a Sensor Set, unlike the QUICK START menu which recommended the sensor set to use. If you enter an inappropriate sensor set in this menu you will be presented with an error message later when you go to the SENSOR SEPARATION screen.

```
VIEW EDIT SITE DATA  DD-MM-YY HH:MM:SS
Choose from list of sites
Site name           : MyNewSite
Dimensions           : mm
Pipe outside diameter: 58.00
Pipe wall thickness  : 4.00
Pipe lining thickness: 0.00
```

9. When all the data is correct you can either:
 - a) Select Save current site & read flow to continue fitting the transducers and opening the FLOW READING screen.
 - b) Select Delete this site to delete the site name and values and restore it to the original EmptySite name.
 - c) Select Download & save current site to save the site details and download them to a PC via RS232/USB provided the RS232/USB link is connected and correctly set-up.
 - d) Select Exit to return to the MAIN MENU.

```
Pipe wall material   : Mild Steel
Lining material      : -----
Sensor set           : A-ST
Sensor mode          : Reflex
Fluid type           : Water
Save current site & read flow
Delete this Site
Download & save current site
Exit
```

3.4.2 Changing a site name

To change a site name use the same method described above for generating a new site: but in this case access a current site name to change rather than an EmptySite. If you change a site name while the site is logging the logging will stop.

3.5 Instrument Calibration

The Portaflow is fully calibrated before it leaves the factory; however the following adjustments are provided to allow you to further 'fine tune' your instrument to suit local conditions and application where necessary. Apart from the zero flow offset adjustment, these are normally carried out only where the instrument is to be used in a permanent or semi-permanent location.

3.5.1 Adjusting the zero cut-off

This adjustment allows you to set a minimum flow rate (m/s) below which the instrument will indicate '0'. The default setting is 0.1 m/s but you may adjust this value if required.

1. With the instrument operating in FLOW READING mode, press the Options key to access the FLOW READING OPTIONS menu shown.
2. Select Zero Cutoff (m/s) and press the ENTER key.
3. Enter the value for the Zero Cutoff (e.g. 0.06 m/s) then press the ENTER key.
4. Scroll down to select Exit and press the ENTER key to return to the FLOW READING screen.

FLOW READING OPTION	DD-MM-YY	HH:MM:SS
Data review		
Zero Cutoff (m/s)	:	0.00
Set zero flow (m/s)	:	0.00
Damping (secs)	:	10
Totaliser	:	Run
Reset +Total		

3.5.2 Adjusting the set zero flow offset

The Portaflow instrument operates by comparing the time taken to send an ultrasonic signal between two transducers in either direction. A Set zero flow offset adjustment is provided to compensate for any inherent differences between the two sensors, noise pick-up, internal pipe conditions etc. It can be used to 'zero' the flow indication under no-flow conditions.



If you have adjusted the Zero Cutoff point to anywhere above '0' you must reset it to '0' before you can observe and adjust the Set zero flow offset, as its value is very small. Once the Set zero flow offset has been calibrated you can then reapply the Zero Cutoff if required.

1. Stop the liquid flow.
2. With the instrument in FLOW READING mode press the Velocity function key and observe the reading (m/s). Any reading other than 0.000 indicates an offset error and in practice this will typically be in the range ± 0.005 m/s (possibly higher on smaller diameter pipes). If a greater figure is shown it is worth calibrating the offset to obtain a more accurate result. Continue as follows:
3. Press the Options key to access the FLOW READING OPTION screen shown.
4. Select Set zero flow (m/s) and press the ENTER key.
5. Press the ENTER key on the subsequent screen to accept the change, which will return you to the screen shown.
6. Scroll down to select Exit and press the ENTER key to return to the FLOW READING screen.

FLOW READING OPTION	DD-MM-YY	HH:MM:SS
Data review		
Zero Cutoff (m/s)	:	0.00
Set zero flow (m/s)	:	0.00
Damping (secs)	:	10
Totaliser	:	Run
Reset +Total		



Key Point: In order to cancel any applied offset you must either read flow via Quick Start or switch the Portaflow instrument OFF & ON. Any value that you trim-out using the offset adjustment will be added/subtracted from the flow reading across the whole range.

3.5.3 Adjusting the calibration factor



Key Point: USE THIS FACILITY WITH CARE & ONLY WHERE NECESSARY

The Portaflow instrument is fully calibrated before leaving the factory and under normal circumstances does not require further calibration when used on site.

This facility can be used to correct the flow indication where unavoidable errors occur due to the lack of a straight pipe or where the sensors are forced to be fitted close to the pipe-end, valve, junction etc.

Any adjustment must be made using a reference flowmeter fitted in the system.

With the system running:

1. Stop (Stall) the Portaflow's totaliser facility and zero it ([Paragraph 3.6.1](#)).
2. Run the Portaflow's totaliser to measure the total flow over a 30-60 minute period, and note the total flow indicated by the reference flow meter over the same period.
3. Calculate the % error between the Portaflow and reference meters. If the error is greater than $\pm 1\%$ calibrate the Portaflow as detailed below.
4. Press the Options key to access the FLOW READING OPTION screen shown.
5. Scroll down and select Calibration factor.
6. Change the calibration factor according to the error calculated in step 3. For example, if the Portaflow was reading 1% high then increase the Calibration factor value by 0.010. Conversely, if the reading is 1% low then decrease the calibration factor to 0.990.
7. Press the ENTER key to apply the change.
8. Select Roughness factor or Exit as required.

FLOW READING OPTION	DD-MM-YY	HH:MM:SS
Data review		
Zero Cutoff (m/s)	:	0.00
Set zero flow (m/s)	:	0.00
Damping (secs)	:	10
Totaliser	:	Run
Reset +Total		
Reset -Total		
Calibration factor	:	1.000
Roughness factor	:	0.01
Diagnostics		
Select Totals	:	Both
Exit		

3.5.4 Adjusting the roughness factor

The roughness factor compensates for the condition of the internal pipe wall, as a rough surface will cause turbulence and affects the flow profile of the liquid. In most situations it is not possible to inspect the pipe internally and the true condition is not known. In these circumstances experience has shown that the following values can be used:

Pipe Material	Roughness Factor
Non ferrous metal Glass Plastics Light metal	0.01
Drawn steel pipes: <ul style="list-style-type: none"> • Fine planed, polished surface • Plane surface • Rough planed surface 	0.01
Welded steel pipes, new: <ul style="list-style-type: none"> • Long usage, cleaned • Lightly and evenly rusted • Heavily encrusted 	0.1
Cast iron pipes: <ul style="list-style-type: none"> • Bitumen lining • New, without lining • Rusted / Encrusted 	1.0

With the system running in FLOW READING mode:

1. Press the Options key to access the FLOW READING OPTION screen shown.
2. Scroll down and select Roughness factor.
3. Change the roughness factor according to the pipe material and condition as described above.
4. Press the ENTER key to apply the change.

FLOW READING OPTION	DD-MM-YY	HH:MM:SS
Data review		
Zero Cutoff (m/s)	:	0.00
Set zero flow (m/s)	:	0.00
Damping (secs)	:	10
Totaliser	:	Run
Reset +Total		
Reset -Total		
Calibration factor	:	1.000
Roughness factor	:	0.01
Diagnostics		
Select Totals	:	Both
Exit		

3.5.5 Adjusting the damping factor

By averaging-out the flow rate over several seconds, the Damping factor can be used to smooth out rapid changes in flow rate to prevent wild fluctuations in the displayed flow value. It has a range of 1, 10, 15, 20, 30, 50 seconds, with a default setting of 10.

With the system running in FLOW READING mode:

1. Press the Options key to access the FLOW READING OPTION screen shown.
2. Scroll down and select Damping (secs).
3. This will open the DAMPING OPTIONS screen.

FLOW READING OPTION		DD-MM-YY	HH:MM:SS
Data review			
Zero Cutoff (m/s)	:	0.00	
Set zero flow (m/s)	:	0.00	
Damping (secs)	:	10	
Totaliser	:	Run	
Reset +Total			
Reset -Total			
Calibration factor	:	1.000	
Roughness factor	:	0.01	
Diagnostics			
Select Totals	:	Both	
Exit			

4. Select the value of the Damping factor as required to remove any unwanted display fluctuations. Increasing the value applies a greater smoothing affect.
5. Press the ENTER key to apply the selection and return to the FLOW READING OPTIONS screen.

DAMPING OPTIONS		DD-MM-YY	HH:MM:SS
1 second			
10 seconds			
15 seconds			
20 seconds			
30 seconds			
50 seconds			



Key Point: If the damping factor is set too high the value displayed may appear stable but it may exhibit large step changes when the value is updated.

3.6 Performing Monitoring & Logging Functions

This procedure shows you how to set up a basic logging session under manual start/stop control.

Logged data is saved to the instrument's memory and can be downloaded to a PC at a later time. Either -Flow Rate or +Flow Rate and \pm Totals can be logged to Memory, RS232 or both. Totals are always logged and can be selectively down loaded after the logging has stopped.



Key Point: To view the totals on the screen and send them to the RS232/USB output as they are logged, you have to select the required option in the Data Logger menu before setting up the flow reading.

3.6.1 How to measure totalised flows (manually)

The basic measurement indicated on the FLOW READING screen is the instantaneous flow rate, which in some applications may vary over a period of time. Average flow rates are therefore often required in order to get a better understanding of an application's true performance. This is simply achieved by noting the total flow over a specific period (for example 30-60 minutes) and then calculating the average flow rate over that period of time.

1. Press the Options key to access the FLOW READING OPTION screen shown.
2. If the Totaliser is indicating Run, select it and change it to Stall. Press the ENTER key.
3. Select Reset +Total and press the ENTER key.
4. Press the ENTER key on the subsequent screen to accept the reset.
5. Press the ENTER key again to return to the FLOW READING OPTIONS menu.
6. Select Reset -Total and press the ENTER key.
7. Press the ENTER key on the subsequent screen to accept the reset.
8. Press the ENTER key again to return to the FLOW READING OPTIONS menu.
9. Note and record the current time.
10. Select Totaliser and change it to Run. Press the ENTER key.
Note: the totalisers begin to count up as soon as Totaliser is put to Run.
11. Scroll down and select Exit to return to the FLOW READING screen which will now indicate the instantaneous flow together with the totalised flow.

Note: In some installation the measured flow can be in either direction. Where this is the case the upstream flow is shown separately in the -Total field.

```

FLOW READING OPTION  DD-MM-YY  HH:MM:SS
Data review
Zero Cutoff (m/s)    :      0.00
Set zero flow (m/s)  :      0.00
Damping (secs)      :      10
Totaliser          :      Stall
Reset +Total


```

```

FLOW READING OPTION  DD-MM-YY  HH:MM:SS
Zero Cutoff (m/s)    :      0.00
Set zero flow (m/s)  :      0.00
Damping (secs)      :      10
Totaliser          :      Run
Reset +Total
Reset -Total

```

```

FLOW READING          DD-MM-YY  HH:MM:SS
Signal                Qxx.x%
 12.34 l/min
+Total: 300.0          litres
-Total: 0.00           litres

```

Calculating the average flow

To calculate the average flow wait for the allotted monitoring period to expire then divide the indicated total flow by the time taken. This will give you the average flow in m/s, galls/hour or whatever units you select.

Note that in a bi-directional flow situation you must calculate the difference between the indicated positive and negative flow totals before carrying out the average flow rate calculation.

How to stop the totaliser temporarily

If you want to stop the totaliser temporarily for operational reasons, set the Totaliser option to Stall in the FLOW READING OPTIONS screen as described above. This will stop the totaliser operation without affecting its current values.

3.6.2 Display of totalisers

1. To change the display of the totalisers select the Select Totals menu item from the FLOW READING OPTION menu.
2. The display of the totals on the FLOW READING screen is controlled by this menu.
3. Select one, both or no totals to be displayed. The default is the display of Both totalisers.
4. Press the ENTER key.

```

FLOW READING OPTION  DD-MM-YY  HH:MM:SS
Off
Both
+Total
-Total
    
```

Note: This menu selection only affects the Display of the totaliser. Unless the totalisers are stalled, the recorded volume will still be incremented and the totals will be logged irrespective of the display setting.

3.6.3 How to set up the basic logging application to memory

This procedure shows you how to set up a basic logging session under manual start/stop control. The logged data is saved to the instrument's memory and can be downloaded to a PC at a later time.

Starting point

This procedure assumes that the Portaflow instrument has been correctly installed and is operating in the FLOW READING mode.

Setting up and starting the logging

1. With the Portaflow operating in FLOW READING mode, check that the indicated flow units are the same as those you want to appear on the logger output (e.g. l/min).
2. Press the Logger function key to access the REAL TIME LOGGER screen.
3. Select Log data to and choose Memory to store the log to the instrument's internal memory.
4. Select Logging interval and enter the required period (e.g. 10 seconds).
5. Select Clear log if you want to discard any existing logging data.
6. Select START NOW.

```

REAL TIME LOGGER  DD-MM-YY  HH:MM:SS
4-20mA O/P is ON.  Qxx.xx%
Unit              : l/min
Log name          : Quickstart
Log data to       : Memory
Logging interval  : 10 seconds
Start date & time : dd-mm-yy hh:mm:ss
Stop date & time  : dd-mm-yy hh:mm:ss
    
```

```

Remaining time    : MM DD HH MM SS
Extended Intervals : Stop
Graph Y axis max. : 50
View log as text
View log as graph
START NOW
Set Auto start
Clear log
Exit
    
```

7. This screen appears only if a log already exists for the QuickStart site. It allows you to either delete or save the existing log, or cancel the START NOW request.

```

ERR:Log not empty  DD-MM-YY  HH:MM:SS

Press ← to confirm deletion
Press △ to save log and continue
Press ▽ to cancel
    
```

If you choose to save the existing log it will be saved to the highest number site that does not currently have an attached log (e.g. EmptySite19, EmptySite18.... etc). The name of the site to which the log is saved will be changed to CopyQS_xx (where xx is a numerical value which is incremented each time a log is saved). For example: if EmptySite19 is available when you elect to save the QuickStart log, the log is saved to EmptySite19 and the sitename is changed to CopyQS_1.



Key Point: When setting up a named site it is advisable to run a brief logging session on the new site to establish a data log file, as this will prevent the site name being overwritten when saving the QuickStart log, as described above.

View log as text

- The VIEW LOG AS TEXT screen displays the log events in date-stamped chronological order.

Note: Press key 5 to go to the top line of logged data or key 6 to go to the bottom line.

VIEW LOG AS TEXT	DD-MM-YY	HH:MM:SS
Logging to memory		
Log:Quickstart		l/m
Date	Time	Flow Totals
DD-MM-YY	hh:mm:ss	xxx.xx
DD-MM-YY	hh:mm:ss	xxx.xx
DD-MM-YY	hh:mm:ss	xxx.xx
DD-MM-YY	hh:mm:ss	xxx.xx

DD-MM-YY	hh:mm:ss	xxx.xx l/m

- Press the ENTER key to return to the REAL TIME LOGGER screen. Then select Exit to return to the FLOW READING screen. Logging will continue to take place in the background.



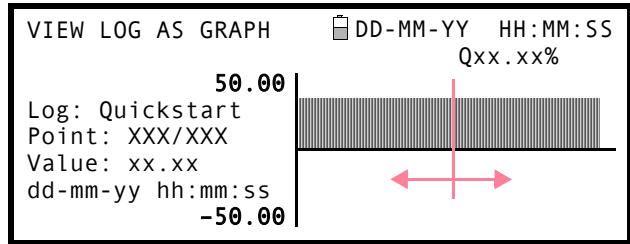
Key Point: There can be only one set of logged data per site. If a new data log is started on a site it will clear the existing data.

View log as graphic

- If you want to view the logging progress graphically rather than as text, press the Logger function key to get to the REAL TIME LOGGER screen.
- Select Graph Y axis max and enter a value equal to the expected maximum flow.
- Select View log as graph. This will open the VIEW LOG AS GRAPH screen shown below.
- You can select the data at any point in time by scrolling along the time axis of the graph using the LEFT/RIGHT scroll keys (5 & 6). The data values for the selected point are then shown to the left of the graph. Keep the scroll key pressed for the cursor to move automatically.

REAL TIME LOGGER	DD-MM-YY	HH:MM:SS
4-20mA O/P is ON.		Qxx.xx%
Unit	:	l/min
Log name	:	Quickstart
Log data to	:	Memory
Logging interval	:	10 seconds
Start date & time	:	dd-mm-yy hh:mm:ss
Stop date & time	:	dd-mm-yy hh:mm:ss
Remaining time	:	MM DD HH MM SS
Extended Intervals	:	Stop
Graph Y axis max.	:	50
View log as text		
View log as graph		
START NOW		
Set Auto start		
Clear log		
Exit		

14. If you want to change the value of the Y axis to improve the resolution of the graph press the UP/DOWN scroll keys. The maximum values will then increase/decrease as appropriate.
15. To exit the VIEW LOG AS GRAPH screen and return to the REAL TIME LOGGER screen press the ENTER key.



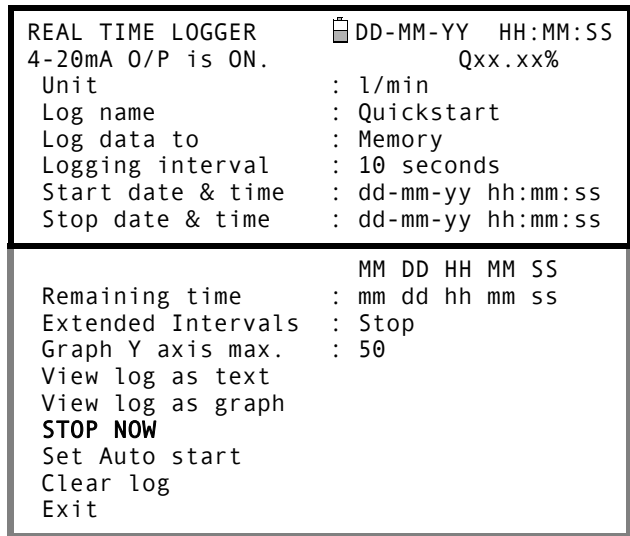
Monitoring the logged events at a later time

16. If you wish to monitor the logging progress at any time while you are operating in FLOW READING mode, press the Logger function key as described above to switch to the REAL TIME LOGGER screen. You can then select View log as text or View log as graph, as required, without interfering with the logging operation.

Stop logging

17. From the FLOW READING screen, press the Logger function key to access the REAL TIME LOGGER screen.
18. Select STOP NOW to cease logging. Note that the START NOW and STOP NOW options toggle depending on which was last selected.
19. Select Exit to return to the FLOW READING screen.

Note: *The logged data will remain stored in the instrument's memory and can be accessed at any time as described above.*



3.6.4 How to set up automatic (timed) logging mode

This procedure shows you how to set up an auto logging session under timed start/stop control. The logged data is saved to the instrument's memory and can be downloaded to a PC at a later time.

Starting point

This procedure assumes that the Portaflow has been correctly installed and is operating in the FLOW READING mode. Also that the instrument's date and time are correctly set.

Setting up, starting and cancelling auto logging



Key Point: When entering the Start and Stop times in this procedure, you must enter '00' in the seconds field rather than leave it blank, otherwise an error message is displayed.

Key Point: If you enter a Start time that is later than the Stop time you will see an error message until the stop time has been set to be later. This does not however affect the operation of the equipment once the correct times have been set.

1. With the Portaflow operating in FLOW READING mode, check that the indicated flow units are the same as those you want to appear on the logger output (e.g. l/min).

2. Press the Logger function key to access the REAL TIME LOGGER screen.
3. Select Log data to and choose Memory. This will store the log to the internal memory.
4. Select Logging interval and enter the required period.
5. Select Start date & time and enter the date and time you wish logging to commence. Note this must be in the future.

Note: If the log is not empty then a warning screen will be displayed, and when a key is pressed the menu will be displayed with the cursor at the Clear Log item. The log must be cleared before new times can be entered.

```

REAL TIME LOGGER      DD-MM-YY  HH:MM:SS
4-20mA O/P is ON.    Qxx.xx%
Unit                  : l/min
Log name              : Quickstart
Log data to          : Memory
Logging interval     : 10 seconds
Start date & time    : dd-mm-yy hh:mm:ss
Stop date & time     : dd-mm-yy hh:mm:ss
  
```

```

Remaining time       MM DD HH MM SS
                    : mm dd hh mm ss
Extended Intervals  : Stop
Graph Y axis max.   : 50
View log as text
View log as graph
START NOW
Set Auto start
Clear log
Exit
  
```

6. Select Stop date & time and enter the date and time you wish logging to cease. Note this must be later than the start time.

7. If the instrument is to be left unattended for a long logging period it could possibly fill the log memory. To determine how the instrument should react in such circumstances select Extended Intervals from the REAL TIME LOGGER screen and select the required option from the EXTENDED INTERVALS screen as described below:

```

EXTENDED INTERVALS  DD-MM-YY  HH:MM:SS
                    Qxx.xx%

Stop
Overwrite
Daily
Weekly
Monthly
  
```

- a) Stop: The default state and when the memory is full any active logging will stop.
- b) Overwrite: Allows logging to continue after the memory is full by erasing the oldest sample and replacing it with the latest.

Note: The three options below must be selected before the times and dates are entered in Start Time and Date and Stop Time and Date.

- c) Daily: Activates logging for part of each day as defined by the Start Time and Stop time. When selected, and the logging is started via the Set Auto start option, the flow value will be logged each day between the times specified. The Stop Time must be later than the Start Time. The data will be accumulated into a single file.
- d) Weekly: This is similar to Daily in that the active logging period is defined by the Start Time and Stop Time. The difference is that with Weekly the logging occurs every 7 days, with the start day being defined by the selected Start Date.
- e) Monthly: This is similar to Daily in that the active logging period is defined by the Start Time and Stop Time. The difference is that with Monthly the data is logged on the day of the month specified in the Start Date. If this is set to 29, 30 or 31, and the current month does not have this number of days, logging will occur on the last day of the month.

Note: if you select to clear all logs you will lose all the currently held log data.

8. Select Set auto start. This enables the auto logging application.

Note: *If Set Auto start is enabled with valid start and stop times then this entry will change to Cancel Auto start.*

9. To cancel the automatic logging session before it commences, click the Cancel Auto Start.
10. Select Exit to return to the FLOW READING screen.

```

REAL TIME LOGGER      DD-MM-YY HH:MM:SS
4-20mA O/P is ON.    Qxx.xx%
Unit                  : l/min
Log name              : Quickstart
Log data to          : Memory
Logging interval     : 10 seconds
Start date & time    : dd-mm-yy hh:mm:ss
Stop date & time     : dd-mm-yy hh:mm:ss
    
```

```

MM DD HH MM SS
Remaining time       : mm dd hh mm ss
Extended Intervals  : Stop
Graph Y axis max.   : 50
View log as text
View log as graph
START NOW
Cancel Auto Start
Clear log
Exit
    
```

Monitoring the logged events

11. If you wish to view the logging progress at any time while you are operating in FLOW READING mode, press the Logger function key as described above to access the REAL TIME LOGGER screen. You can then select View log as text or View log as graph, as required, without interfering with the logging operation. This is described in detail in the procedure given in [Paragraph 3.6.3](#).

Manually stopping the auto logging session

12. The logging session will stop automatically at the programmed Stop date & time.
13. If you wish to manually stop logging earlier than programmed, press the Logger function key to access the REAL TIME LOGGER screen then select STOP NOW to cease logging.
14. Select Exit to return to the FLOW READING screen.

Note: *The logged data will remain stored in the instrument's memory and can be viewed at any time as described above.*

```

REAL TIME LOGGER      DD-MM-YY HH:MM:SS
4-20mA O/P is ON.    Qxx.xx%
Unit                  : l/min
Log name              : Quickstart
Log data to          : Memory
Logging interval     : 10 seconds
Start date & time    : dd-mm-yy hh:mm:ss
Stop date & time     : dd-mm-yy hh:mm:ss
    
```

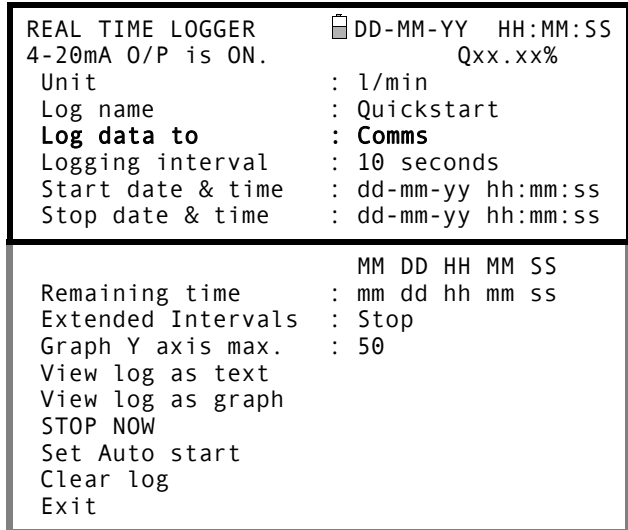
```

MM DD HH MM SS
Remaining time       : mm dd hh mm ss
Extended Intervals  : Stop
Graph Y axis max.   : 50
View log as text
View log as graph
STOP NOW
Set Auto start
Clear log
Exit
    
```

3.6.5 How to log directly to a PC

Selection made during logging set-up

1. In the previous procedures the logging data was routed to the Portaflow 330's internal memory where it was stored for later download to a PC/printer. However, you could have sent it directly to the PC or printer for 'live' data display by selecting Comms in the Log data to option in the REAL TIME LOGGER screen.
2. In order for this to work correctly the Portaflow 330 must be connected to the PC and the RS232/USB link already established.



Swapping data destinations during a logging session

When a logging session is in progress the Portaflow 330 is normally in the FLOW READING mode. In this mode you can switch the logging data destination by pressing the Logger function key and then selecting either Memory or Comms in the Log data to field – see the screen above. You can also select Both, to route the data to both destinations simultaneously.



Key Point: This will only work if the Portaflow 330 is connected to the PC and the RS232 link has already been established. If the RS232 protocol has not been configured you can access the RS232 set-up screen by returning to the FLOW READING screen and then pressing the Comms button.

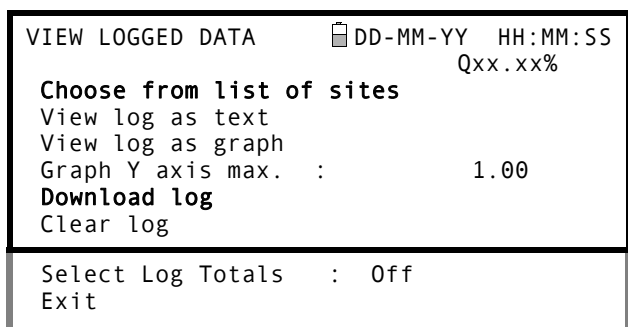
3.6.6 How to download logged data to a PC

This procedure describes how to download stored data to a PC. It assumes that the Portaflow 330 is already connected to the PC's serial port and that RS232/USB communication has been established, as described in [Paragraph 3.7.1](#).

1. Access the MAIN MENU.

Note: If this is done from the FLOW READING screen any logging currently taking place will be terminated.

2. Select Data Logger from the MAIN MENU.
3. Select Choose from list of sites and select the name of the site to download.



4. The totals are always logged. If you wish to display them when either viewing a log or downloading it to a PC or printer, then use the options in **Select Log Totals**. The default is **Off**. (Portagraph III does not display the totals, even if they are enabled).
5. If you want to view the log prior to downloading it you can do so using the **View log as text** or **View log as graph** options.
6. When you are ready to begin downloading the log select **Download Log**.

```
VIEW LOGGED DATA      DD-MM-YY  HH:MM:SS
Off
Both
+Total
-Total
```

7. From the **DOWNLOAD LOG** screen select **USB** or **RS232** then select **Send** from the subsequent confirmation screen.
8. The selected logged data is now downloaded to the PC.
9. Upon completion select **Exit** to return to the **VIEW LOGGED DATA** screen.
10. On the **VIEW LOGGED DATA** screen you can now **Clear** the log if required or **Exit** directly back to the **MAIN MENU**.

```
DOWNLOAD LOG          DD-MM-YY  HH:MM:SS
                        Qxx.xx%
Select Serial port or printer & press ↵
USB
RS232
Exit
```



Key Point: When using the USB to download data, make sure that the USB driver has been installed and the correct COM port has been set (see [Paragraph 2.3](#)).

3.7 Configuring the Portaflow 330 Communication Interfaces

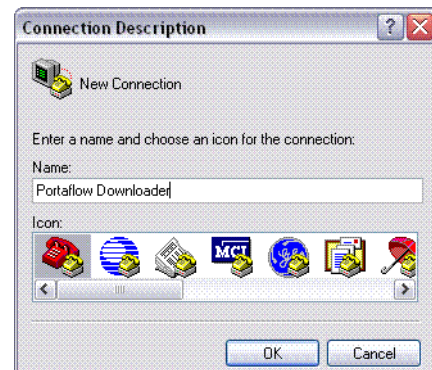
3.7.1 How to set-up an RS232 connection

If you want to download a stored data log, or output live data logging, to a PC you must first establish RS232 communication between the PC and the data logger. (Download is also possible using USB.)

This procedure provides step-by-step instructions for setting up a HyperTerminal connection, which is a standard Windows® XP application (not available on Vista). The default location of HyperTerminal is:
Start>All Programs>Accessories>Communications>HyperTerminal

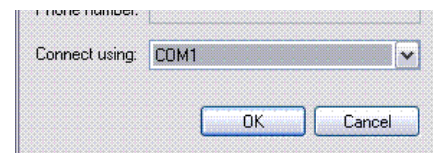
Setting up a HyperTerminal connection

1. Open HyperTerminal. The Connection Description dialogue box will appear.
2. Enter a name for the connection (Portaflow Download in the example) then click OK.



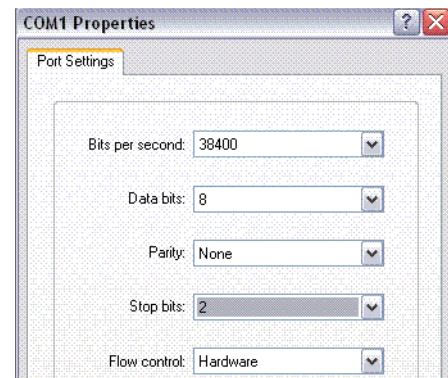
3. Select a COM port, then click OK.

Note: The available COM ports will vary between individual PC installations.

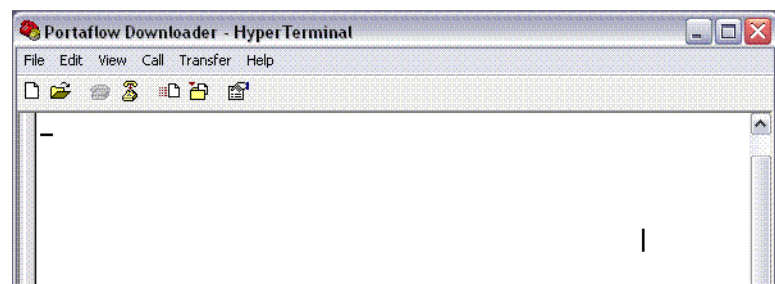


4. Enter values for the Port Settings as shown.
5. Click on OK.
6. The 'Portaflow Download' Terminal settings will now be saved.

Note: When you next start a HyperTerminal session you can select the 'Portaflow Download' terminal from the File>Open menu rather than having to re-enter the parameters.



7. The main HyperTerminal window will now become active (note the connection name now shown in the title bar).
8. Leave this window open while you configure the Portaflow 330's RS232 parameters.



Configuring the Portaflow 330 instrument

9. Select Setup RS232 / USB from the MAIN MENU. This will access the SETUP RS232/USB screen shown here.
10. Set the RS232 parameters as shown opposite.

Note: The selected Baud Rate must also be available on the receiving terminal.

SETUP RS232 / USB	☐ DD-MM-YY	HH:MM:SS
		Qxx.xx%
Handshaking	:	None
Baud Rate	:	38400
Data Bits	:	8
Stop Bits	:	2
Parity	:	None
New line	:	CR+LF
Printer test	:	
Exit		

Testing the RS232 connection

11. Ensure the Portaflow 330 is connected to the PC's serial port using the cable provided.
12. In the SETUP RS232/USB screen select Printer test.
13. If the link is working correctly the software revisions and serial number should now appear in the HyperTerminal window, as shown in [Figure 3.1](#) on page 40.

3.7.2 How to set-up a USB connection

In order to use a USB connection you must first install the special USB driver as detailed in [Paragraph 2.3](#). This will set up a virtual port through which the Portaflow 330 can communicate.

When you make the connection with the computer use the same technique as described above for setting up an RS232 communications session through HyperTerminal. But in this case when you are asked to select a Com Port choose the virtual port set up by the driver installation.

Once this is done, provided the Portaflow and computer communications protocols are set to the same values (Handshaking, Start bits, Stop bits, Parity etc) the two devices should be able to communicate in the same manner as described for the RS232.

3.7.3 Working With Portagraph III

Micronics Ltd supplies the 'Portagraph III Downloading and Graphing' software to make it easy for the user to download logged data to a PC. Once downloaded, the logged data can be analysed using the Portagraph III graphing capability, or exported to Microsoft Excel® for more detailed graphing and analysis.

The software application connects to the Portaflow instrument via the RS232 or USB serial interface.

For full details of Portagraph III operation, refer to the Portagraph III User Manual.

3.8 Configuring the Current / Pulse Output

The Current/Pulse Output connector provides two output signals that are proportional to the measured fluid flow. The first is a current signal calibrated to a standard control range (e.g. 4-20mA), and the second is a pulse output. It is permissible to use both outputs simultaneously.

3.8.1 Current output

Using the instrument's menu system, the operator can use the following procedures to:

- Select the current output function Off / On
- Select the current output signal range (4-20mA, 0-20mA, 0-16mA)
- Calibrate the current output signal to a required flow range

Turning the 4-20mA output OFF/ON and selecting the current range

1. With the instrument operating in the FLOW READING mode, press the 4-20mA function key. This will access the 4-20mA OUTPUT screen.
2. The ON/OFF status of the 4-20mA output is shown on line 2 of the display.
3. To change the ON/OFF status select Output Range and press the ENTER key.
4. Select Off, to turn OFF the 4-20mA Output or select one of the output ranges to turn it ON.
5. Press the ENTER key to return to the 4-20mA OUTPUT screen.

```

4-20 mA OUTPUT      DD-MM-YY HH:MM:SS
4-20 mA O/P is ON  Qxx.xx%
mA Output Reading   : 0.00
Output Range        : 4-20
Units                : l/min
Flow at max. output : 0.00
Flow at min. output : 0.00
Output mA for error : 22.00
Exit
    
```

```

4-20 mA OUTPUT      DD-MM-YY HH:MM:SS
Off                  Qxx.xx%
4-20mA
0-20mA
0-16mA
    
```

4-20mA signal calibration and ranging



Key Point: The 4-20mA output has been calibrated in the factory and should not require further adjustment. In the rare event that re-calibration is necessary, this procedure should be carried out only by a trained engineer.

This procedure describes how to calibrate the 4-20mA output and 'scale' it to operate over a defined flow-rate range.

Signal calibration

1. Select Setup Instrument from the MAIN MENU, to access the SETUP INSTRUMENT screen.
2. Select Calibrate 4-20mA.
3. Connect a calibrated ammeter to the 4-20mA output and adjust the UP/DOWN Scroll keys (Coarse) and LEFT/RIGHT Scroll keys 5 & 6 (fine) until the output is exactly 4.0mA. The DAC should indicate approximately 8000.
4. Press the ENTER key when done.

```

SETUP INSTRUMENT    DD-MM-YY HH:MM:SS
Set Date & Time     : dd-mm-yy hh:mm:ss
Calibrate 4-20mA
Pulse output
Backlight           : Disabled
Factory settings
Change Language
Exit
    
```

```

CALIBRATE 4mA       DD-MM-YY HH:MM:SS
Adjust the output current to 4mA
Use Δ▽ to set, 5/6 to trim
DAC Value:          8000
Press ← when done
    
```


- With the meter still connected to the 4-20mA output adjust the Scroll keys to obtain an output of exactly 20mA. The DAC should indicate approximately 40000.
- Press the ENTER key when done.

CALIBRATE 20mA DD-MM-YY HH:MM:SS

Adjust the output current to 20mA
Use Δ / ∇ to set, 5/6 to trim

DAC Value: 40000

Press \leftarrow when done

4-20mA Signal scaling

Note: The 4-20mA can be set to represent a particular flow range. It is also possible to enter a negative figure for the minimum output and this would enable a reverse flow to be monitored.

- With the instrument operating in the FLOW READING mode, press the 4-20mA function key. This will access the 4-20mA OUTPUT screen.
- Select Flow at max. output and enter a value of the flow rate that you want to associate with a 20mA output.
- Select Flow at min. output and enter a value of the flow rate that you want to associate with a 4mA output. This could be '0'.
- Select Output mA for error and enter a value (default is 22mA) that you want the 4-20mA output to produce in the event of an error (e.g. if the flow-rate is outside the set range).
- Upon completion press the ENTER key to return to the FLOW READING screen.

4-20 mA OUTPUT DD-MM-YY HH:MM:SS

4-20 mA O/P is ON Qxx.xx%

mA Output Reading : 0.00

Output Range : 4-20

Units : l/min

Flow at max. output : 0.00

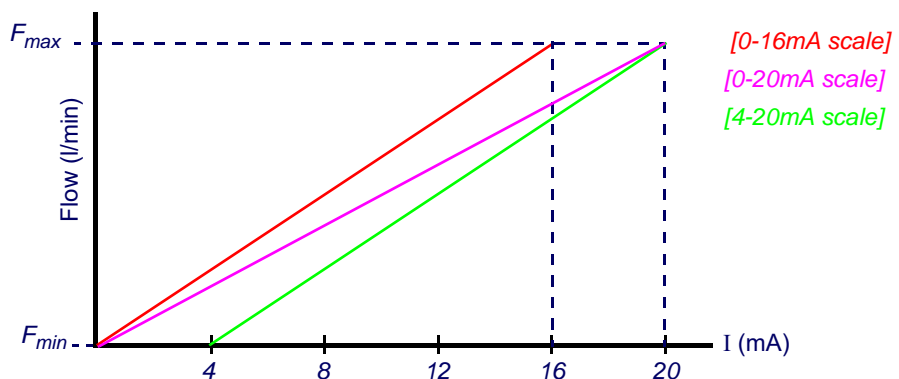
Flow at min. output : 0.00

Output mA for error : 22.00

Exit

Converting the measured current to flow rate

Assume the maximum flow rate is F_{max} (l/min) and the minimum flow rate F_{min} is '0' (l/min), as shown.



To calculate the flow rate (l/min) for a measured current I(mA) then:

0-20mA	0-16mA	4-20mA
$\text{Flow rate} = \frac{I \times (F_{max} - F_{min})}{20} + F_{min}$	$\text{Flow rate} = \frac{I \times (F_{max} - F_{min})}{16} + F_{min}$	$\text{Flow rate} = \frac{(I - 4) \times (F_{max} - F_{min})}{(16)} + F_{min}$

3.8.2 Pulse output

The pulse output can be used in two modes, 'volumetric' and 'frequency'. When operating in the 'volumetric' mode a pulse is produced every time a pre-selected volume of liquid passes through the pipe; and when in the 'frequency' mode the output is a continuous pulse-train with a frequency proportional to the flow rate (l/s).

Using the instrument's menu system, the operator can use the following procedures to:

- Select the pulse output function Off/On/Frequency
- Volumetric mode – select the output pulse width and volume per pulse
- Frequency mode – select the maximum pulse frequency and the corresponding maximum flow rate

Turning the pulse output OFF/ON (volumetric mode)

1. With the instrument operating in the FLOW READING mode, press the Pulse function key to access the PULSE OUTPUT screen.
2. A Pulse output is ON (or OFF) message appears in the second line of the display.
3. To change the pulse output operational status, select the Output menu option then select Off/On as required.
4. Select Exit and press the ENTER key to return to the FLOW READING screen.

PULSE OUTPUT	☰ DD-MM-YY	HH:MM:SS
<i>Pulse output is ON</i>		Qxx.xx%
Flow units	:	litres
Output	:	On
Vol per pulse	:	10.00
Pulse width (ms)	:	10
Max Pulse Freq (Hz)	:	10.00
Flow at Max Freq	:	200.00
Calculated Pulse Value:		20.0
Exit		

Generating a 'Test' pulse

If the PULSE OUTPUT menu screen is accessed from the SETUP INSTRUMENT menu you can generate a 'test' pulse by selecting Flow units and pressing the Option key.

Note: This does not apply if the PULSE OUTPUT menu is accessed by pressing the Pulse key when operating in the FLOW READING mode.

Calibrating the pulse output signal range (volumetric mode)

1. With the instrument operating in the FLOW READING mode, press the Pulse function key to access the PULSE OUTPUT screen.
2. To change the Flow units shown in this menu you must return to the FLOW READING screen and select the required units using keys 7,8 and 9.
3. Select Vol per pulse and enter the required value.
In the example shown, a 10ms pulse is produced for every 10 litres of flow.

PULSE OUTPUT	☰ DD-MM-YY	HH:MM:SS
<i>Pulse output is ON</i>		Qxx.xx%
Flow units	:	litres
Output	:	On
Vol per pulse	:	10.00
Pulse width (ms)	:	10
Max Pulse Freq (Hz)	:	10.00
Flow at Max Freq	:	200.00
Calculated Pulse Value:		20.0
Exit		

Note: The pulse Output must be Off in order to change the Volume per pulse.

4. Select a Pulse width (in ms) to suit the particular application – e.g. electro-mechanical counter. Refer to the manufacturer's data sheet for the minimum pulse width.
5. Select Exit and press the ENTER key to return to the FLOW READING screen.

Selecting the pulse output frequency mode

1. With the instrument operating in the FLOW READING mode, press the Pulse function key to access the PULSE OUTPUT screen.
2. To change the pulse output to 'frequency' mode, select the Output menu option then select Frequency as required.
3. A1 Pulse Frequency is ON message appears in the second line of the display.
4. Select Exit and press the ENTER key to return to the FLOW READING screen.

PULSE OUTPUT	☰ DD-MM-YY	HH:MM:SS
<i>A1 Pulse Frequency is ON</i>		Qxx.xx%
Flow units	:	litres
Output	:	Frequency
Vol per pulse	:	10.00
Pulse width (ms)	:	10
Max Pulse Freq (Hz)	:	10.00
Flow at Max Freq	:	200.00
Calculated Pulse Value:		20.0
Exit		

Calibrating the pulse frequency range

1. With the instrument operating in the FLOW READING mode, press the Pulse function key to access the PULSE OUTPUT screen.
2. Select Max Pulse Freq (Hz) and enter the required value.
3. Select Flow at Max Freq and enter the required value (l/s).
4. Select Exit and press the ENTER key to return to the FLOW READING screen

PULSE OUTPUT	☰ DD-MM-YY	HH:MM:SS
<i>A1 Pulse Frequency is ON</i>		Qxx.xx%
Flow units	:	litres
Output	:	Frequency
Vol per pulse	:	10.00
Pulse width (ms)	:	10
Max Pulse Freq (Hz)	:	10.00
Flow at Max Freq	:	200.00
Calculated Pulse Value:		20.0
Exit		

The Calculated Pulse Value field is automatically calculated as:

$$\text{Calculated Pulse Value} = \frac{\text{Flow at Max Freq}}{\text{Max Pulse Freq (Hz)}}$$

This value is often required to be programmed into the device that is receiving the pulses to enable it to calculate the correct flow rate – for example, when connecting the pulse output to a Calec energy meter.

3.9 Printing

Logged data can be printed using an RS232-compatible printer.

3.9.1 How to print logged data using the RS232 printer

This procedure shows you how to set up and use the RS232 printer to print logged data.

Setting up an RS232 connection

1. Connect the Portaflow 330 to the printer using the printer cable supplied. This cable is fitted with a 9-way D-Type plug terminated as follows:

Pin 1 – N/C (No connection)	Pin 2 – TxD data from Portaflow 330 to printer
Pin 3 – RxD data from printer to Portaflow 330	Pin 4 – N/C
Pin 5 – Signal ground	Pin 6 – N/C
Pin 7 – N/C	Pin 8 – N/C
Pin 9 – N/C	

2. Select Setup RS232 / USB from the MAIN MENU. This will access the SETUP RS232 / USB screen shown here.
3. Set the RS232 parameters to comply with those for the printer.

SETUP RS232 / USB	DD-MM-YY	HH:MM:SS
		Qxx.xx%
Handshaking	:	Xon/Xoff
Baud Rate	:	1200
Data Bits	:	8
Stop Bits	:	1
Parity	:	None
New line	:	CR+LF
Printer test	:	
Exit		

Note: The parameters shown here are for the Seiko DPU-414 Thermal Printer.

4. Ensure that the printer has sufficient paper, is switched ON and ON LINE.

Printer test

5. To check that the Portaflow 330 printer interface is operational, select Printer test from the SETUP RS232 / USB menu. If the RS232 interface is working correctly the software revisions and serial number will be printed:

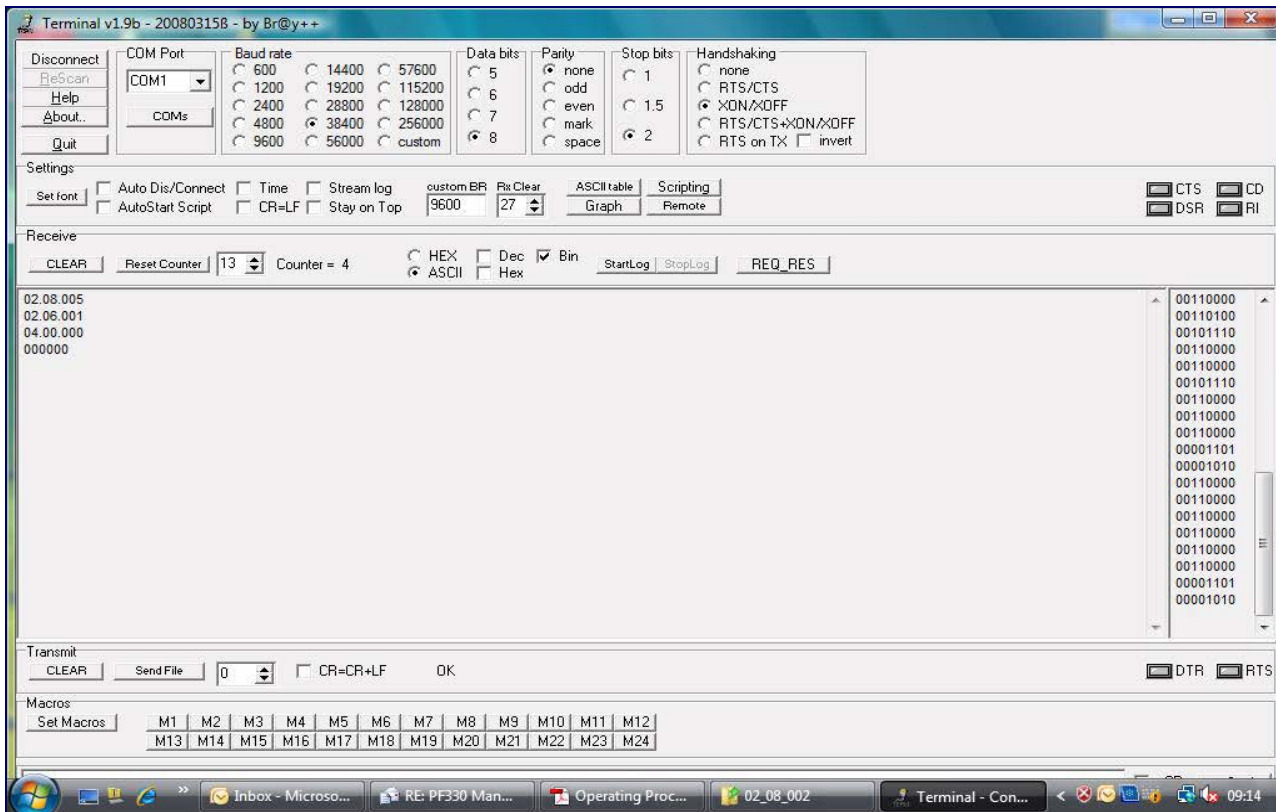


Figure 3.1 Printer test results in Terminal window

If nothing is printed, check that the RS232 parameter settings are correct for the printer and that the PF330 TxD and RxD signals are compatible with the printer's RS232 interface. A gender changer may be required to swap the TxD and RxD signals.

Printing logged data

1. Select View Logged Data from the MAIN MENU. This will display the VIEW LOGGED DATA screen shown.
2. Select Choose from list of sites and select the site name for the log you want to print.
3. When you are ready to begin printing the log select Download log.
4. From the DOWNLOAD LOG screen select RS232. This will open the SETUP RS232/USB screen shown below.
5. Select Send from the SETUP RS232/USB screen. The printer should now start printing.
6. The message screen will be displayed while printing takes place (see next page).
7. Printing will continue until all logged data is output or until the ↵ key is pressed.

Note: *The printer will continue printing until its print buffer is empty, which may take a few minutes.*

```
VIEW LOGGED DATA      DD-MM-YY  HH:MM:SS
Choose from list of sites
View log as text
View log as graph
Graph Y axis max. :      1.00
Download log
Clear log

Select Log Totals : Off
Exit
```

```
DOWNLOAD LOG          DD-MM-YY  HH:MM:SS
Select Serial port or printer & press ↵
USB
RS232
Exit
```

```
SETUP RS232/USB      DD-MM-YY  HH:MM:SS

Send
Exit
```

```
SETUP RS232/USB      DD-MM-YY  HH:MM:SS
Data is being downloaded on RS232

This screen will clear
when download is completed.
Press↵ to cancel Download
```


4: Maintenance & Repair

This instrument does not contain any user-serviceable parts. The following notes are provided as a guide to general equipment care



WARNING

**Do not disassemble this unit unless advised by Micronics.
Return the unit to an approved service agent or place of purchase
for further advice.**

1. Ensure the unit is switched off and disconnected from the mains, then wipe the exterior of the instrument with a clean, damp cloth or paper towel. The use of a solvent may damage the surface.
2. The instrument contains a rechargeable battery, dispose safely and in accordance with the local regulations in force in the country of operation.
3. Ensure all cables and connectors are kept clean and free from grease or contaminants. Connectors may be cleaned with a general purpose cleaner if necessary.
4. Avoid the use of excessive grease/ultrasonic couplant on the sensors as this may impair the performance of the equipment. Excessive grease/couplant can be removed from the sensors and guide rails using an absorbent paper towel and a general purpose solvent cleaner.
5. We recommend that the ultrasonic couplant is replaced on the sensors every 6 months, especially on pipes where the application is too hot to touch. If the signal level drops below 30% this is also an indication that the sensors need re-greasing.
6. Regularly check all cables/parts for damage. Replacement parts are available from Micronics.
7. Ensure the person who services your instrument is qualified to do so. If in doubt, return the instrument to Micronics with a detailed report on the nature of any problem.
8. Ensure that suitable precautions are taken when using any materials to clean the instrument/sensors.
9. The instrument and sensors should be calibrated at least once every 12 months. Contact Micronics or your local service agent for details.
10. When returning product to Micronics make sure it is clean and please notify Micronics if the instrument has been in contact with any hazardous substances.
11. If the instrument was supplied with dust or dirt caps make sure they are re-fitted when the instrument is not in use.

5: Troubleshooting

5.1 Overview

If you have a problem with your flow monitoring system it can be due to any of the following:

Faulty instrument

If you suspect the instrument is faulty you can check it out using a test block as described in [Paragraph 5.4](#). This will establish that the instrument is functional and receiving a healthy signal from the connected transducers.

Incorrect setup

A low, or zero, signal could be caused by incorrect set-up such as:

- Incorrect site data entered into the instrument.
- Incorrect or non-matching ultrasonic transducers selected for use.
- Incorrectly fitted transducers – lack of couplant applied, incorrect spacing, insecure attachment.
- Poor connections between the probes and the instrument.

Application problem

If you are certain that the instrument is healthy and suitably set-up for the current site; and the probes are properly assembled and fitted correctly, there could be an application problem concerned with the site.

Check such conditions such as:

Poor pipe outer surface quality

- Uneven surface preventing good surface contact with the transducer.
- Flaking paint (should be removed).
- Variable air gap in concrete-covered pipes affecting the ultrasonic signal quality.

Poor internal pipe construction

- Rough internal pipe walls affecting fluid flow (see roughness factor).
- Internal welds positioned in the transducer signal path affecting the signal quality.
- The 'drippings' in galvanised-dipped pipes or other irregularities interfering with the signal path.

Incorrect probe location

- Transducers located too close to bends or valves, disturbing the flow profile.
- Transducers located too close to insertion probes, disturbing the flow profile.
- For horizontal pipework transducers should not be positioned on the top of the pipe.

Poor fluid conditions within the pipe

- Fluid contains bubbles, high particle density or sludge.
- Air in the top of the pipe.

Low fluid flow within the pipe

- Pipe obstructions.
- Malfunctioning valve not opening fully (or closed inadvertently).

Liquid content problems

- Multiple liquid contents do not comply accurately to expected sound speed criteria.
- Very hot pipe almost turns water to steam and therefore exhibits the wrong speed characteristics – could be due to reduced pipe pressure.
- Flashover – liquid turns into a gas because of lower than required pressure.

Automatic signal loss recovery

- If the signal is lost or the Quality falls below 40% then the set up procedure, normally invoked by Read Flow in the main menu, is automatically run until a good quality signal is found.

5.2 General Troubleshooting Procedure

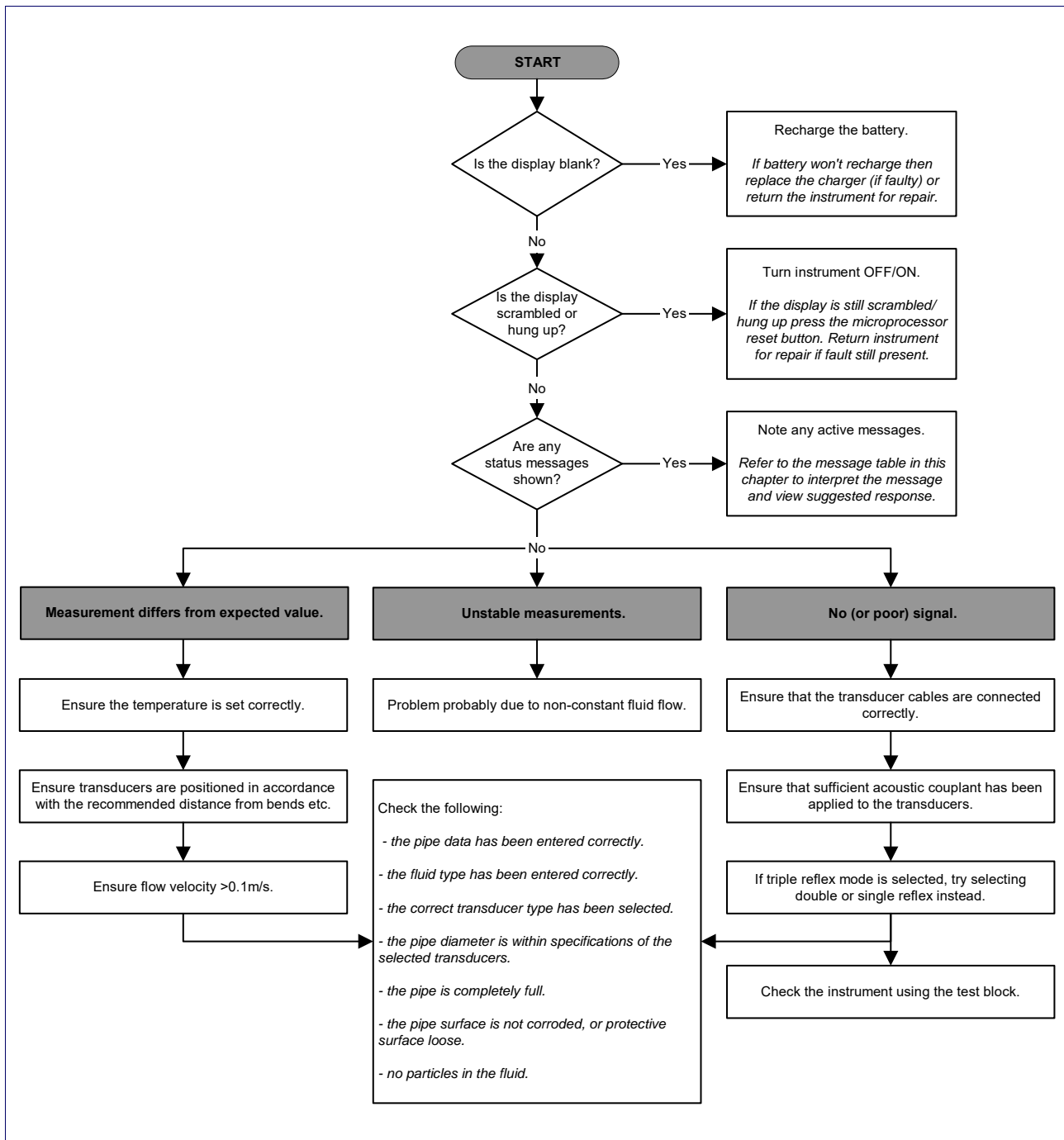


Figure 5.1 Troubleshooting chart

5.3 Warning & Status Messages

FLOW RATE ERRORS	
No flow signal	<p>Interpretation: This message appears when the transducers cannot send or receive signals to each other.</p> <p>Response: Firstly check that all cables are connected, transducers are on the pipe correctly with sufficient couplant on the face. This condition could also be due to a partially empty pipe, aerated liquid, particulate content too high or when the condition of the pipe being measured is poor.</p>
Flow signal is poor	<p>Interpretation: This warning appears when the signal is lower than 25%.</p> <p>Response: This could be due to an application problem, a poor quality pipe – see also the conditions for No flow signal (above). Check for sufficient couplant.</p>
Zero cut-off error!	<p>Interpretation: You have entered an out-of-range value in the Zero cutoff field in the Options menu.</p> <p>Response: Enter a valid number.</p>
Totaliser beyond maximum!	<p>Interpretation: The totaliser has overflowed its maximum count. The counter will roll-over and restart from zero but this message alerts you to the fact.</p> <p>Response: Reset the totaliser as described in Paragraph 3.6.1.</p>
PULSE ERRORS	
Pulse Rate > Max	<p>Interpretation: The flow rate exceeds the capability of the pulse output – i.e. too many pulses per second are required than can be achieved.</p> <p>Response: Narrow the pulse width time or increase the volume per pulse, as described on page 38.</p>
Pulse volume error!	<p>Interpretation: You have entered an out-of-range value in the Pulse volume error field in the PULSE OUTPUT menu – see page 38.</p> <p>Response: Enter a valid number.</p>
Pulse width error	<p>Interpretation: You have entered an out-of-range value in the Pulse width error field in the PULSE OUTPUT menu – see page 38.</p> <p>Response: Enter a valid number.</p>

4-20mA ERRORS	
mA out > Max	<p>Interpretation: The actual flow is higher than the maximum set on the mA range.</p> <p>Response: Re-scale the 4-20mA output to be able to cope with the higher flow – see page 36.</p>
Calibration 20mA Error!	<p>NOTE: The 4-20mA output is calibrated before the instrument leaves the factory and should not require further adjustment.</p> <p>Interpretation: You have adjusted the DAC outside its accepted range when calibrating the 20mA signal output.</p> <p>Response: Re-calibrate the 4-20mA output – see page 36.</p>
Calibration 4mA Error!	<p>NOTE: The 4-20mA output is calibrated before the instrument leaves the factory and should not require further adjustment.</p> <p>Interpretation: You have adjusted the DAC outside its accepted range when calibrating the 4mA signal output.</p> <p>Response: Re-calibrate the 4-20mA output – see page 36.</p>
DATA LOGGING ERRORS	
Log not empty!	<p>Interpretation: When using QuickStart and manually starting a log, this message is displayed to warn you that a log already exists. The screen will offer the option to cancel the logging, or save the log to another site.</p> <p>Response: Attempt to save the existing log, then re-start logging. If logging still fails to start, and the error message remains, then either all the sites are in use or all the Logger memory is full. Check for any unwanted log files and delete them.</p>
Log memory full	<p>Interpretation: This occurs when all the data logger memory locations are filled. The effect on the logging process will depend on the setting of the Memory rollover field in the REAL TIME LOGGER screen (which may be set to Stop or Overwrite).</p> <p>Response: Clear the logger memory, as described in Paragraph 3.6.4.</p>
BATTERY ERRORS	
Battery Low	<p>Interpretation: The battery has discharged to below 30% remaining. This leaves the instrument with approximately 4 hours remaining, depending on power usage, before it needs recharging.</p> <p>Response: Recharge the internal battery at the earliest opportunity. Do not leave the instrument for a prolonged period with a fully discharged battery.</p>
Battery Exhausted	<p>Interpretation: The battery is approaching a fully discharged state and the instrument is about to store the internal data and shut-down.</p> <p>Response: Recharge the battery.</p>

SET-UP ERRORS	
Pipe OD out of range	<p>Interpretation: You have entered an out-of-range value for the pipe outside diameter dimension – i.e. larger or smaller than the unit or sensor can be used on.</p> <p>Response: Enter a valid number.</p>
Wall thickness out of range	<p>Interpretation: You have entered an out-of-range value for the pipe wall thickness dimension – accepted range is 1mm - 75mm.</p> <p>Response: Enter a valid number.</p>
Lining thickness out of range	<p>Interpretation: You have entered an out-of-range value for the lining thickness dimension – acceptable range is 0mm - 25mm.</p> <p>Response: Enter a valid number.</p>
Temperature range	<p>Interpretation: You have entered an out-of-range value for the fluid Temperature. Accepted temperature range -20°C to +300°C.</p> <p>Response: Enter a valid number.</p>
Invalid Date or Time	<p>Interpretation: The entered Date or Time is invalid, or when setting up 'timed' data logging the Stop time is set earlier than the Start time.</p> <p>Response: Enter a valid Date and Time.</p>
Sensors: INVALID	<p>Interpretation: The selected temperature is higher than the maximum allowed for the sensor type.</p> <p>Response: Select alternative sensors or change the temperature.</p>
Mode: Err Typ	<p>Interpretation: The selected sensors are invalid and the mode cannot be verified.</p> <p>Response: Select a valid sensor type and choose a mode that gives a non-zero separation distance.</p>

5.4 Test Block

A test block is included with the Portaflow 330 equipment to allow the transducers and inter-connecting cables to be functionally checked.

1. Switch ON the instrument.
2. Select **Quick start** and enter the parameters shown in the table below for the appropriate transducer type (A or B):

Parameter	A Sensors	B Sensors
Pipe outside diameter	30.0mm	50.0mm
Pipe wall thickness	14.0mm	22.0mm
Pipe lining thickness	0.00	
Pipe wall material	Plastic	
Fluid type	Water	
Mode	Diagonal	
Temp	20°C	

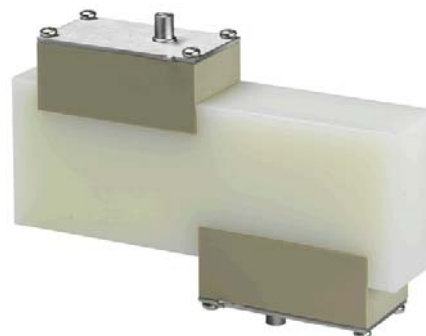


Figure 5.2 Test block

3. When the above data is entered, the **SENSOR SEPARATION** screen will be displayed.
4. Use the **UP/DOWN** scroll key to go to the **SENSOR SELECTION** menu. Select the appropriate sensor (the default will be "A") and press the **ENTER** key to return to the **SENSOR SELECTION** menu.
5. Select **Sensor mode** and position the cursor at **Diagonal** and press the **ENTER** key to return to the **SENSOR SELECTION** menu.
6. Select **Exit** and press the **ENTER** key to return to the **SENSOR SEPARATION** screen.
7. Check that the parameters displayed are correct.
8. Apply acoustic couplant to the sensors and attach them to the test block with the connectors positioned towards the centre of the test block as shown, and temporarily secure them in place using elastic bands or tape.
9. Connect the sensors to the Portaflow 330 instrument using the cables provided.
10. Press **ENTER** to go to the **FLOW READING** screen.
11. Select the **Options** key to go to the **FLOW READING OPTION** menu and set the **Damping** to at least 10 seconds.
12. Select **Exit** and press the **ENTER** key to return to the **FLOW READING** menu.
13. The flow reading value displayed is not important. The fact that a reading is obtained indicates that the instrument is functioning. This value may fluctuate but this is normal.
14. The signal strength indicator at the left of the display should show 3–4 bars.

5.5 Microprocessor Reset Facility

In the rare event that the Portaflow 330 instrument appears to totally hang-up, or displays total gibberish, you can reset its microprocessor by carefully inserting a straightened paperclip into the pinhole located in the right-hand side of the instrument to operate the internal reset switch. Hold the paperclip perpendicular to the instrument while doing this.

5.6 Diagnostics Display

This feature is designed for advanced users and is intended to provide information that will aid the user to diagnose problems – e.g. no signal strength.

When operating in the FLOW READING mode you can access a diagnostics screen by pressing the Options function key and then selecting Diagnostics from the FLOW READING OPTIONS screen. This will display the operating values for the following parameters.

Calculated time (μs)

This is a value the instrument predicts will be the time in μs that it should take for the acoustic wave to propagate across a particular pipe size. This value is ascertained from the data entered by the user. i.e. Pipe size, material, sensor set etc.

Actual time (μs)

This is the value the instrument measures as the time taken for the acoustic wave to propagate across the pipe. It is used to see if the signal is being taken from the burst, at the correct time to get the strongest signal. This value is normally a few μs below the calculated μs value. If, however, this value is much greater than the calculated time then there is a problem with the set-up.

Flow (m/s)

This displays flow velocity in m/sec to 3 decimal places.

Signal strength

This is the averaged value of Signal and should be a value between 800 and 1600 – where 800 is approximately 50%, and 1600 is approximately 100%.

Gain

Gain values are typically in the range 600 to 850.

Switches

Typical Switches values are None and *10. On small pipes (and when using the test block) the value should be None. A Switch value of *100 indicates poor sensor set-up or poor connections.

UP/DN time difference

The difference in transit times between the upstream and downstream signals due to the fluid flow.

Fluid propagation rate

This is the sound speed of the fluid calculated using the data entered by the user.

Sensor separation

The same value as displayed in the setup screen.

Appendix A: Specification

GENERAL	
DSP Measurement Technique:	Transit time.
Timing Resolution:	50 pico-second, continuous signal level indication on display.
Flow Velocity Range:	Minimum Velocity 0.1m/s; Max Velocity 20m/s: Bi-directional.
Turn Down Ratio:	100:1
Accuracy:	±0.5% to ±2% of flow reading for flow rate >0.2m/s and Pipe ID >75mm. ±3% of flow reading for flow rate >0.2m/s and Pipe ID in range 13mm - 75mm. ±6% of flow reading for flow rate < 0.2m/s.
Repeatability:	±0.5% of measured value or ±0.02m/s whichever is the greater.
Reynolds Number Correction:	Flow velocity corrected for Reynolds number over entire velocity range.
Response Time:	< 500ms depending on pipe diameter.
Selectable Flow Units:	VELOCITY: m/sec, ft/sec. VOLUME: l/s, l/min, l/h, gal/min, gal/h, USgals/min, USgals/h, Barrel/h, Barrel/day, m³/s, m³/min, m³/h.
Selectable Volume Units:	l, gal, USgals, Barrel, m³.
Total Volume:	12 Digits - forward and reverse.
APPLICABLE FLUID TYPES	
Fluid Condition:	Clean liquids or oils that have less than 3% by volume of particulate content. Applications include river water, sea water, potable water, demineralised water, glycol/water mix, hydraulic systems and diesel oil.
APPLICABLE PIPE TYPES	
Pipe Materials:	Any sonic conducting medium such as Carbon Steel, Stainless Steel, Copper, UPVC, PVDF, Concrete, Galvanised Steel, Mild Steel, Glass, Brass. Including Lined Pipes - Epoxy, Rubber, Steel, Plastic.
Pipe Dimension (outside diameter):	Min 13mm; Max 5000mm with D sensor set.
Pipe Wall Thickness:	1mm - 75mm.
Pipe Lining:	Applicable pipe linings include Rubber, Glass, Concrete, Epoxy, Steel.
Pipe Lining Thickness:	0mm – 25mm.
Pipe Wall Temperature Range:	Standard sensor operating temperature is -20°C to +135°C.
TRANSDUCER SETS	
Standard:	Temperature Range -20°C to +135°C. 'A-ST' (standard) 13 mm...115 mm pipe O.D. (2MHz). 'B-ST' (standard) 50 mm...2000 mm pipe O.D. (1MHz). 'D'* 1500 mm...5000 mm pipe O.D. * Temperature Range -20°C to +80°C (0.5MHz).

DATA LOGGER	
Data Logged:	Log application details, flow rate. Logs data selected in setup, e.g l, gals, USgals, m ³ .
No. data points:	200K.
Time Stamping:	All data points are time stamped.
No. Sites:	20 sites.
No. Data Points Per Site:	All free memory can be allocated to any site up to a max of 200,000 data points.
Programmable Logging Interval:	5 secs to 1hr – Updating on screen the end time of memory remaining as sample units are selected. At overflow overwrite old data - or user selectable stop logging when memory is full. Logged data downloadable to PC via USB cable or RS232. Transfer to Microsoft Windows or Micronics user-compatible software package (optional).
LANGUAGES	
Standard Supported Languages:	English, French, German, Italian, Spanish, Portuguese, Russian, Norwegian, Dutch, Swedish.
OUTPUTS	
USB Interface:	Supports USB 2.0 Full Speed (12Mbps/sec) mode, USB software driver provided.
Printer/Terminal:	Serial RS232-C inc. handshaking.
Analogue Output: Resolution: Alarm Currents: Isolation: Maximum Load:	4–20mA, 0–20mA, 0–16mA. 0.1% of full scale. Any between 0–26mA. 1500V Opto-isolated. 620 Ohms.
Pulse Output TTL: Max Current:	Opto-isolated MOSFET relay. 150mA
(Volumetric mode) Pulse Repetition Rate:	Up to 500 pulses/sec (depending on pulse width). 500ms for 1 pulse/sec. 5ms for 100 pulses/sec.
(Frequency mode) Max Pulse Frequency Flow at Max Frequency	200Hz 9999 l/s
ELECTRICAL	
Supply Voltage:	
Input Voltage Range:	9–24Vdc.
Power Consumption:	10.5W.
Battery:	
Technology:	5-cell NiMH.
Capacity:	3.8Ahr.
Operating time:	Typically 20 hours continuous with backlight and 4-20mA output OFF.
Recharge Time:	6.5 Hours.
Service Life:	>500 charge/discharge cycles.

Power Supply/Charger:	
Manufacturer:	Mean Well type GE1812-P1J
Input Voltage Range:	90–264Vac.
Input Frequency Range:	47–63Hz.
Output Voltage:	12Vdc.
Max. Output Current:	1.2A.
Approvals:	FCC, C-Tick, UL, CUL, TUV, CB & CE.
MECHANICAL	
Carrying case:	
Rating:	All components are contained in a hard-wearing IP67 rated carrying case with a protective moulded foam insert.
Enclosure:	
Material:	Flame retardant injection moulded ABS.
Dimensions:	264mm x 168mm x 50mm.
Weight (Including Battery):	1.1 kg.
Protection:	IP54.
Keypad:	
No. Keys:	16.
Display:	
Format:	240 x 64 pixel graphic display, high contrast black-on-white, with backlight.
Viewing Angle:	Min 30°, typically 40°.
ENVIRONMENTAL	
Operating Temperature:	–20°C to +50°C.
Storage Temperature:	–25°C to +65°C.
Operating Humidity:	90% RH MAX at +50°C.
Charging Temperature:	0°C to +40°C.
APPROVALS	
Safety:	BS EN 61010.
EMC:	BS EN 61326 - 1:2006, BS EN 61326-2-3:2006.
Battery Charger:	EN61204 - 3.
SHIPPING INFORMATION	
Box Dimensions:	410mm x 205mm x 355mm.
Weight:	7.5 kg.
Volumetric Weight:	5. kg.

***Micronics reserve the right to alter any specification without notification.
PORTAFLOW™ 330 and PF330 are identical.***

A.1 CE Declaration of Conformity



MICRONICS

CE Declaration of Conformity

Micronics Ltd

Knaves Beech Business Centre
Davies Way, Loudwater,
High Wycombe, Bucks.
HP10 9QR

Ultrasonic Clamp on Flow Meter Portaflow 330, 220A, 220B models.

This product is manufactured in accordance with the following Directives and Standards.

Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility.

Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.

BS EN 61010-1:2001 Safety requirement for electrical equipment for measurement control and laboratory use. Part 1 General requirements

BS EN61326-1:2006 Electrical equipment for measurement control and laboratory use EMC requirements. Part 1: General requirements

BS EN61326-2-3:2006 Electrical equipment for measurement control and laboratory use EMC requirements. Part 2-3: Particular requirements – Test configuration and performance criteria for transducers with integrated ore remote signal conditioning.

(Included accessory battery charger not manufactured by Micronics complies with EN61204 – 3)

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).

Signature:



Printed Name:

Michael Farnon

Title:

Managing Director

Date:

26th February 2009

Registered Office: Micronics Limited, Knaves Beech Business Centre, Davies Way, Loudwater, Buckinghamshire, HP10 9QR

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Directors: E.J. Farnon, M.A. Farnon

Registration No. 1289680 V.A.T. Registration No. 303 8190 91

Attachment 4

Pressure logger (LEO5) manual



LEO 5

Hochauflösendes Manometer mit Peak- und Aufzeichnungs-Funktion

High Resolution Manometer with Peak and Record Function

Manomètre haute résolution avec fonctions d'enregistrement et de mesure des pics de pression



Hinweis: Entlüftungsmembrane nicht eindrücken.

Note: Do not touch/press ventilation film.

Remarque: Ne pas appuyer sur la membrane de ventilation.

Betriebsanleitung · Operating Instructions · Notice d'utilisation



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Beschreibung / Description / Description

LEO 5 – Hochgenaues Manometer für Druck- und Temperaturmessung, mit Druckspitzen- (Peak) und Aufnahme- (Record) Funktion. Hohe Messwertauflösung (20 Bit ADC), lange Betriebslaufzeiten dank internem Akkumulator und ein robustes Gehäuse (IP66) ergänzen die Produktspezifikationen.

LEO 5 – High-precision manometer for measuring pressure and temperature with a Peak and Record function. High measuring resolution (20 bit ADC), long operating cycles thanks to an internal accumulator, and a sturdy case (IP66) round off the product specifications.

LEO 5 – Manomètre ultraprécis pour mesure de pression et de température, avec fonction pics de pression (Peak) et enregistrement (Record). Ce produit se distingue en outre par sa haute résolution (convertisseur analogique/numérique de 20 bits), sa grande autonomie (appareil équipé d'une batterie interne) et son boîtier robuste (IP 66).

Deutsch

English

Français

Berührungsempfindliche Tasten / Touch Keys / Touches tactiles

Das LEO 5 verfügt über zwei Tasten. Durch mindestens 0,5 Sekunden dauerndes Berühren der Felder «Select» und «Enter» wird der entsprechende Befehl ausgeführt. Der Finger soll nach der Betätigung mindestens 1 cm von der Oberfläche entfernt werden.

The LEO 5 has two keys. Execute the command by pressing the keys «Select» and «Enter» for a minimum of 0,5 seconds. Keep fingers at a distance of at least 1 cm from the surface following any activity.

Le LEO 5 a deux boutons. La commande correspondante est exécutée en touchant les champs «Select» et «Enter» pendant au moins 0,5 seconde. Le doigt doit être retiré de la surface au moins 1 cm après l'opération.





Installation / Installation / Montage

Das Einschrauben des Druckanschlusses erfolgt mit Hilfe eines Gabelschlüssels über den Sechskant am Sensor (max. Anzugsmoment ca. 50 Nm). Bitte nicht das LEO 5- Gehäuse als Schraubhilfe benutzen!

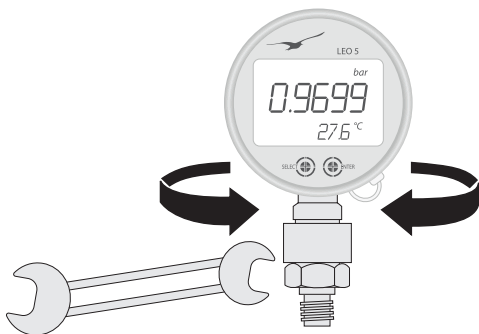
The pressure connection is screwed in with the aid of a wrench on the hexagon of the sensor (maximum tightening torque ca. 50 Nm). Please do not use the LEO 5 housing as an aid!

Le raccord de pression est vissé à l'aide d'une clef plate sur l'hexagone du capteur (couple de serrage maxi. env. 50 Nm). Ne pas utiliser le boîtier du LEO 5 comme outil de vissage!

Das Manometergehäuse lässt sich um 360° drehen, bis die Frontseite optimal ausgerichtet ist.

The manometer's housing can be rotated 360°.

Le boîtier du manomètre est orientable sur 360°.





Einschalten, Basis-Menü / Turn ON, Basic Menu / Mise en service, Menu de base

Einschalten: Durch Drücken von «SELECT» startet das Display. Das Gerät zeigt «PRESS ENTER» an. Drücken Sie «ENTER» um das Manometer zu starten, dann «SELECT», um zwischen den Funktionen zu wählen. Um einen Befehl auszuführen drücken Sie wieder «ENTER». Das Gerät hat folgende Hauptfunktionen:

MENÜ: Zugang zu den Funktionen, die im Abschnitt «MENÜ» und «UNTERMENÜ» dieses Handbuchs aufgeführt sind.

RESET: Min./Max.-Werte auf dem Display werden dem aktuellen Druck gleichgesetzt (wenn über «DISPL» aktiviert).

OFF: Schaltet das Gerät aus.

Hinweis: Wird während 10 Sekunden keine Taste gedrückt, wechselt das Display zurück zum Hauptbildschirm.

Turn ON: Touching the «SELECT» key turns on the display. «PRESS ENTER» appears on the device. Press «ENTER» to start the manometer and use «SELECT» to choose between different functions. To execute a selected command, press «ENTER» again. The device has the following main functions:

MENU: Provides access to the functions that are specified in the «MENU» and «SUB-MENU» section of these instructions.

RESET: Min. and max. values on the display screen are reset to the current pressure level (if activated through «DISPL»).

OFF: Turns the device off.

Note. If no keys are pressed for 10 seconds, the display switches back to the main screen.

Mise en service: l'écran s'allume par un simple actionnement de la touche «SELECT». L'appareil affiche «PRESS ENTER» (appuyer sur la touche ENTER). Appuyez sur la touche «ENTER» pour mettre l'appareil en service et choisissez l'une des fonctions grâce à la touche «SELECT». Pour effectuer une opération, appuyez de nouveau sur «ENTER». Les fonctions principales de cet appareil sont les suivantes:

MENU: accès aux fonctions des rubriques «MENU» et «SOUS-MENU» de ce manuel;

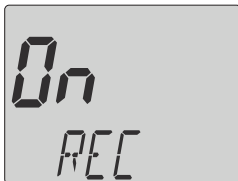
RESET (réinitialisation): les valeurs minimale et maximale sont réinitialisées à la valeur de la pression actuelle lorsque l'activation s'effectue à partir du mode «DISPL».

OFF (arrêt): mise hors tension de l'appareil.

Remarque: si aucune touche n'est pressée au bout de 10 secondes, le menu principal s'affiche à nouveau.



Menü / Menu / Menu

**Rec ON**

Startet eine Aufzeichnung (Record). Die Einstellungen für Messintervall, Startzeitpunkt etc. werden vorgängig über die Computersoftware konfiguriert.

Starts the Record process. Settings for measurement interval, start time, etc. are preconfigured via the computer software.

Effectue un enregistrement (Record). Les paramètres de l'intervalle de mesure, de l'heure de démarrage, etc. sont configurés au préalable à partir du logiciel informatique.

**Rec OFF**

Beendet einen aktiven Record.

Ends an active record.

Arrête un enregistrement en cours.

**Peak START**

PEAK OFF: Normaler Druckmessmodus mit 2 Messungen pro Sekunde (max. 20 Bit Auflösung des ADC*). PEAK ON: Schneller Messmodus mit 5000 Messungen pro Sekunde.

Im Peak-Modus (max. 16 Bit Auflösung des ADC) beträgt die Batterielaufzeit ca. 160 Stunden. Die Aufzeichnungsfunktion (Record) ist auch im Peakmodus möglich. Das Gerät erfasst 5000 Messwerte pro Sekunde und ermittelt dabei den aufgetretenen Minimal- (PMin) und Maximalwert (PMax) für Druck. Zusätzlich wird ein aktueller Druckwert (P1) und die Temperatur (TOB1) im ausgewählten Messintervall (max. 1x pro Sekunde) gespeichert.

*Analog-Digital-Wandler



PEAK OFF: Standard measuring mode with two measurements per second (max. 20 bit resolution of the ADC*). **PEAK ON:** Fast measuring mode with 5,000 measurements per second.

The battery life in peak mode (max. 16 bit resolution of the ADC) is around 160 hours.

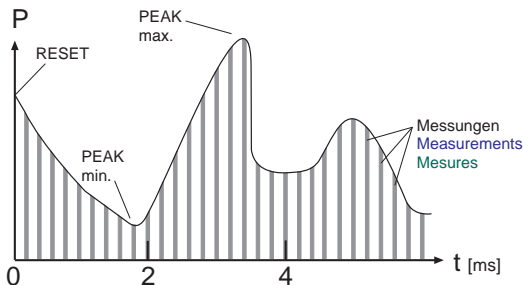
The Record function is also available in Peak mode. The device records 5,000 measurements per second and calculates the minimum (PMin) and maximum (PMax) pressure values from those recorded. In addition, a current pressure value (P1) and the temperature (TOB1) in the selected measuring interval are saved (at most once per second).

*Analog-to-Digital-Converter

PEAK OFF: mode de mesure normal avec 2 mesures par seconde (résolution max. du CAN* 20 bits). **PEAK ON:** mode de mesure rapide avec 5000 mesures/seconde.

En mode Peak (résolution max. du CAN 16 bits), l'autonomie de l'appareil est d'environ 160 heures. La fonction d'enregistrement (Record) est également disponible en mode Peak. L'appareil effectue 5000 mesures par seconde et détermine les valeurs minimale (PMin) et maximale (PMax) de la pression. En outre, l'appareil peut enregistrer à chaque seconde une valeur de pression actuelle (P1) et la température (TOB1) relevée durant l'intervalle de mesure sélectionné (max. 1 fois par seconde).

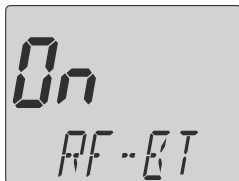
* Convertisseur analogique-numérique



Messablauf im Peak-Mode (5000 Messungen/Sekunde)

Measuring curve of the Peak-Mode (5000 measurements/second)

Courbe de mesure en mode Peak (5000 mesures/seconde)



RF BT ON/OFF (optional / optional / facultatif)

Für die LEO 5-Bluetoothfunktion (optional) auf «ON» oder «OFF» schalten. (Bei «ON» hält der Akkumulator etwa 40 Stunden).

Switch the LEO 5 Bluetooth module (optional) «ON» or «OFF» to communicate wirelessly. (If turned «ON», one battery charge lasts for about 40 hours).

Permet d'activer (ON) et de désactiver (OFF) la fonction Bluetooth (optionnelle) de l'appareil. (Si cette fonction est activée (ON), la batterie de l'appareil a une autonomie d'environ 40 heures).



ZERO SET

Setzt einen neuen Druck-Nullpunkt.

Sets a new zero reference point.

Définit une nouvelle valeur comme référence de mesure (nouveau point zéro).



ZERO RESET

Setzt den Druck-Nullpunkt auf Werkseinstellung.

Sets the zero pressure point to its factory setting.

Le point zéro est réinitialisé à sa valeur d'origine (paramètre d'usine).



Untermenü / Submenu / Sous-menu

UNIT

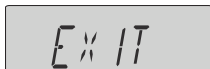
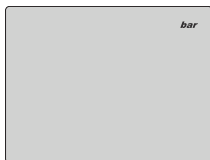


Einheitenwahl

Unit selection

Sélection de l'unité de mesure

bar, mbar, hPa, kPa, MPa, PSI, kp/cm², cmH₂O, mH₂O,
inH₂O, ftH₂O, mmHg, inHg



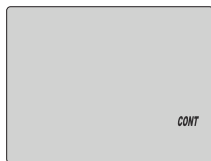
Mit EXIT gelangt man zurück in das Hauptmenü.

Press EXIT to return to the main menu.

Appuyez sur EXIT pour revenir au menu principal.



CONT

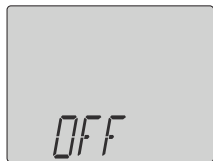


Dauerbetrieb
Continuous mode
Mode continu

↓ ENTER



SELECT
→



CONT ON: Deaktiviert die automatische Ausschaltfunktion.

CONT OFF: Aktiviert die automatische Ausschaltfunktion. Das Gerät schaltet sich 15 Minuten (einstellbare Konfiguration) nach der letzten Tastenbetätigung oder Kommunikation automatisch aus.

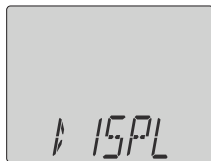
CONT ON: Deactivates the automatic turn-off function.

CONT OFF: Activates the automatic switch-off function. The device switches off automatically 15 minutes (adjustable configuration) after a key was last pressed or after the last communication.

CONT ON: désactive la fonction d'arrêt automatique

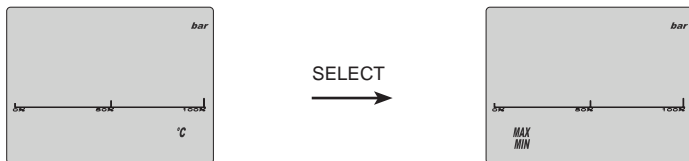
CONT OFF: active la fonction d'arrêt automatique. L'appareil s'arrête automatiquement 15 min (valeur réglable) après le dernier actionnement d'une touche ou après la dernière communication.

DISPL



Auswahl Hauptdisplay
Main display selection
Sélection de l'affichage principal

↓ ENTER

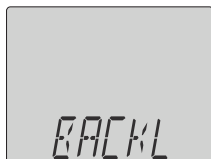


Wechselt zwischen der Temperatur-Anzeige und der Min./Max. Druck-Anzeige im unteren Teil des Displays.

Switches between the temperature display and the min./max. pressure value display in the lower part of the screen.

Commute entre deux modes d'affichage: température et pression minimale/maximale dans la partie basse de l'affichage.

BACKL

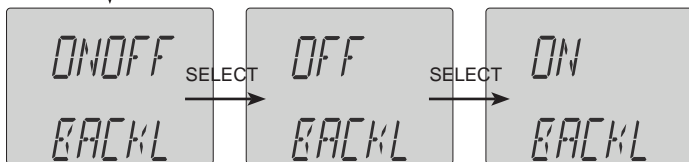


Einstellung Hintergrundbeleuchtung

Backlight setting

Réglage du rétro-éclairage

↓ ENTER



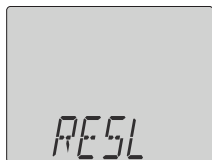
Die Hintergrundbeleuchtung kann auf «ONOFF», «ON» oder «OFF» gesetzt werden. «ONOFF» aktiviert die automatische Ausschaltfunktion, welche die Hintergrundbeleuchtung bei Berührung aktiviert und 10 Sekunden nach der letzten Tastenbetätigung ausschaltet.



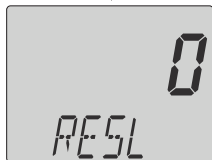
The backlight can be set to «ONOFF», «ON» or «OFF». «ONOFF» launches the automatic turn-off function, which activates the backlight when it is pressed and turns the backlight off 10 seconds after a key was last pressed.

Le rétro-éclairage peut être réglé sur «ONOFF», «ON» ou «OFF». L'option «ONOFF» active la fonction automatique qui allume le rétro-éclairage dès qu'on touche l'appareil et l'éteint 10 secondes après.

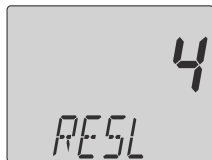
RESL



↓ ENTER



SELECT



Auflösungswahl

Resolution selection

Sélection de la résolution

Mit «Select» wird die Auflösung verändert

By pressing «Select» you can change the resolution.

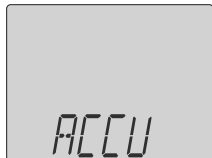
Appuyez sur «Select» pour modifier la résolution.

Legen Sie die Auflösung des Messwerts auf 0 bis 4 Dezimalstellen fest.

Sets the measuring resolution to between 0 and 4 decimal places (full scale dependent).

Règle la résolution de mesure entre 0 et 4 décimales.

ACCU



Informationen zu Akkumulator und Ladestatus.

Zeigt die Akkumulator-Spannung und dessen Ladestand an. 3,4 Volt steht für einen leeren Akkumulator, 4,2 Volt für einen voll aufgeladenen.

Accumulator information and charge status.

Displays the accumulator voltage and charge level. 3.4 volts indicates an empty accumulator, 4.2 volts a fully charged one.



Informations et état de charge de la batterie.

Affiche la tension et le niveau de charge de la batterie. Une valeur de 3,4 volts correspond à une batterie vide, contre 4,2 volts pour une batterie chargée.

Das LEO 5 wird mit einem Akkumulator betrieben und kann über die USB-Schnittstelle mit einem PC oder mit einem handelsüblichen Ladeadapter wieder aufgeladen werden. Der Akkumulator ist fest im Gerät eingebaut. Der Austausch des Akkumulators darf nur durch den Hersteller vorgenommen werden. Durch das unbefugte Öffnen des Gerätes erlischt die Gewährleistung. Um eine Tiefentladung zu vermeiden, ist bei Nichtgebrauch des Manometers das Gerät auszuschalten (OFF) und der Akkumulator jährlich nachzuladen.

Akkumulatoren dürfen nicht über den normalen Hausmüll entsorgt werden. Zur Vermeidung möglicher Umwelt- oder Gesundheitsschäden durch unkontrollierte Müllentsorgung muss dieses Produkt von anderen Abfällen getrennt und ordnungsgemäss recycelt werden, um den nachhaltigen Gebrauch der Rohstoffe zu gewährleisten.

The LEO 5 is operated by an accumulator and can be charged via USB interface on a computer or with a standard adaptor. The rechargeable battery is welded into the device. Only the manufacturer may replace the accumulator. Opening the device without authorization voids the warranty. To prevent total discharge, the device must be switched off (OFF) and the accumulator recharged annually if the manometer is not in use.

Batteries must never be disposed of in normal household waste. To prevent possible damage to the environment or to health due to uncontrolled waste disposal, this product must be separated from other waste and recycled correctly in order to ensure sustainable use of the raw materials.

Le LEO 5 est alimenté par un accumulateur et peut être rechargé via l'interface USB avec un PC ou un adaptateur de charge disponible dans le commerce. La batterie est entièrement intégrée à l'appareil. Le remplacement doit impérativement être réalisé par le fabricant. Toute ouverture non autorisée de l'appareil annule la garantie. Lorsque le manomètre n'est pas utilisé, arrêter l'appareil (OFF) et recharger la batterie une fois par an afin d'éviter un niveau de décharge critique.

Les batteries ne doivent pas être jetées parmi les ordures ménagères. Afin d'éviter toute pollution ou atteinte à la santé résultant d'une élimination incontrôlée des déchets, ce produit doit être séparé des autres déchets et dûment recyclé afin de garantir une utilisation durable des matières premières.



Akku-Ladestand / Accumulator charge level / Niveau de charge de la batterie

Unterschreitet der Ladestand des Akkumulators 50%, können keine neuen Aufzeichnungen (Records) mehr gestartet werden, die Hintergrundbeleuchtung des Displays wird abgeschaltet und die Bluetooth-Funktion wird gesperrt. Unterschreitet der Ladestand 40%, werden aktive Aufzeichnungen (Records) gestoppt oder eine aktive Bluetooth-Verbindung deaktiviert um einer Tiefentladung des Akkumulators vorzubeugen. Sobald der Ladestand 50% überschreitet, sind wieder sämtliche Funktionen verfügbar.

Das vollständige Aufladen des Akkumulators dauert ca. 23 Stunden.

If the accumulator's charge level falls below 50%, no new records can be created, the display screen backlight switches off and the Bluetooth function is blocked. If the level falls below 40%, active records will be stopped and an active Bluetooth connection will be deactivated to prevent the accumulator from losing power completely. All functions will be available again once the charge level rises back above 50%.

It takes around 23 hours to charge the accumulator fully.

Lorsque le niveau de charge de la batterie est inférieur à 50%, il n'est plus possible de démarrer de nouveaux enregistrements (records), le rétro-éclairage de l'écran est désactivé et la fonction Bluetooth verrouillée. Lorsque le niveau de charge est inférieur à 40%, les enregistrements actifs (records) sont stoppés ou une connexion Bluetooth est désactivée afin d'éviter un niveau de décharge critique de la batterie. Toutes les fonctions sont à nouveau disponibles dès que le niveau de charge dépasse 50%.

La charge complète de la batterie dure env. 23 heures.

USB-Schnittstelle / USB Interface / Interface USB

Für den Betrieb des Manometers via USB-Schnittstelle muss zuvor der Schnittstellentreiber «DriverManometer» auf dem Computer installiert werden. Die Treibersoftware ist auf der KELLER Software CD enthalten oder als kostenloser Download unter www.keller-druck.com verfügbar.

Operating the manometer via USB interface requires the «DriverManometer» interface driver to be installed on the computer. The driver software is included on the KELLER software CD and can be downloaded for free from www.keller-druck.com.

Pour que le manomètre puisse fonctionner via l'interface USB, le pilote d'interface «DriverManometer» doit être installé au préalable sur l'ordinateur. Ce pilote se trouve sur le CD de logiciels KELLER ou peut être téléchargé gratuitement à l'adresse www.keller-druck.com.



Die USB-Schnittstelle wird zum Laden und Kommunizieren mit dem Manometer verwendet.

The USB interface is used to charge and communicate with the manometer

L'interface USB est utilisée pour la recharge de la batterie et la communication avec le manomètre.

USB-Mode / USB Mode / Mode USB

Der Bluetooth-Modus wird beim Verbinden des Gerätes mit einer USB-Schnittstelle automatisch beendet. Ist das Gerät mit einer USB-Schnittstelle verbunden, oder ist das Gerät nicht mit einer Bluetooth-Option ausgestattet, wird die Funktion «ON RF-BT» nicht im Displaymenü angezeigt.

Das Manometer wird über die USB-Schnittstelle aufgeladen. Ist das Gerät eingeschaltet, wird das Batteriesymbol auf dem Display blinkend angezeigt (Akkumulator wird geladen), solange bis der Akkumulator vollständig aufgeladen ist. Ist das Gerät ausgeschaltet und die USB-Schnittstelle verbunden, zeigt das Display den Ladezustand des Akkumulators an. Zeigt das Display «Charg» an und das Batteriesymbol blinkt dabei, lädt sich der Akkumulator auf.

Bluetooth mode stops automatically when the device is connected to a USB interface. If the device is connected to a USB interface, or if it is not equipped with a Bluetooth option, the «ON RF-BT» function will not appear in the display menu.

The manometer is charged via the USB interface. If the device is switched on, the battery symbol on the display screen will flash (accumulator charging) until the accumulator is fully charged. If the device is switched off while connected to a USB interface, the display screen will show the accumulator's current charge level.



The display screen shows «Charg» and a flashing battery symbol when the accumulator is charging.

Le mode Bluetooth est automatiquement désactivé dès que l'appareil est raccordé à une interface USB. Si l'appareil est raccordé à une interface USB, ou s'il n'est pas équipé de l'option Bluetooth, la fonction «ON RF-BT» n'apparaît pas dans le menu à l'écran.

Le manomètre se charge via l'interface USB. Lorsque l'appareil est mis en service, le symbole représentant une pile sur l'écran clignote (batterie en charge) jusqu'à obtention de la charge complète. Lorsque l'appareil est arrêté et relié à l'interface USB, l'écran affiche l'état de charge de la batterie. La batterie se charge lorsque l'écran affiche «Charg» et que le symbole représentant une pile clignote.

Bluetooth-Mode (optional) / Bluetooth Mode (optional) / Mode Bluetooth (facultatif)

Das LEO 5 verwendet Bluetooth 3.0 Classic mit einer typischen Reichweite bis zu 10 m (Geräteklasse 2). Das Bluetooth-Funksignal kann das Metallgehäuse des Manometers nicht durchdringen und wird ausschliesslich frontal, durch das Display hindurch, abgestrahlt. Dieser Umstand kann die Reichweite der Funkverbindung deutlich reduzieren oder eine Verbindung verunmöglichen. Achten Sie bei eventuellen Verbindungsproblemen darauf, dass die Front des Manometers direkt auf das Empfangsgerät gerichtet ist.

Das Bluetooth-Modul auf der PC-Seite (Master) muss mindestens Bluetooth 2.0 Classic unterstützen um eine erfolgreiche Verbindung aufbauen zu können. Im Bluetooth Mode ist das Gerät für Bluetooth-Geräte sichtbar. Das Manometer muss mit der Gegenstelle (z.B. Computer) gepaart werden um eine Bluetooth-Verbindung aufbauen zu können.

The LEO 5 uses Classic Bluetooth 3.0 with a typical range up to 10 m (device class 2). The Bluetooth radio signal cannot penetrate the metal case of the manometer and is emitted solely through the display. This can affect the signal coverage to some extent, making a connection impossible. In case of connection problems, please make sure to point the front face of the manometer in the direction of the receiver.

The Bluetooth module on the PC (master) must support Bluetooth 2.0 Classic as a bare minimum in order to successfully establish a connection. The device will be visible to other Bluetooth devices in this mode. The manometer needs to be coupled with its partner device (e.g. the computer) to establish a Bluetooth connection.



Le LEO 5 utilise Bluetooth 3.0 Classic avec une portée typique jusqu'à 10 m (appareil de classe 2). Le signal radio Bluetooth ne peut pas traverser le boîtier métallique du manomètre. Il n'est donc émis que vers l'avant, à travers l'affichage. Cette particularité peut fortement réduire la portée du signal ou empêcher toute connexion. En cas d'éventuels problèmes de connexion, veiller à ce que la face avant du manomètre soit dirigée vers l'appareil récepteur.

Le module Bluetooth du PC (maître) doit être au minimum compatible Bluetooth 2.0 Classic pour pouvoir établir une connexion. Lorsqu'il est en Bluetooth, l'appareil est visible pour d'autres appareils fonctionnant sur le même mode. Le manomètre doit être relié avec le périphérique (p. ex. un ordinateur) pour pouvoir établir une connexion Bluetooth.

Peak-Mode / Peak Mode / Mode Peak

Die LCD-Anzeige für den Minimal- und Maximalwert des Druckes zeigt die gemessenen Spitzenwerte während der gesamten Betriebsdauer an; die Werte können durch den Benutzer zurückgesetzt werden (Prinzip Schleppzeiger). Wird das Gerät ausgeschaltet, werden die Spitzenwerte automatisch zurückgesetzt.

Werden die Minimal- und Maximalwerte des Druckes durch eine Aufzeichnung (Record) gespeichert, so entsprechen die gespeicherten Spitzenwerte dem ermittelten Spitzenwert pro Aufzeichnungsintervall.

The LCD display of the minimum and maximum pressure values shows the peak values measured over the course of operation, which the user can reset («trailing pointer» principle). The peak values are reset automatically if the device is switched off.

If the minimum and maximum pressure values are saved in a record, the peak values stored correspond to the peak value calculated for each recording interval.

L'afficheur LCD des valeurs minimale et maximale de pression indique les pics de pression mesurés sur l'ensemble de la période d'utilisation; les valeurs peuvent être réinitialisées par l'utilisateur. Les pics sont automatiquement réinitialisés lorsque l'appareil est arrêté.

Si les valeurs minimale et maximale de pression sont enregistrées (Record), les pics enregistrés correspondent à ceux déterminés pour chaque intervalle d'enregistrement.



Benutzerspezifische Geräteanpassungen / User-specific modifications to the device / Adaptation de l'appareil aux besoins de l'utilisateur

Die Standard- bzw. Aufstart-Einheit des Gerätes, die wählbaren Druckeinheiten sowie zusätzliche, benutzerspezifische Einheiten können über das Softwareprogramm ManoConfig durch den Benutzer angepasst werden. Zusätzlich kann mit Hilfe dieser Software die Zeit der automatischen Abschaltfunktion angepasst sowie eine Gerätekalibration vorgenommen werden.

The user can use the ManoConfig software to change the default or initial unit used by the device, the selectable pressure units and additional user-specific units. This software can also be used to modify the time for the automatic switch-off function and to calibrate the device.

L'unité standard ou de départ de l'appareil, les unités de pression sélectionnables ainsi que des unités supplémentaires spécifiques à l'utilisateur peuvent être adaptées par ce dernier via le logiciel ManoConfig. Ce logiciel permet en outre d'adapter l'heure de la fonction d'arrêt automatique et de calibrer l'appareil.

Hinweise / Notes / Remarques

- Wird die angewählte Funktion oder Einheit nicht innerhalb von 10 Sekunden durch die «ENTER»-Taste aktiviert, kehrt LEO 5 ohne Änderung einer Einstellung in den Messmodus zurück.
- Beim Ein- und Ausschalten bleiben die zuvor getätigten Einstellungen erhalten.
- Ist die «PEAK»- oder «CONT on»-Funktion aktiviert, wird dies im Display blinkend angezeigt.
- Ist die «RECORD»-Funktion aktiviert, wird alle 10 s ein «run» in der unteren Displayhälfte angezeigt.
- Kann ein Druck auf dem Display nicht dargestellt werden, erscheint «OFL» (overflow) oder «UFL» (underflow) auf der Anzeige.
- Wird ein Druck ausserhalb des Messbereiches des Gerätes angelegt, wird der letzte gültige Druckwert blinkend angezeigt (Überlastwarnung).
- Bei Temperaturen ausserhalb von 0...50 °C kann die Lesbarkeit des Displays beeinträchtigt werden.



- If the selected function or unit is not activated within 10 seconds with the «ENTER»-key, LEO 5 returns to the measuring mode without changing any settings.
 - Turning LEO 5 on and off does not influence any of the previous settings.
 - If the «PEAK» or «CONT on» function is activated, it is indicated with a flashing sign on the display.
 - If the «RECORD» function is activated, a «run» will appear in the lower half of the display every 10 seconds.
 - If a pressure can not be represented on the display, «OFL» (overflow) or «UFL» (underflow) appears on the display.
 - If the actual pressure goes beyond the measuring range, the last valid pressure value starts flashing on the display (overload warning).
 - Temperatures outside of 0...50 °C could impair the readability of the display.
-
- Si la fonction ou l'unité choisie n'est pas validée dans les 10 secondes avec la touche ENTER, le LEO 5 bascule automatiquement, sans modification des réglages, en mode mesure.
 - La mise en route et l'arrêt de l'instrument ne modifient pas les réglages précédemment validés.
 - La fonction «PEAK» ou «CONT on» active est indiquée par un clignotement à l'écran.
 - Si la «fonction enregistrement Record» est activée, il s'affiche toutes les 10 secondes «run» dans la partie inférieure de l'écran.
 - Si une pression ne peut être affichée, le message «OFL» (overflow) ou «UFL» (underflow) apparaît à l'écran.
 - Si une pression mesurée est en dehors de l'étendue de mesure, la dernière valeur valide de pression est affichée clignotante (avertissement de surcharge).
 - La lisibilité de l'affichage peut être affectée par une température excédant 0...50 °C.



Wichtige Informationen / Important Information / Informations importantes

Richtlinien für den sicheren und effizienten Einsatz

Stellen Sie vor der Installation, der Inbetriebnahme und der Bedienung sicher, dass das Produkt entsprechend den technischen Spezifikationen in Bezug auf den Messbereich, das Design und die spezifischen Messbedingungen geeignet ist.

- Montieren Sie das Gerät nur an Systeme, die sich im drucklosen Zustand befinden.
- Versuchen Sie nicht, das Gerät zu manipulieren und / oder zu öffnen.
- Lassen Sie das Gerät nicht fallen und werfen Sie es nicht.
- Betreiben Sie das Gerät niemals bei über 80 °C.

Guidelines on safe and efficient use

Before installing, commissioning and operating the product, ensure that it complies with the technical specifications relating to measurement range, design and the specific measuring conditions.

- Only install the device on depressurised systems.
- Do not try to modify or open the device.
- Do not drop or throw the device
- Never operate the device at temperatures over 80 °C.

Directives pour une utilisation sûre et efficace

Avant l'installation, la mise en service et l'utilisation du manomètre, vérifiez que l'appareil est adapté à l'usage prévu en vous référant aux spécifications techniques (étendue de mesure, design et conditions de mesure spécifiques).

- Installez l'appareil uniquement sur des systèmes préalablement hors pression.
- Ne tentez pas de modifier ou d'ouvrir l'appareil.
- Ne faites jamais tomber l'appareil et ne le lancez pas.
- Ne faites jamais fonctionner l'appareil à une température supérieure à 80 °C.



Datensicherheit / Data Security / Sécurité des données

KELLER übernimmt keinerlei Verantwortung für Datenverluste jedweder Art und leistet bei Datenverlust keinen Schadenersatz. Bei Reparatur oder Austausch des Produktes können im Produkt gespeicherte Daten verloren gehen. Sie sollten deshalb immer eine Sicherheitskopie aller im Produkt gespeicherten Daten erstellen, bevor Sie das Produkt für eine Reparatur oder einen Austausch aushändigen.

KELLER assumes no responsibility for data loss of any nature, and shall not pay any compensatory damages in the event of data loss. Data stored in the product may be lost if the product is repaired or replaced. You should always make a backup of all data stored in the product before handing it in for repair or replacement.

KELLER décline toute responsabilité en cas de perte quelconque de données et par conséquent ne verse aucun dommage et intérêt. Lors de la réparation ou du remplacement du produit, il peut arriver que les données enregistrées soient perdues. Vous devrez donc toujours sauvegarder toutes les données enregistrées dans le produit avant d'expédier votre produit pour réparation ou remplacement.

KELLER-Software / KELLER Software / Logiciel KELLER

Im Download-Bereich von www.keller-druck.com kann sämtliche KELLER-Software heruntergeladen werden. Die Seite enthält stets die aktuellsten Software-Versionen sowie Datenblätter und Bedienungsanleitungen zu den entsprechenden Produkten.

In the download section on www.keller-druck.com, you will find all KELLER software free of charge. The site contains the latest software versions together with data-sheets and operating instructions for the corresponding products.

À l'adresse www.keller-druck.com, vous trouverez une rubrique Software où vous pourrez télécharger gratuitement l'ensemble des logiciels KELLER. La page web contient les dernières versions des logiciels ainsi que les fiches techniques et les notices d'utilisation pour les produits correspondants.



Garantiebedingungen / Warranty Conditions / Conditions de garantie

Die Garantie gilt nicht für Fehler am Gerät, die durch normalen Verschleiss, falsche Benutzung oder Missbrauch entstanden sind.

Service und Support

Für Service und Support setzen Sie sich bitte mit Ihrem lokalen Händler in Verbindung oder benutzen eine Kontaktmöglichkeit der Website www.keller-druck.com

The warranty does not apply to faults on the device caused by normal wear and tear, incorrect use or misuse.

Service and Support

For service and support, please contact your local dealer or contact us via www.keller-druck.com

La garantie ne s'applique pas aux défauts dus à une usure normale, à une utilisation non conforme ou un usage abusif, ainsi qu'en cas de non-respect de la présente notice.

Service après-vente et assistance technique

Pour toute demande de service après-vente ou d'assistance technique, veuillez vous adresser à votre revendeur local ou nous contacter directement via l'adresse: www.keller-druck.com



EU-Konformitätserklärung

Für das folgende Erzeugnis...

Digitales Manometer LEO 5

...wird hiermit bestätigt, dass es den Anforderungen folgender EG-Richtlinien entspricht:

EMV-Richtlinie 2014/30/EU
RoHS-Richtlinie 2011/65/EU

Dieses digitale Manometer LEO 5 wurde entsprechend den folgenden Normen geprüft:

Declaration of Conformity EU

We hereby declare that the following product...

Digital Manometer LEO 5

...meets the basic requirements which are established in the following Directives of the European Community:

Directive 2014/30/EU
Directive RoHS 2011/65/EU

As criteria, the following standards for this digital manometer LEO 5 are applied:

Déclaration UE de conformité

Par la présente, nous attestons que le produit...

Manomètre numérique LEO 5

...satisfait aux exigences prescrites par les directives de la Communauté Européenne:

Directive CEM 2014/30/UE
Directive RoHS 2011/65/UE

Le manomètre numérique LEO 5 répond aux normes:

EN 61000-6-1:2007
EN 61000-6-4:2011

EN 61000-6-2:2005
EN 61326-1:2013

EN 61000-6-3:2011
EN 61326-2-3:2013

Diese Erklärung wird verantwortlich für den Hersteller:

This declaration is given for the manufacturer:

La présente déclaration est fournie pour le fabricant:

KELLER AG für Druckmesstechnik, St. Gallerstrasse 119, CH-8404 Winterthur

abgegeben durch die

in full responsibility by

par

KELLER GmbH, Schwarzwaldstrasse 17, DE-79798 Jestetten

Jestetten, 28. Juni | June | Juin 2018

Hannes W. Keller

Geschäftsführender Inhaber | Managing Owner | Propriétaire et gérant de l'entreprise
mit rechtsgültiger Unterschrift | with legally effective signature | dûment autorisé à signer





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KELLER GmbH Schwarzwaldstrasse 17 DE-79798 Jestetten Tel. +49 7745 9214 0

Attachment 5

Dual channel logger (i2O) manual



120™

Calm water



LOGGER 17 USER MANUAL

V2.3
5 July 2018
Imran C.F Jones



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Introduction

i2O loggers allow water companies to measure and log pressure and flow data from their water networks. This is done remotely via our software platform and each water company has a personalised platform website, which is used to configure loggers and view data.

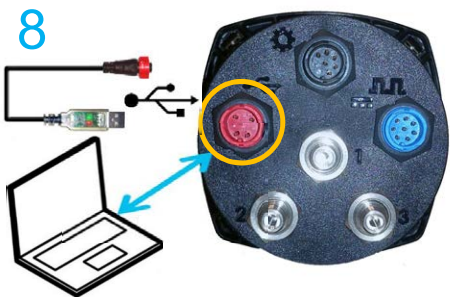
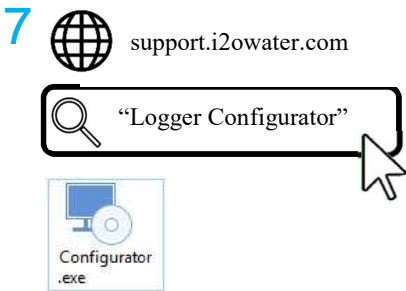
Alarms can be configured per channel to give real-time information on network issues such as low pressures or increased flows due to leakage or bursts. When thresholds are met or exceeded, an alarm is triggered automatically. Individual alarm trigger thresholds can be set for each pressure and flow channel.

The logger supports Over the Air firmware updates, meaning that if a new version of the firmware is released, the logger will download and install it automatically, there is therefore no need to physically connect to the device in order for an update to be installed. Loggers are available with up to 3 pressure transducers, and inputs for 2 flows. This document details the procedure for installing and configuring an i2O logger.



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Quick Start Guide



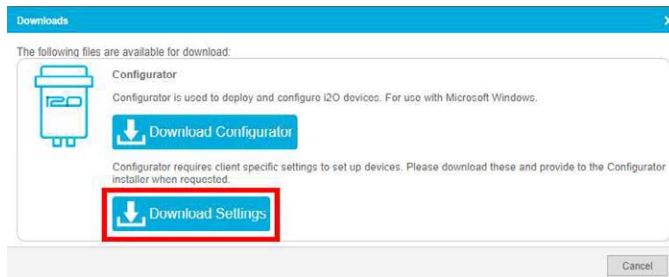


This area is reserved for quickstart text

Deploying the Logger

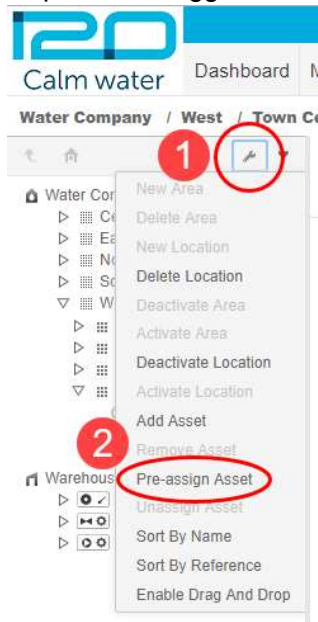
Install Configurator

Download Configurator from your i2O Platform and install on the laptop used for direct connection to the logger. For more information on downloading and using Configurator, visit support.i2owater.com. You will also need your platform settings files, which are used when configuring the logger:



Assign the logger to a Location

Before installing the logger on site, it must first be associated with a location in the platform. Loggers can be pre-assigned to a location using the device serial number. After the logger is assigned to the location, you can configure dial-ups, view the recorded data, and manage device alarms. For more information on creating locations, visit our Help Centre at support.i2owater.com



When a L17 is used with the "pre-assign" option, it must dial-up twice to get its Location configuration. The first time it dials-up it only gets a "Warehouse configuration" and the second time it gets its proper Location configuration. If you do not do the second manual dial-up, it will not receive its proper configuration until midnight, which is the default dialup time for a Warehouse configuration.



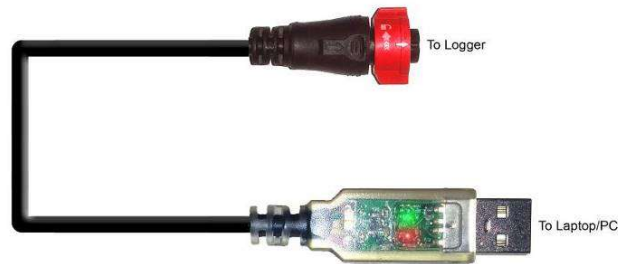
You may wish to configure multiple dialups to monitor logger operation on the day of deployment. Remember to revert to a more permanent setting (eg. once daily) after correct logger operation is verified.

Mounting

Mount the logger using a zip-tie or optional mounting bracket if required



Connect the Logger to a Laptop



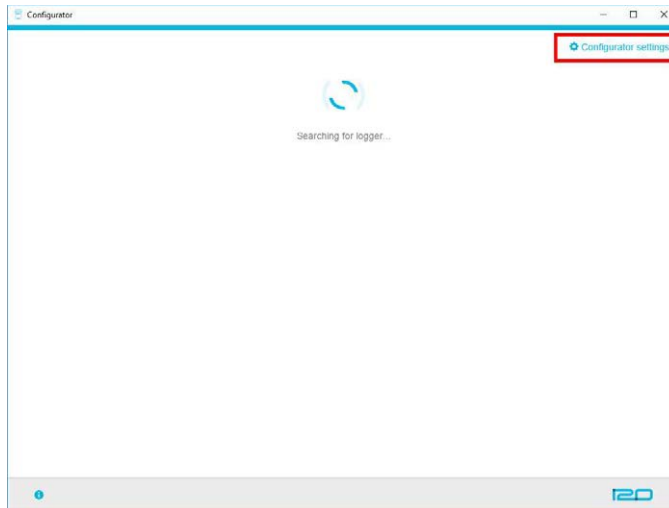
Ensure both arrows on the cable and logger are aligned before inserting the cable.



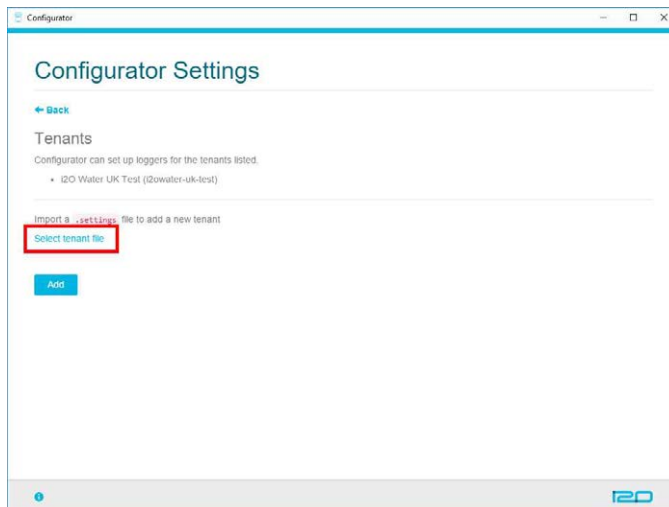
Device driver prompts may appear, ignore these, as no additional drivers are needed for the logger.

Load settings file:

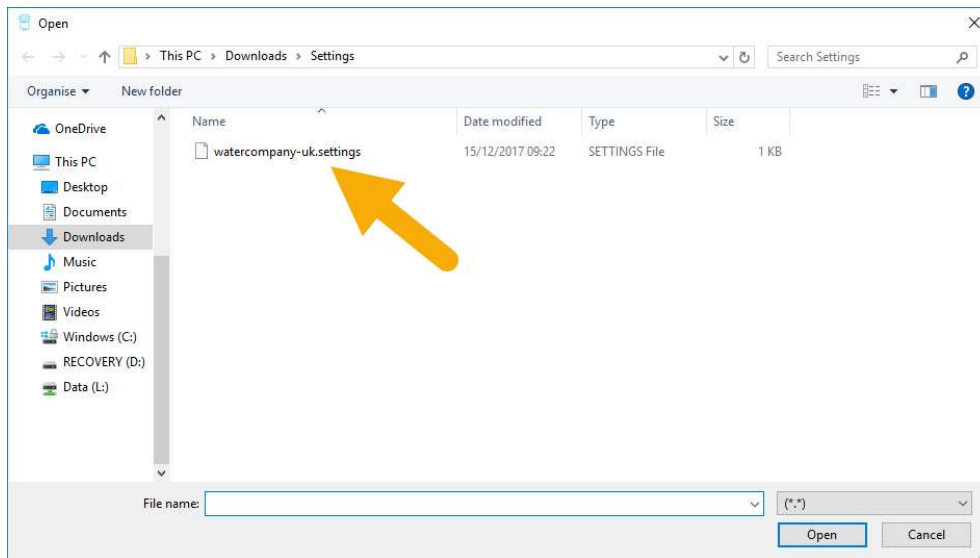
Before logger is connected, Configurator will say 'Searching for logger'. Load your platform settings file by clicking the 'Configure settings' link:



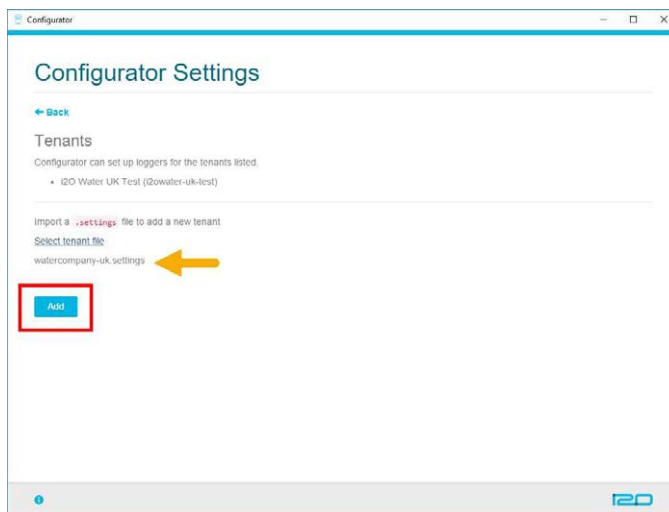
Then click the 'Select tenant file' link



Select your downloaded settings file

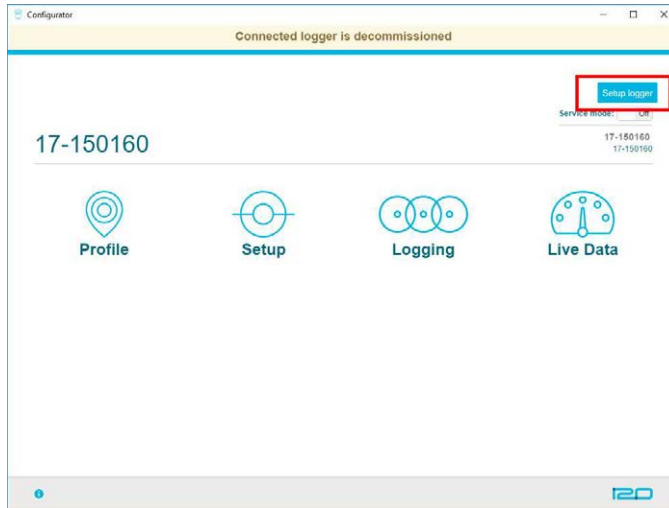


Your selected settings file will now appear in Configurator, click 'Add' to load the file

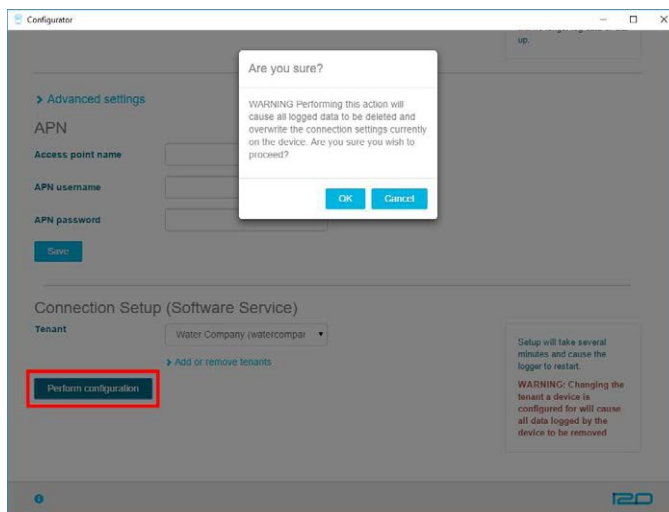


Configure the logger

Connect the logger to your laptop. When the logger is detected, the configurator home screen will appear. Click 'Setup logger'

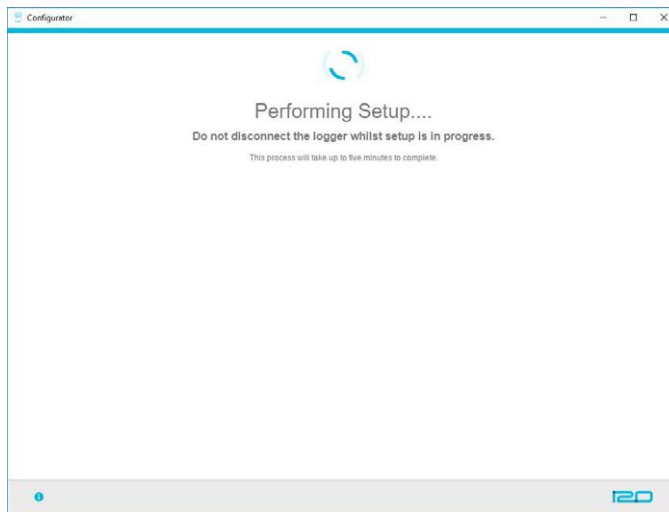


Click the 'Perform configuration' button to start the logger configuration sequence. A confirmation message will appear, be sure to read the contents of the message before continuing

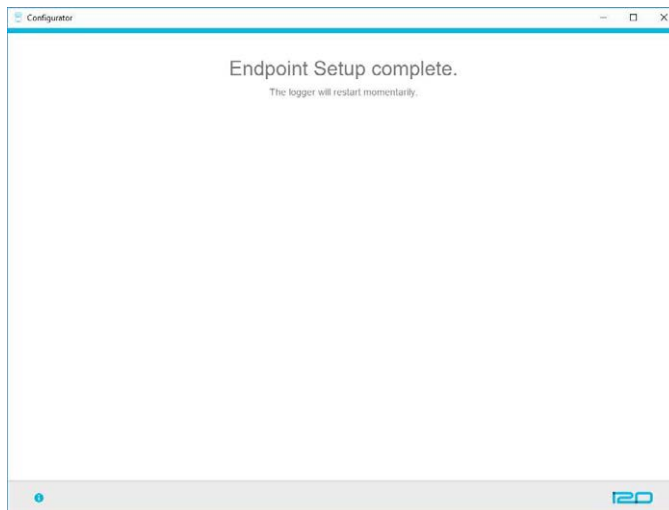


This procedure will remove all recorded data from the device. Any existing settings files will be overwritten.

Wait while the logger completes the setup process



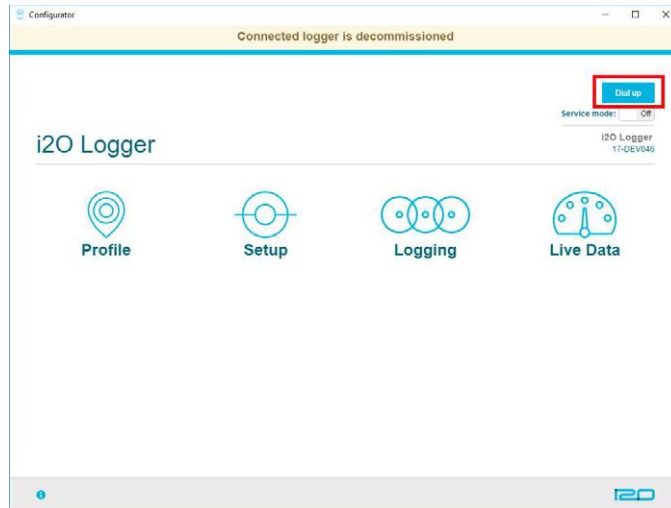
When the process is complete, a message showing this will appear on the Configurator screen



The logger will restart automatically and Configurator will go back to showing the home screen.

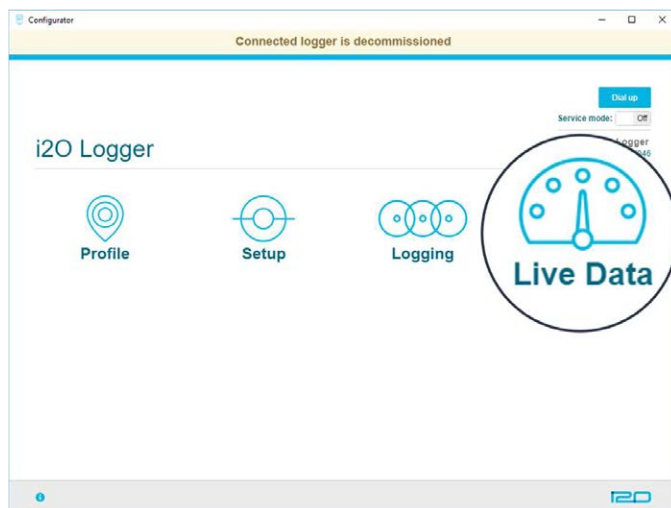
Force a Dial-up

Click the dialup button to allow the logger to download its configuration files from the Platform. The dialup button changes to an animation sequence of status messages as it completes the different stages of the dial-up process.

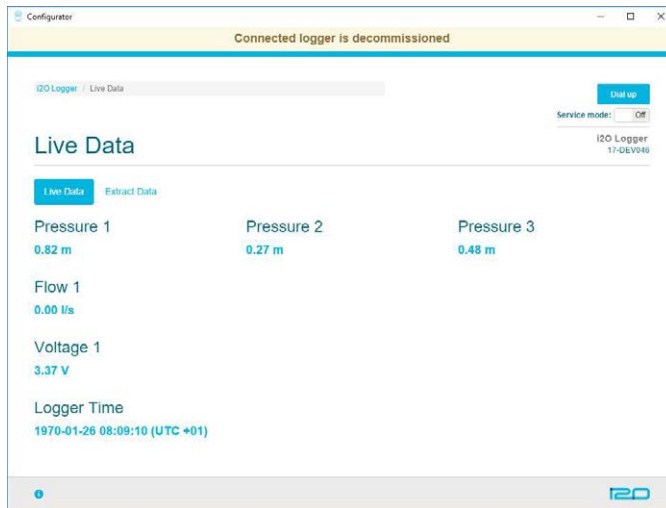


Viewing Live Data

Live logger behaviour is available from the Live Data screen.



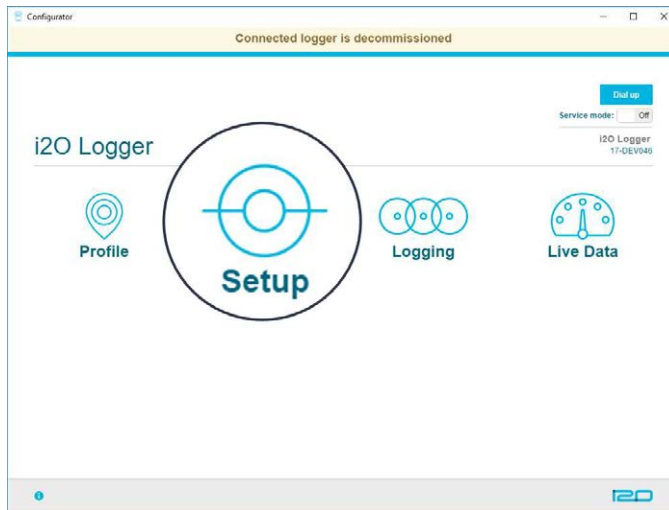
Here you can look at information including current signal strength, logger name and serial no, along with live pressure, flow and battery voltage readings during the deployment process.



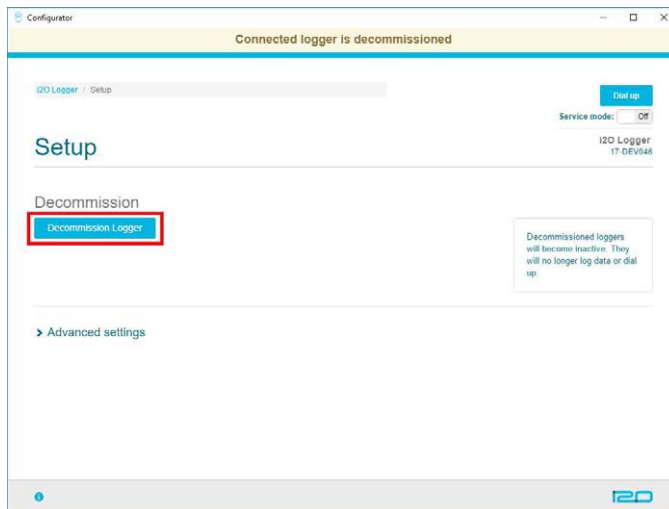
The Live Data page also allows you to extract local data from the device. The logger will store up to 12 months of flow and pressure data. More information on this is available in the Reference section.

Decommissioning

The logger can be decommissioned if it is no longer in use or temporarily being placed into storage, to do this, enter the “Setup” menu:



Select the “Decommission Logger” button. Decommissioning the logger removes its scheduled dial-ups and disables logging. This prevents spurious data from being recorded and extends battery life.



Changing the Battery



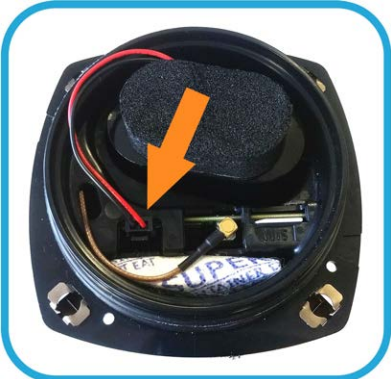
Loosen 4 in no. Camlok screws



Carefully disconnect the battery cable



Remove old battery and desiccant pack



Insert new battery, desiccant pack and re-connect battery cable

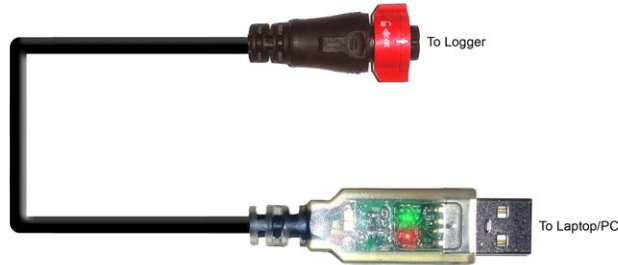
Fitting the SIM card



Insert the new SIM as shown, taking note of the orientation. The SIM card must be full size, do not use micro or nano SIMs with converters. The SIM must support 3G.

Connections

Connecting the Logger to a Laptop



Ensure both arrows on the cable and logger are aligned before inserting the cable.

i Device driver prompts may appear, ignore these, as no additional drivers are needed for the logger.

Flow Cable

The Logger 17 version comes with two options for connecting flow and external power. There is also the capability to record reverse flow for bi-directional flow meters. Connect the flow cable in accordance with the following diagram. There is more information on connecting external power, including what supplies are compatible with the i2O logger, in the next section of this document.

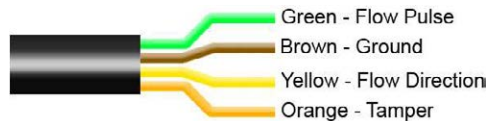
2-wire



3-wire



5-wire



i For 5-wire meters, the 'Low Frequency' pulse is not connected.

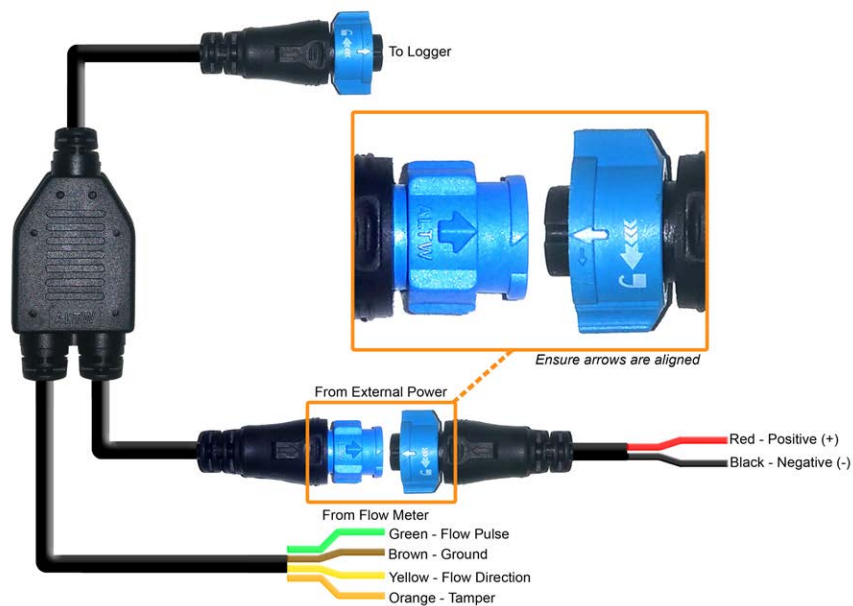
External Power

An external DC power source such as a mains-powered supply, battery, solar panel, or micro-turbine may be used with or without internal battery fitted. The supply must be 6 – 30 Volts DC.

Connect the DC supply using the external power cable as shown below. If a flowmeter connection is also required, use the combined flow and power cable.



Combined Flow and External Power



Features and Specifications

Physical Dimensions

SIZE (mm)	w115 x d115 x h155
WEIGHT (kg)	0.68

Technical Data

DATA SAMPLING INTERVAL	≥1s (1min default)
DATA LOGGING INTERVAL	≥1min (15min default)
DIALUP INTERVAL	External Power ≥5 min (24hr default) Internal Battery ≥60 min
TEMPERATURE/VOLTAGE	Logged (default = hourly)
MODEM SIGNAL STRENGTH	Logged on dial-up Connection

Logging Modes

STANDARD LOGGING

Mean of samples over logging interval

ENHANCED STATISTICS

Instability, pressure transients and surges can be identified from maximum, minimum and standard deviation values captured during the logging interval

Alarms

Alarm thresholds can be individually set for each flow and pressure channel (HH&LL in graph). Alarms are logged when they occur and can trigger the logger to:

- Log alarm details
- Send an SMS alert to a specified telephone number containing alarm details
- Dial up with increased regularity

A Nightline period can be defined and alternative thresholds can be set for a flow channel to aid breach and burst detection.

Interfaces

DIGITAL FLOW INPUT

TYPE	Industry standard, digital 2-wire interface, plus 3-wire and 5-wire bi-directional meters
MAX PULSE FREQUENCY	100Hz
MIN PULSE WIDTH	5ms

PHYSICAL INTERFACES

CONFIGURATION PORT	USB connection to PC or Windows tablet
EXPANSION PORT	Connection to external power sources 6 – 30VDC

OVER THE AIR INTERFACE

NETWORK	Quad band GSM and Penta-band UTMS
SIM	Field replaceable
	Automatic configuration, supports roaming SIMs

Reference Information

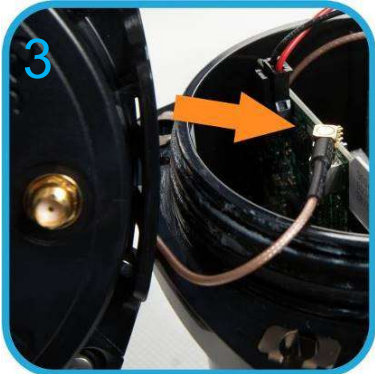
Installing an External Antenna



Loosen 4 in no. Camlok screws



Carefully disconnect the internal antenna



Connect external antenna top cap



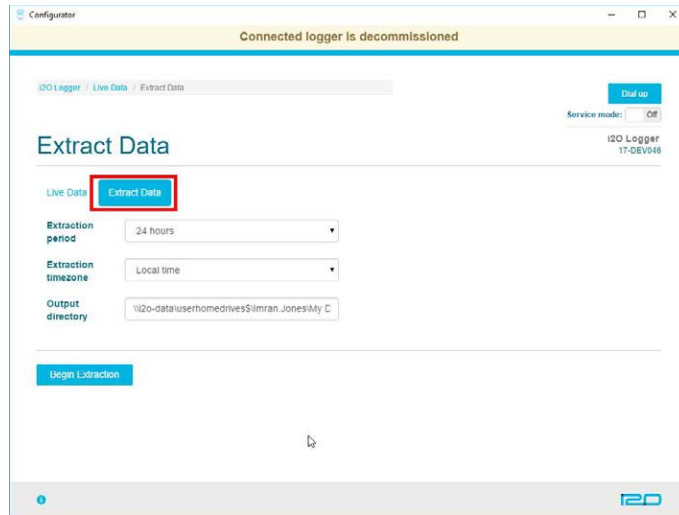
Use external antenna kit AMKT0018



Connect external antenna

Retrieving Local Data

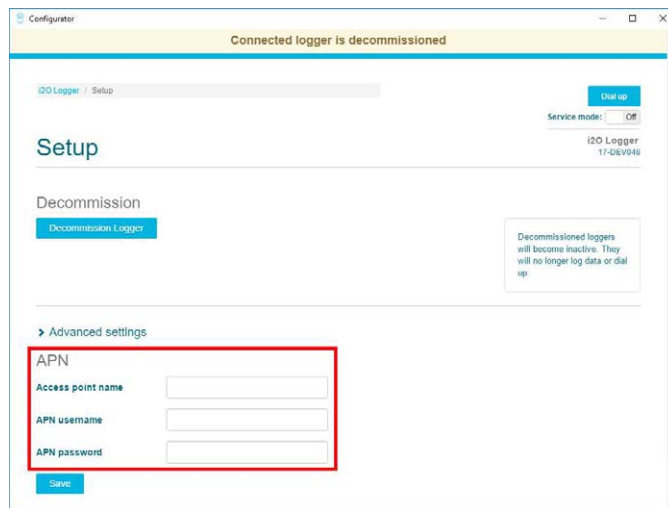
The logger allows you to extract local data in circumstances where there is poor signal strength, or a mobile network is not available. This is done from the Live data screen:



You can select an extraction period, extraction time zone and folder where you want your data. Data is saved in CSV format and can be viewed in Excel or similar spreadsheet application. Note that it is not possible to upload extracted data files to the platform.

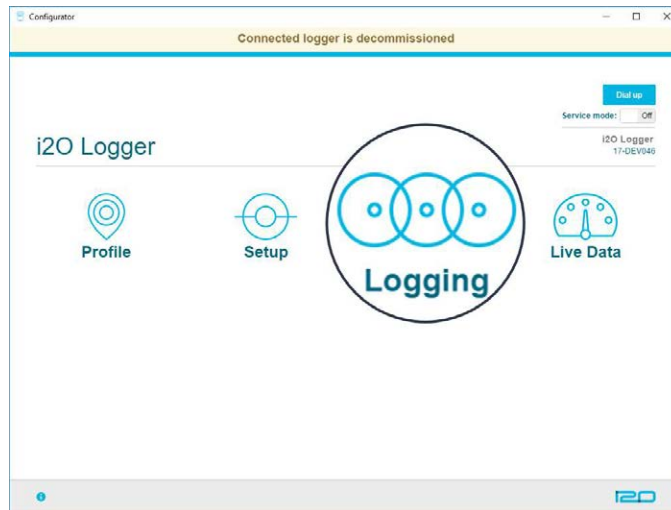
Advanced Settings

Expand the Advanced Settings menu to view and configure the logger's APN settings:

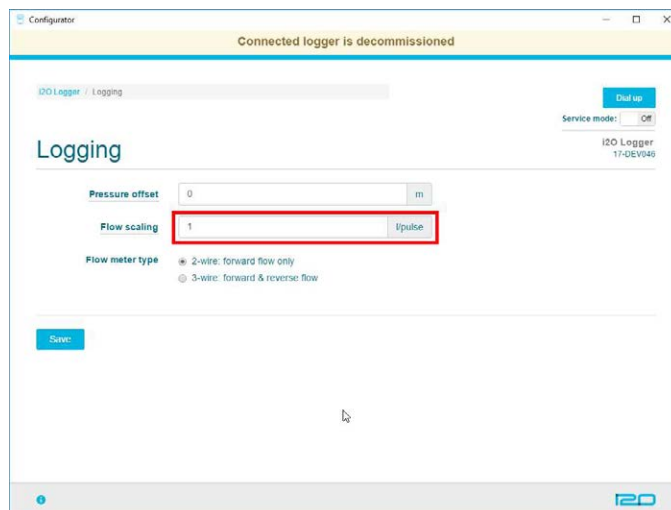


Configuring Flow Scaling

To configure flow scaling, enter the “Logging” screen:



Set the desired flow scaling value in the box highlighted:



Part Numbers

This user manual is applicable to the following i2O logger part numbers:

ALGA0120	ALGB0120
ALGA0130	ALGB0130
ALGA1120	ALGB1120
ALGA1130	ALGB1130
ALGA1121	ALGB1121
ALGA1131	ALGB1131
ALGA3220	ALGB2120
ALGA3230	ALGB2130
ALGA3221	ALGB2121
ALGA3231	ALGB2131



Calm water

<http://support.i2owater.com>

support@i2owater.com

Attachment 6

Manual of pressure measuring devices



PALESTINIAN WATER AUTHORITY

THE PROJECT FOR STRENGTHENING THE CAPACITY OF WATER SERVICE MANAGEMENT IN JENIN MUNICIPALITY



**MANUAL ON
PRESSURE MEASURING DEVICES**

APRIL 2021

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

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CHAPTER 1. PURPOSE AND USE OF THIS MANUAL

1.1 Introduction

Pressure measurement is the analysis of an applied force by a fluid (liquid or gas) on a surface. Pressure is typically measured in units of force per unit of surface area. Many techniques have been developed for the measurement of pressure and vacuum. Instruments used to measure and display pressure in an integral unit are called pressure meters or pressure gauges or vacuum gauges. A manometer is a good example, as it uses the surface area and weight of a column of liquid to both measure and indicate pressure. Likewise the widely used Bourdon gauge is a mechanical device, which both measures and indicates and is probably the best known type of gauge.

A vacuum gauge is a pressure gauge used to measure pressures lower than the ambient atmospheric pressure, which is set as the zero point, in negative values (e.g.: -15 psig or -760 mmHg equals total vacuum). Most gauges measure pressure relative to atmospheric pressure as the zero point, so this form of reading is simply referred to as "gauge pressure". However, anything greater than total vacuum is technically a form of pressure. For very accurate readings, especially at very low pressures, a gauge that uses total vacuum as the zero point may be used, giving pressure readings in an absolute scale.

Other methods of pressure measurement involve sensors that can transmit the pressure reading to a remote indicator or control system (telemetry).



Example of the widely used Bourdon pressure gauge

1.2 Types of pressure measurement devices

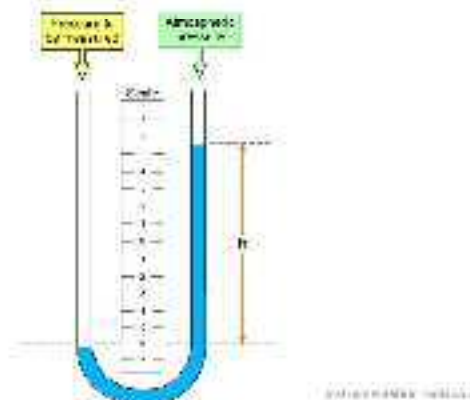
Categories of Pressure Gauges and data loggers

There are different varieties of pressure measuring devices available. Let's discuss some of those important types.

- **Liquid Filled Vs Dry Pressure Gauges:** Dry pressure gauges are commonly used for industrial applications and it prevents corrosion to a greater extent. Dry gauges are ideal for environments without mechanical vibration and moisture presence. In liquid filled pressure gauges, a specific liquid-like glycerin (commonly used) is filled inside the casing. This liquid will coat the internal parts and reduces damages caused by pulsation and pressure spikes. Liquid filled pressure gauges are used in circuits having fast and frequent loads, pressure peaks and mechanical vibrations. Comparatively, dry gauges are less expensive than liquid-filled gauges.



- **Manometer:** Manometer is a type of pressure gauge that uses a column of liquid to measure pressure. This instrument can measure only low pressure close to the atmospheric pressure or vacuum. Toluene, CCl₄, mercury, alcohol, etc... are the liquids used in the limb of the manometer. The working principle of the manometer is it uses the same or another column of liquid for balancing. The two categories of the manometer are simple manometer and differential manometer.



- **Mechanical Pressure Gauges:** Mechanical pressure gauges are used for measuring high-pressure ranges. In this gauge, the rack and pinion arrangement magnifies the deformation caused by the application of pressure on the elastic element. This magnified value is displayed on the pointer scale for pressure measurement. The mechanical gauges will provide quick and rapid response compared to manometers.



- **Digital Pressure Gauges:** Digital pressure gauges are commonly used with temporary industry applications that require highly accurate pressure reading. The reading on the digital display can be interpreted without operator assistance. Also, this pressure gauge eliminates chances for parallax error and it can be re-ranged easily. This pressure gauge requires external energy like battery power, loop power or solar power for operation.



- **Wireless Pressure Gauge:** The wireless pressure gauges are the modern edition of pressure gauge that can transfer the pressure reading directly to other devices. This pressure gauge will provide stable and accurate pressure readings compared to mechanical gauges. The important advantage of this pressure gauge is that the data can be collected remotely. For this remote data collection, a wireless sensor networking

technology called Wireless HART is utilized. This technology is based on the Highway Addressable Remote Transducer Protocol (HART Protocol).



- **Pressure data logger:** Pressure data loggers are used in a variety of settings to measure the pressure of gases or liquids. They can also be used for variables such as fluid and/or gas flow, water levels, altitude and speed. Depending on the environment, a pressure data logger may measure gage and absolute pressure, and/or bridge input for strain or load measurement. Some data loggers may also record data regarding tri-axial shock data using built-in accelerometers. Due to the nature of the environment, pressure data loggers are generally designed to withstand harsh and underwater conditions.



Pressure logger
(with internal pressure sensor)



Dual channel pressure and flow data logger
(with internal pressure sensor)

The above shown type of data loggers have been used in this project in Jenin.

CHAPTER 2. PRESSURE DATA LOGGER USED IN JENIN PROJECT

In order to implement water pressure measurement at different areas in Jenin city, we used a pressure data logger (Digital pressure gauge-LE05-Keller).



Key features:

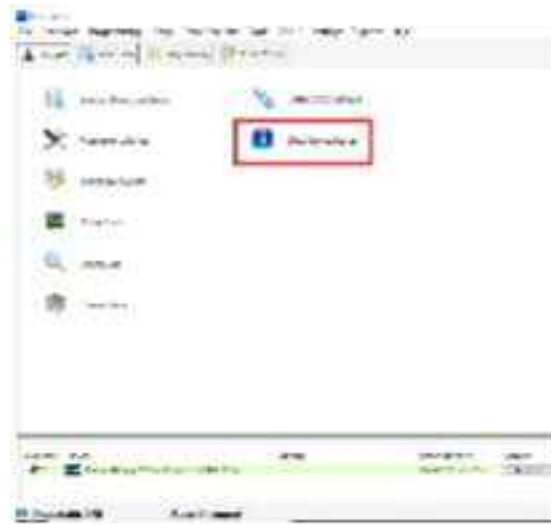
- ✓ Pressure range 1-30 bar
- ✓ Accuracy class 0.05 %FS
- ✓ USB and Bluetooth interfaces
- ✓ Backlighting
- ✓ Data logger including peak value detection with 5 kHz logging frequency
- ✓ Durable steel housing with safety glass and touch operation
- ✓ Protection class IP66

2.1 Installation Settings (Programming the logger)

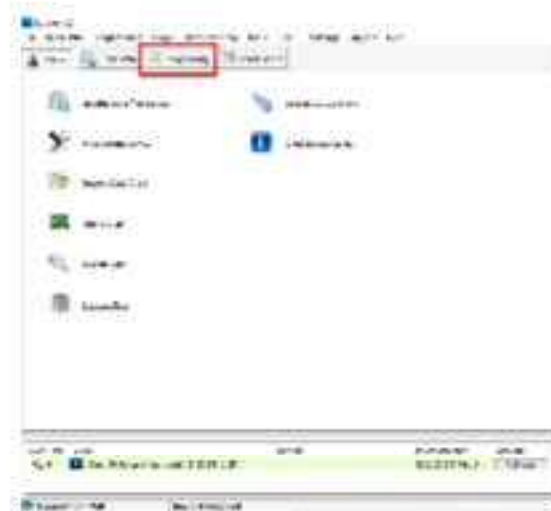
Before installing data logger at site we need to program the logger as following:

- ① Install software of the logger in working computer
- ② Turn on the logger, press the "Select" key and then the "Enter" button

- ③ The logger will power on and the pressure and temperature readings will be displayed automatically after a few seconds
- ④ Connect the data logger with PC by using USB cable
- ⑤ Open the logger software on your PC
- ⑥ Press "check device status" button to ensure that the device is connected.



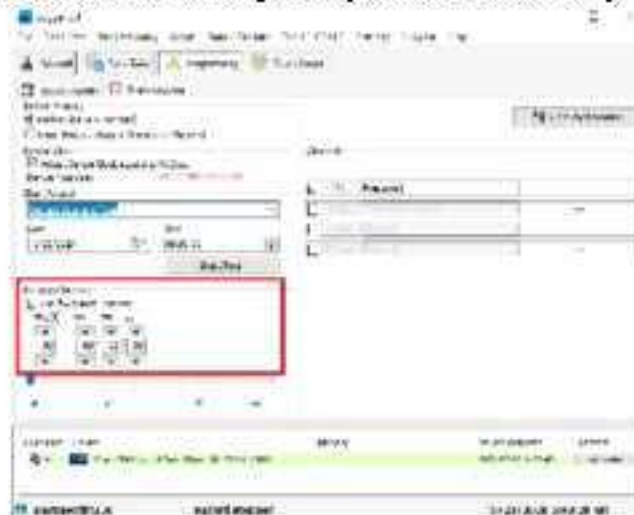
- ⑦ Press "Programming"



- ⑧ Adjust the start date and time of logging



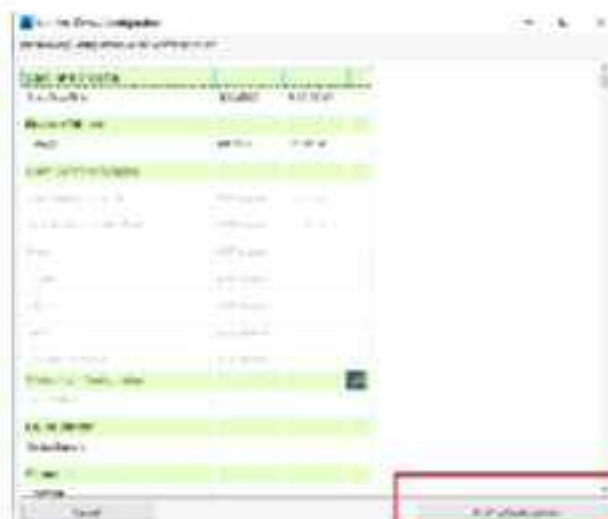
⑨ Adjust the "Measured Interval" as required (5min, 10min, etc...)



⑩ Press "write configuration" button



- ① After new window opens, press "ok write configuration"



- ② Wait until the work "prog" appears on the device's screen.

2.2 Operational Functions with Touch Buttons

Turn ON: Touching the «SELECT» key turns on the display.

«PRESS ENTER» appears on the device. Press «ENTER» to start the logger and use «SELECT» to choose between different functions.

To execute a selected command, press «ENTER» again.

The device has the following main functions:

MENU: Provides access to the functions that are specified in the «MENU» and «SUB-MENU» section of these instructions.

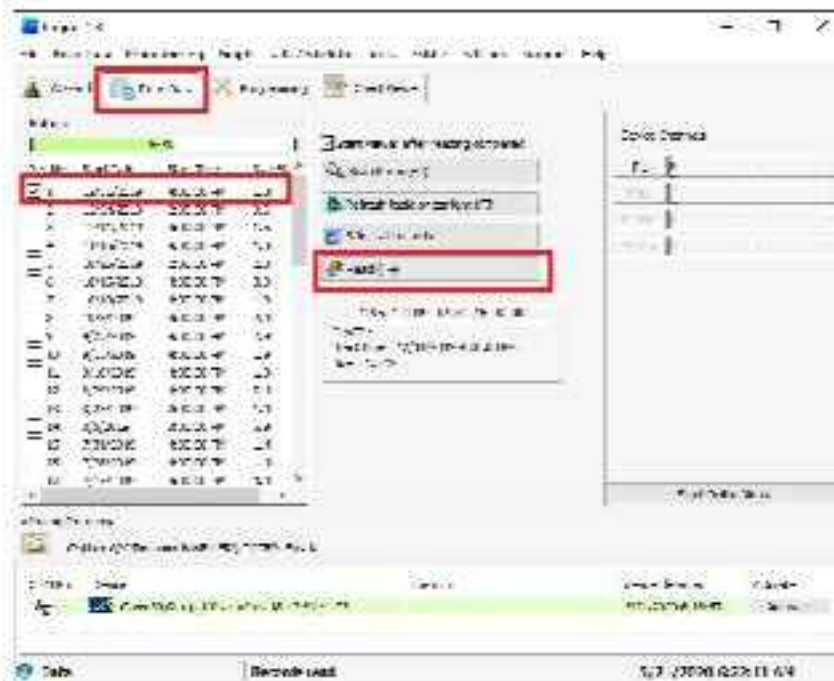
RESET: Min. and max. values on the display screen are reset to the current pressure level (if activated through «DISPL»).

OFF: Turns the device off.

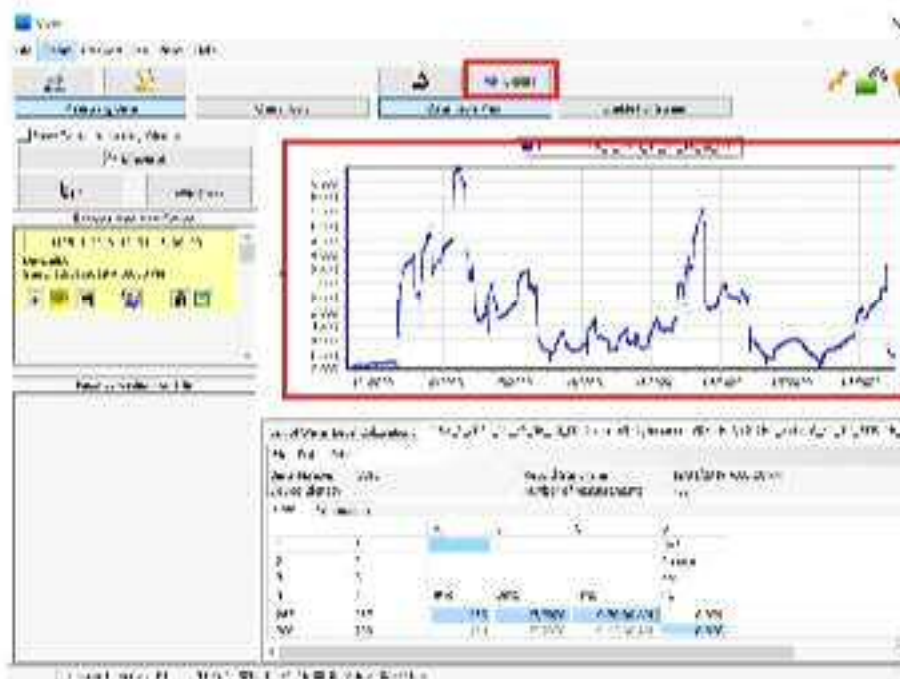
Note. If no keys are pressed for 10 seconds, the display switches back to the main screen.

2.3 Extracting the data

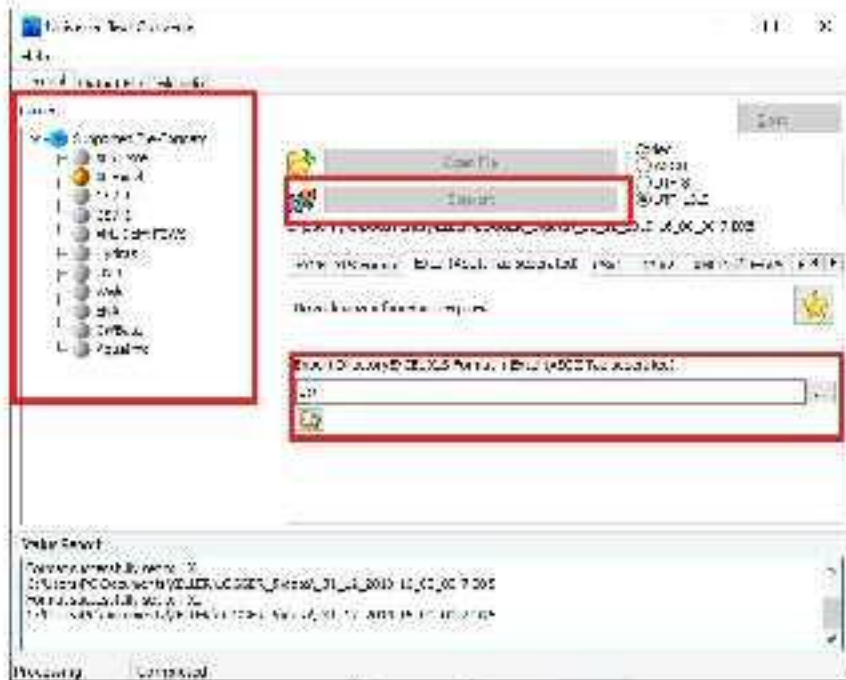
- ① Repeat the first six steps
- ② Choose the record you want then press “read data” then press “Read (F4)”



- ③ New window will open contains a pressure profile curve and other, if you want to export the data as CSV file press “Export”



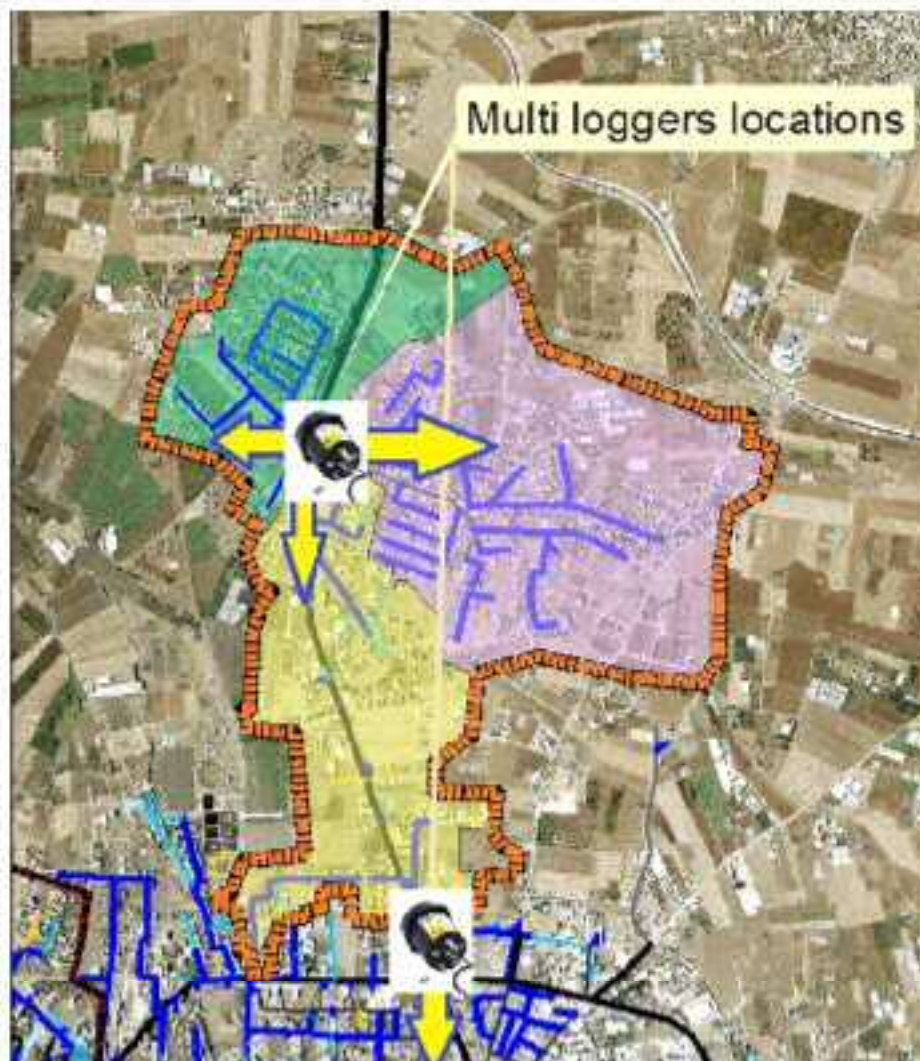
- ④ Choose the location which you want to save the csv file inside it then press "Convert"



CHAPTER 3. DUAL CHANNEL (P & F) LOGGER

3.1 Introduction

For the purpose of monitoring the DMA pressure and flow, (Multi) dual channel data loggers are installed at the entrance of every sub-area (DMA) in the pilot areas, the map below shows examples of the locations where this type of data loggers are installed in PA1:



With dual channel loggers:

- water pressure can be measured (it has internal transducer to measure pressure) and recorded,
- flow signal received through compatible flowmeters (it cannot measure flow by itself) can be recorded.

The logger manufacturer (I2O) provides a personalised platform website to each water utility. Jenin Municipality has also been provided one. Viewing of flow and pressure data and configuration of loggers can be done remotely via the software platform. This aspect is explained in detail in next chapter.

3.2 Quick Installation Steps

Step 1: Install battery



Battery pack and logger



Opening logger housing



Inserting battery



Connecting battery

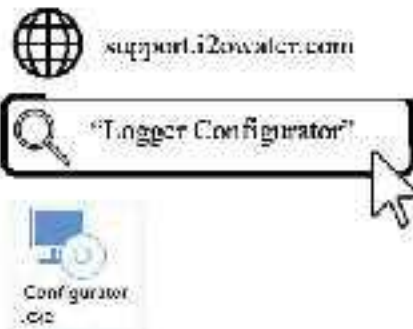
Step 2: Install SIM



Inserting SIM card

A SIM card needs to be purchased from the local telecom service provider and activated beforehand.

Step 3: Configure logger



Download the configurator program and install on your computer

Connect the logger with the computer using provided connector and configure the logger

Step 4: Deploy logger



Bring to site and connect the logger to the tapping point using suitable hose.

For details, please refer to the user's manual provided by the logger manufacturer (Attachment 5).

CHAPTER 4. DUAL CHANNEL LOGGER WEBSITE PLATFORM AND DATA MONITORING

4.1 Introduction

As mentioned in the introduction, the loggers can be configured and logged data can be viewed via the personalized platform website.

For Jenin WWD the personalized website can be accessed from the following link:

<https://jenin-pli2owater.com/login>



The image shows a login interface for Jenin Municipality. At the top is the official logo, a circular emblem with a green dome and palm trees, surrounded by the text 'JENIN MUNICIPALITY' and Arabic script. Below the logo is a white form with two input fields: 'Username' and 'Password'. A prominent blue button labeled 'Login' is centered below the password field. At the bottom of the form, there is a link that reads 'Forgotten Password?'.

There are two types of user accounts: Admin (who can edit settings) and viewers (who can only view).

After entering the username and password the following dashboard page opens:



The following photo shows the installed loggers (as of end of March 2021):

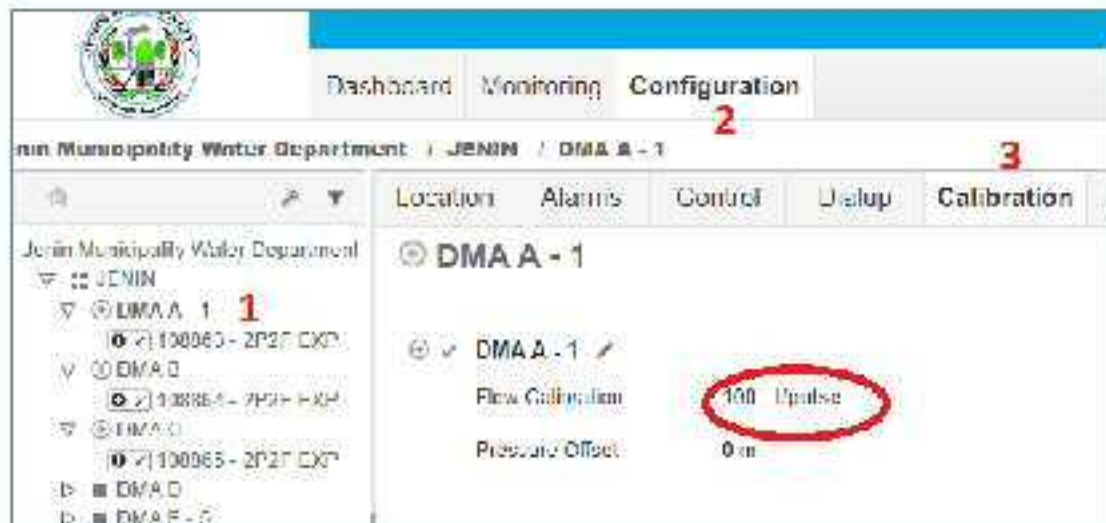


4.2 Logger Configuration

Three issues should be set up at site in the configuration page to calibrate the received data from the network:

1. Calibration:

Click the DMA that you want to do setting for it, then **Configuration > Calibration**:



To do the flow calibration you should be aware of the connected flowmeter (with pulsar connection) specifications (L/Pulse), in Jenin DMA the flowmeter specification used is (100 L/Pulse), so that this value should be matching the flow setting in the logger website for each location.

2. Logging

Click the DMA that you want to do setting for it, then **Configuration: logging:**



Ranges:

Logging frequency: 1 minute - 15 minutes

Acquisition interval: 1 second - 30 seconds

More frequent logging, more smoother data but more battery consumption.

Smaller acquisition interval, more accurate result but more battery consumption.

3. Dial up:

Click the DMA that you want to do setting for it, then **Configuration-Dialup**:

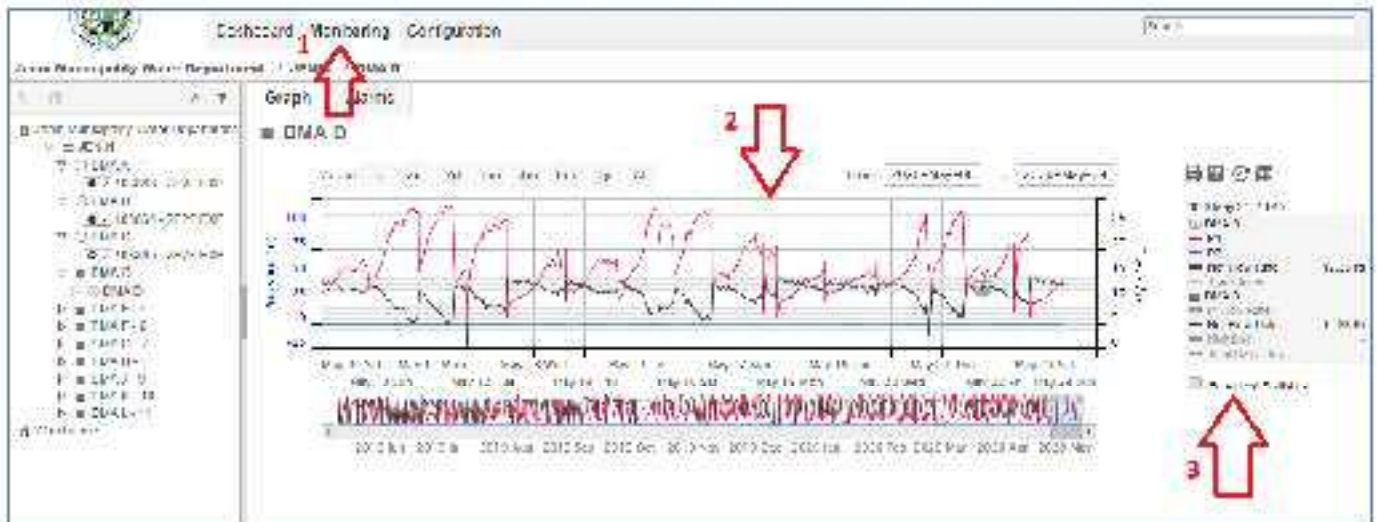


The dialup is the process of transferring the data from the logger device to the related website via the data SIM card. This process consumes power from the logger battery, so that the lowest dialup times will keep the longest lifetime for the logger battery and via versa.

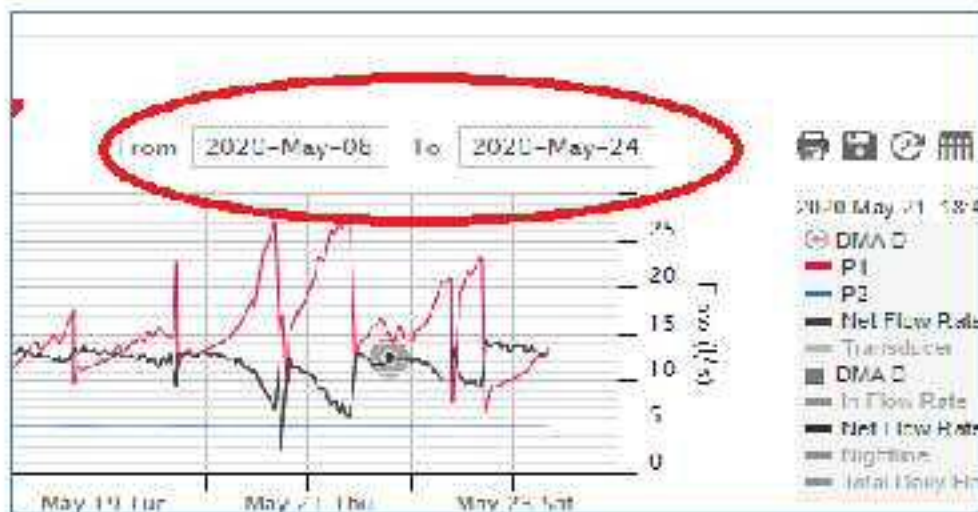
In Jenin project the dialup is set to communicate 3 times/ day.

4.3 Pressure & Flow data Monitoring and Extracting

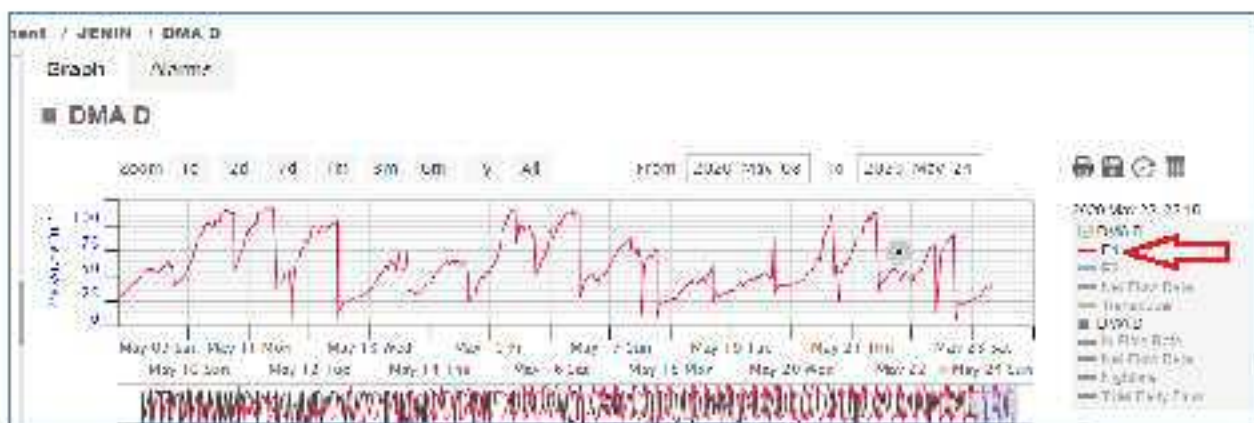
Click the DMA that you want to view the pressure and flow data for it, then **Monitoring**:



The curves will show you the pressure and flow data for any required period, you can choose the period you want from the calendar boxes shown above the curves:



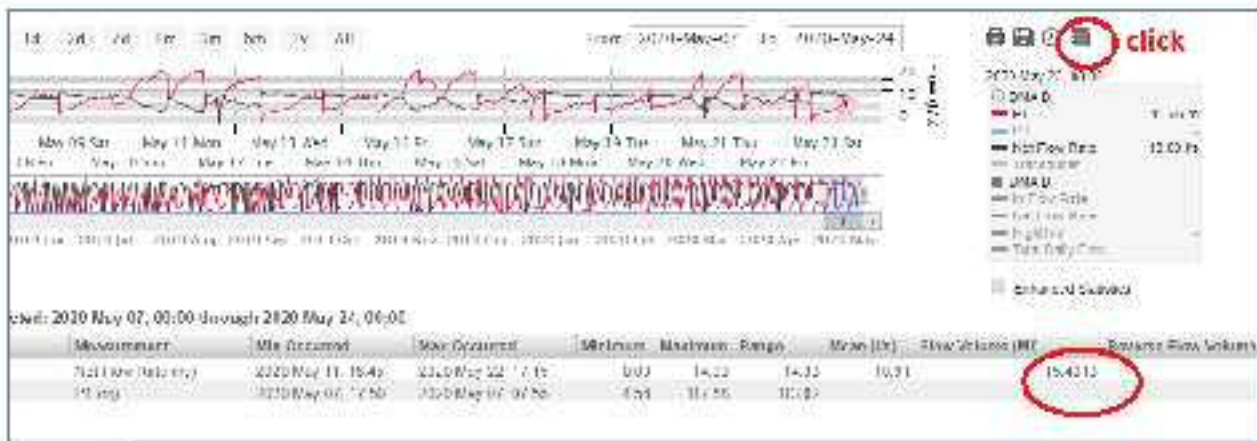
In the right side of the monitoring page you can manage viewing the data on the chart by turning on/off the related symbol as shown below:



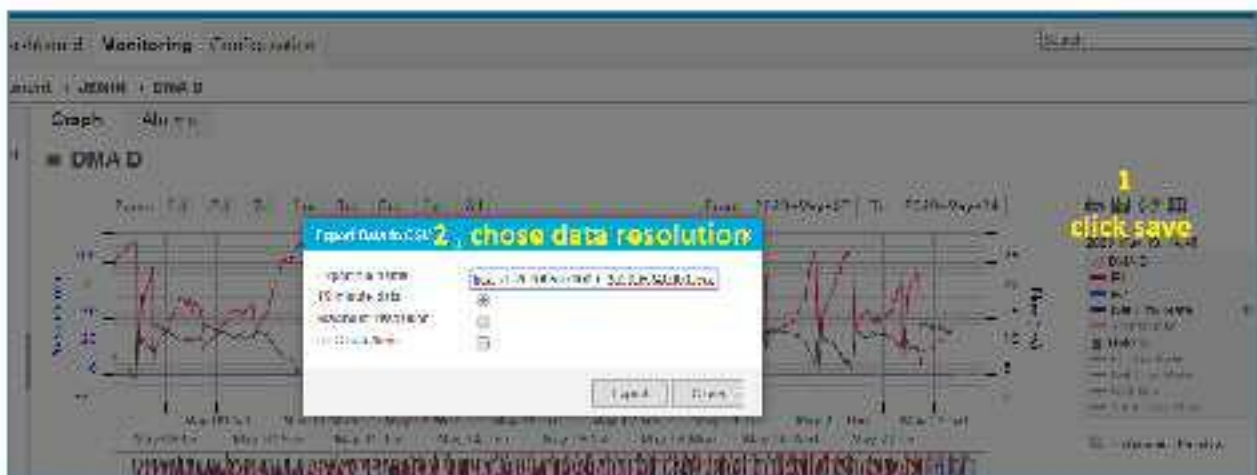
P1 : pressure channel No.1 data is active

P2 : pressure channel No.2 is not connected at site so that no pressure data is available.

By clicking (show statistics) symbol the data will be displayed at the bottom of the chart, in the example below the input volume on the shown DMA above the period from (7th to 24th May 2020) is 154013 ML = 15,401.3 m³.



The displayed information above for any period can be downloaded to CSV file by clicking the save button as below:



By clicking export the data will be downloaded as CSV file which can be opened by MS Excel program.

By clicking the Maximum resolution button, the data will be downloaded every 1 minute, but there is limitation on the size of data for this max resolution. So it can be used for less number of days, for example, for 1 or 2 days at a time.

The following figure shows the downloaded CSV data opened by MS Excel. Once it is opened, it can be saved as Excel file and analyzed as any other Excel data (such as preparation of chart, extraction of statistical values and so on).

Meter L/S

	Timezone	DateTime	DMA D P1	Flow Rate	DMA D Reverse Flow Rate
1	Asia/Jerusalem	05/20/20 23:45	72.34	10	
2	Asia/Jerusalem	05/20/20 23:50	72.98	10.67	
3	Asia/Jerusalem	05/20/20 23:55	73.32	10.33	
4	Asia/Jerusalem	05/21/20 0:00	74.18	10.67	
5	Asia/Jerusalem	05/21/20 0:05	74.67	10.33	
6	Asia/Jerusalem	05/21/20 0:10	75.2	10.33	
7	Asia/Jerusalem	05/21/20 0:15	74.66	10.33	
8	Asia/Jerusalem	05/21/20 0:20	72.98	10.33	
9	Asia/Jerusalem	05/21/20 0:25	74.17	10.67	
10	Asia/Jerusalem	05/21/20 0:30	75.71	10.67	
11	Asia/Jerusalem	05/21/20 0:35	74.59	10.33	
12	Asia/Jerusalem	05/21/20 0:40	71.97	10.33	
13	Asia/Jerusalem	05/21/20 0:45	72.1	10.67	

The End!

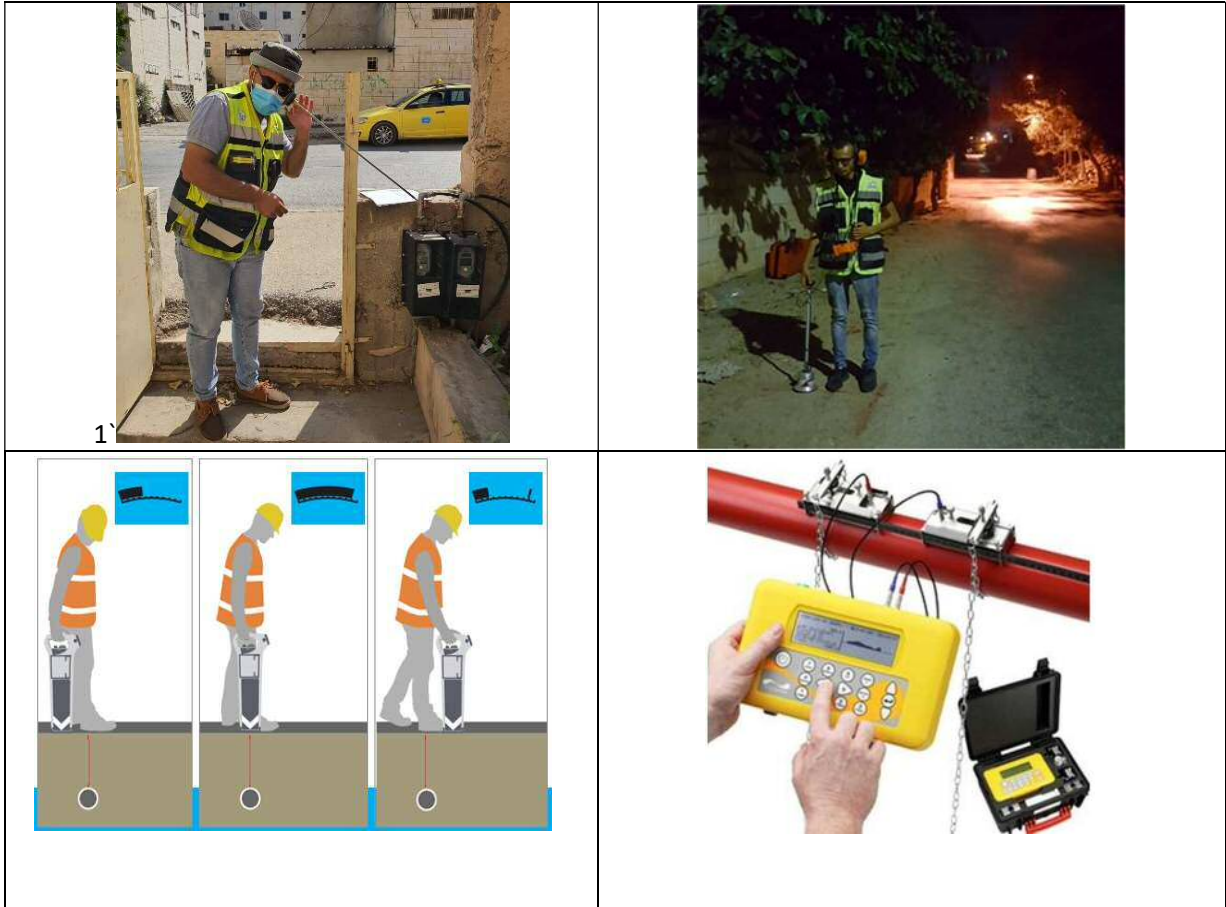
別冊資料 CD 1.10

Equipment Usage Manual (Standard Version)

別冊資料 CD 1.10.2 Arabic Version



سلطة المياه الفلسطينية
PALESTINIAN WATER AUTHORITY
مركز تحسين إدارة خدمات المياه في بلدية جنين



مركز تحسين إدارة خدمات المياه في بلدية جنين

مركز تحسين إدارة خدمات المياه في بلدية جنين

نيسان 2021

مركز تحسين إدارة خدمات المياه في بلدية جنين بالتعاون مع (JICA)
TEC INTERNATIONAL CO., LTD.
PADECO CO.,LTD.

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استمارة إلى صلات التردد في طريق - w f السمع الميكانيكية

2.2 عصابة سمع، الإلكترونية


تشابه w f السمع الإلكتروني ذابرها الميكانيكية في بع KKD نونها ± أنها تدف بوجي و حاة الكرونية (عمدة) في وضعية كسلا صلات التردد ؛ ف زلا (د) ترة اتصالات 2/3 المرز في فيها. فنتيجة لاجلا «كلا كنة كنة» ؛ خيف صلات التردد ووجي «لاد الكرونية» كة KE سلا اتصالات التي ينفذ التقاطها ؛ تعتبر «@» ا ترة أكثر فعالية كقا كة ذابرها الميكانيكية حتى أنهم يمكن استخلاصها كن كة ا تفرار «ذو AE الفات السمعية المنق» .

تصا - w f السمع الإلكتروني كنة أجزا في «يسية» : (1) ق زيد كة كاني (2) و حاة الكرونية لت ؛ خيف صلات التردد (د) ترة اتصالات 2/3 المرز في بها (3) سمات الراح .


	<ul style="list-style-type: none"> ● إيقاف تشغيل الجهاز قم بإخراج كابل المستشعر أو الفجس الأرضي F من جهاز الأكوو.
--	--

أ. خيار الفجس أو المستشعر أرضي.


في حال عدم تشغيل الفجس أو المستشعر الأرضي بشكل تلقائي عند توصيله يدخل جهاز الأكوو (على سبيل المثال إذا كان في وضع قف) بشكل يدوي.

	<ul style="list-style-type: none"> ● اضغط بشكل متواصل على الزر الذي يدخل اشارة جهاز الفجس الأرضي الموجود على وحدة جهاز الأكوو. ● قم بإدخال كابل الفجس أو المستشعر الأرضي بجهاز الأكوو؛ يظهر الرمز " > " على شاشة الجهاز وكذلك تظهر قبة بأداء المجس، أو المستشعر، الفجس اختار جهاز الفجس تصف الشاشة؛ على سبيل المثال (M01). ● اضغط على زر الانتقال للأعلى أو للأسفل للانتقال بين أسداء المجس، المعروف وقم بفتح الجهاز الفجس. ● اضغط على زر تضخيم الصوت، لرفع صوت الفجس أو المستشعر الأرضي الذي تم تشغيله.
--	---

ب. تغيير تباين الشاشة

	<p>في حال إعدادات الشاشة كالتالي:</p> <ul style="list-style-type: none"> ● اضغط بشكل متواصل على زر الاضاءة أو السطوع. ● اضغط على زر الانتقال إلى أسفل لتغيير سطوع الشاشة. ● اضغط على زر الانتقال إلى أعلى لتغيير سطوع الشاشة.
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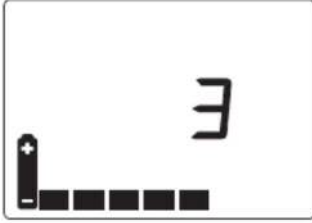
ج. آلية شحن الجهاز

	<p>عند شحن جهاز الفجس الأرضي بشكل كامل؛ الفجس سيعمل بشكل الجهاز لمدة 12 ساعة متواصلة كحد أقصى.</p> <p>لشحن الجهاز احتج إلى فحم شحن HS1.2A (انظر إلى الصورة الفجس) التي تأتي مع الجهاز الفجس، والتمكين أو شحن الفجس.</p>
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- تحتوي فحص الشد على قيس او عدل شد kW كل جاب:

- محول AC/DC M4, 100 - 240 V
- كبل اليرك M4 for 12 V



- قم بإيقاف تشغيل جهاز الأكو و ثم قم بتوصيله مع فحص الشد كما KE تظهر على الشد عدد الوحدا , اللان لاسكف ل شد الجهاز بشكل كفل.
- فك تشغيل جهاز الأكو لمدة 5 سء , (5 وحدا , شد تسكع تشغيل الجهاز لمدة 5 سء ,) kW الح الح يحتاج جهاز الاكو و إلى 3 وحدا , ككو الشد 100%.
- كعد وق , التشغيل الفع ك على عدة عواقل مثل عفر البطون واعدادا , الشد (درج السطوع أو الاضاءة) و كك احتاج جهاز الاكو و إلى 4 سء , كحد أقصى كتم شكله بشكل كفل (8 وحدا ,).
- عاد اكدل شد جهاز الاكو و (100%) تظهر على الشد 8 وحدا , كك ك الرقم .
- بإكفك ترك جهاز الاكو و فوصول ب فحص الشد إلى ك الحال إلى استخدامه مرة آخر !.

	<ul style="list-style-type: none"> ● إذا كان هناك صناديق أو حبات لجهاز الأكواد (A100) فك شكله بداخله/هـ . ● قم بتوصيل كابل أو سلك صناديق جهاز الأكواد مع فحص الشد . ● قم بتوصيل محول ال AC/DC M4 أو كابل الأبرق M4 بالقبس أو الفحل الثاني لفحص الشد . <p>● شحن البطارية .</p> <p>● إذا كان وضع جهاز الأكواد على قاعدة محقق الشد HS1.2A وعلاد كقف تشكال الجهاز تقوم بطرك، (NIMH) الدال بالشد الذاتي.</p> <p>● إذا كان الشد الذاتي لمدة أكثر فـ 30وم كاجا ستظهر شدة جهاز الأكواد كالك بآ وحدا، الشد = 0 ويجب شكله مرة أخرى .</p>
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ث. توصيل سمعها، رأس الك جهاز لايفون (A100)

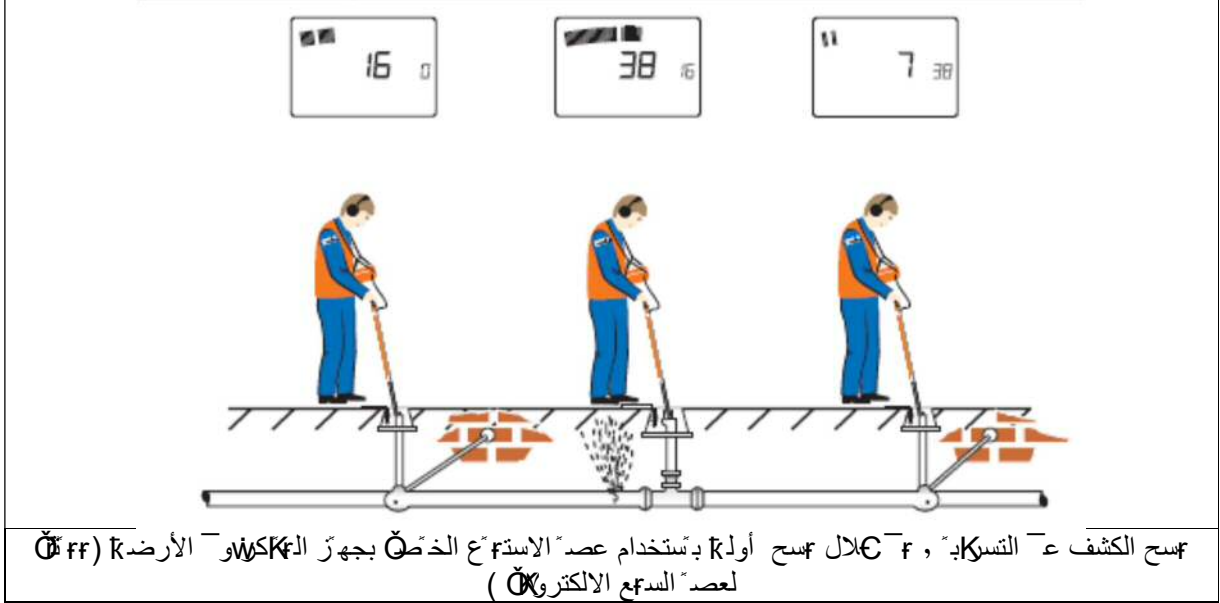
	<ul style="list-style-type: none"> ● يحتوي جهاز الأكواد (A100) على فحل © لوصف فضخم الصو، (speaker) (1). ● والذي كاجا على تكاد أصوا، التسكراب واشترا، الكالك الكلال فسه الكشف عـ تسكاي، الك كالك ال speaker على تضخم الصو، وانترة الأصوا، كار الفـ وب به لذلك لا بد ف استخدام سفا، والرأس لسفا أصوا، التسكراب، بشكل أوضه . ● التكال ف فضخم الصو، (Speaker) إلى سفا، والرأس (headphones): ● ادخل وصل سفا، والرأس الك الفحل الثاني ف جهاز الأكواد A100. الأفر الذي كدي إلى وصل فضخم الصو، بشكل ثققت و تحول الصو، إلى سفا، والرأس. ● علاد وصل وصل سفا الرأس ك تحول الصو، إلى وحدة تضخم الصو، (Speaker).

3.3 تعليمات واستخدام جهاز مايكروفون رضى (Aquaphon A 100) ف عن تسريبات الصوت .

يمكن استخدام الميكروفون في 2 أوضاع: وفقاً لأولي المبدأ المبرر مع كاسير المي (A) إقها ولي المسح على طول الخط . في كل أوضاع المبدأ المبرر على المسح الأولي أيجل نقاط التسريبات ك خلاص استماد إلى ال (A) كالك الك القطع والعلاوات المصا بماسا كعينة باستخدام الفها السمع التابع لجها 3 المايكروفون في 2 أوضاع والتي كالك الفها السمع الإلكتروني . بينما يفهم كالك إلى الثاني المبدأ المبرر أن أصلاات التسريبات في المساح الواقعة بين القطع والاقاعات

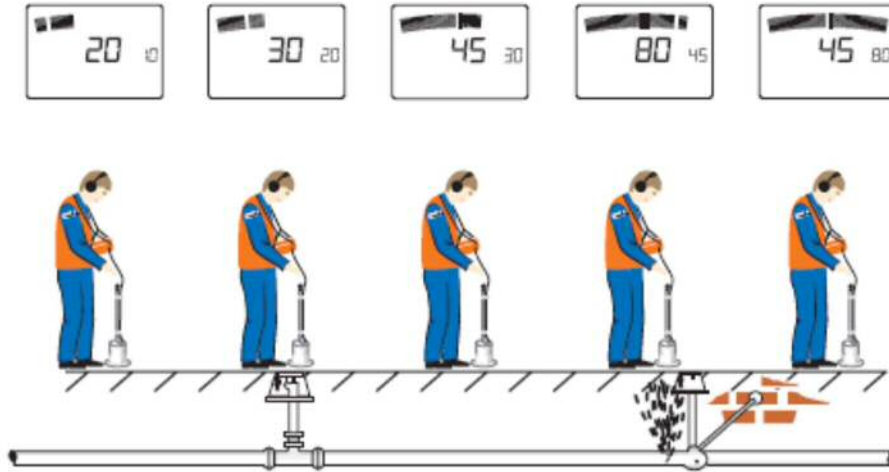
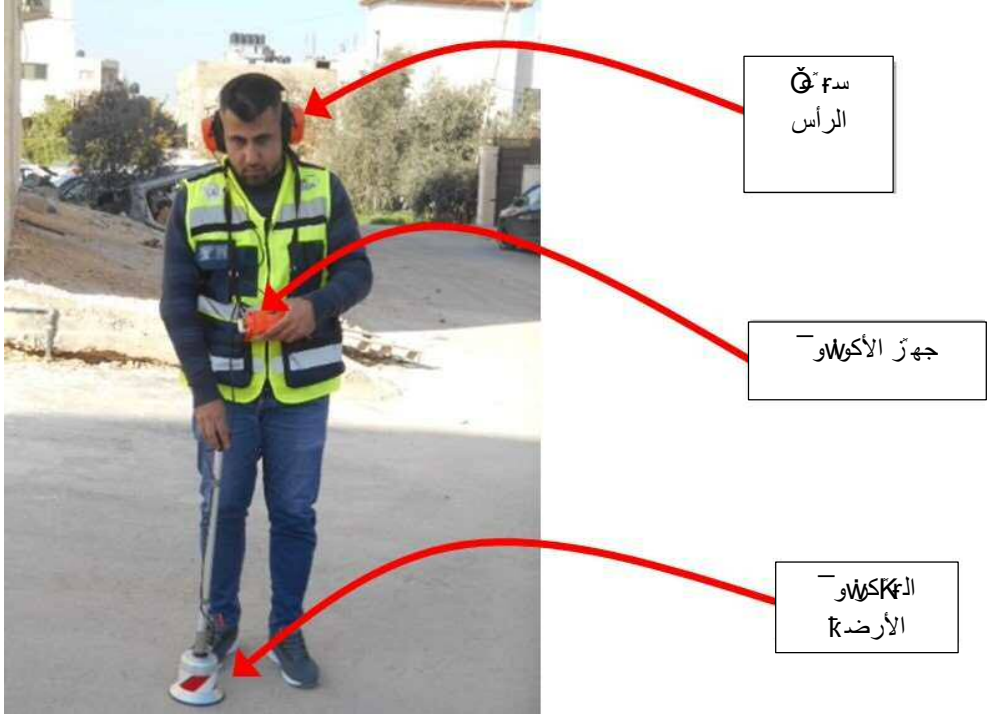
تصليح وصيانة هذه الآلات ووضع جهاز يكتشف ان الارضي مع وصلات سمع في الارض كقدرات زمنية محددة في كتيباته وملاحظ التغييرات في ذبذبات وصلات في كل نقطة مع اقرباب الجهاز من ملاحظه السريه.

أ. لإيجاب اطق لتسريب.



- قم بتوصيل وصلة سفة، والرأس بفتحل جهز الكوادر A100.
- كضد قم بتوصيل كابل عصا السمع (test rod) بفتحل جهز الكوادر A100.
- ضع عصا السمع (test rod) على نقطة الكأس الأولى.
- قم بفتحل جهز الكوادر A100 لال الضغط على زر الكوادر أو ال gauntlet key (زر فطط أسود كقع واوق شدتت جهز الكوادر).
- لال عصا السمع باستخدام عصا الاستفاح (test rod) يظهر رز فضمخ الصو، على شدتت جهز الكوادر.
- تظهر كتردد الصو، على شدتت الكوادر.
- كسفة سفة الصو، لال سفة، والرأس.
- لال عصا السمع تتكاز الكال الظهرة بحجم ككاز على شدتت جهز الكوادر إلى أقل ككاز فتت الكال الاقظ الكال (فقرون بالكال المعروف الكال الكال اللاحق).
- لال عصا السمع تتكاز الكال المعروف بالكال أصغر تردد صو، تم التقط الكال الاقظ السدب الكال بفتحل السمع تكو هي الكال 0 ومع الاستمرار بلا تقل ف نقطة إلى أخرى تستمر الشدتت بعرض تردد الصو، الكال الاقظ السدب.
- لإلغاء فتحل جهز الكوادر A100 قم بالضغط على زر gauntlet أو زر الكوادر مرة أخرى.
- الكال عدم استجود جهز الكوادر A100 لعصا السمع الكال هذا الكال الكال زر ال gauntlet قد تكاز، كارجى الرجوع إلى قسم 4.8 (كال المستخدم)، قم بتكرار المدوون مرة أخرى.
- ضع عصا السمع على الاقظ الكال واستمر بالكال الخطوات، السدب.
- تظهر كتردد الصو الكال الاقظ السدب بحجم صكاز على الشدتت وذلك لغرض الفقرون.

ب. رـكـبـة تـمـنـة مـنـة لـتـسـرـب؁ مـن طـرـيـق تـلـا مـنـة مـنـة؁ مـن طـوـل لـخـط كـا فـلـا ضـع جـهـز الـكـفـة مـنـة الـأرـضـة عـلـى الـأرـضـة



- رـصـد أـصـوا؁ و التـسـرـب بـتـسـتـدـام جـهـز الـكـفـة مـنـة الـأرـضـة مـع عـصـة الـسـمـع
- قـم بـوـصـل كـابـل جـهـز الـكـفـة مـنـة الـأرـضـة مـع عـصـة الـسـمـع بـجـا فـلـا جـهـز الـأـكـوـمـا A100.
- ضـع وـحـدة الـكـفـة مـنـة الـأرـضـة عـلـى الـأرـضـة.
- قـم بـتـفـكـال جـهـز الـأـكـوـمـا A100 مـنـة الـكـفـة مـنـة الـأرـضـة عـلـى زـر الـكـفـة مـنـة الـأرـضـة (زـر فـطـطـة أـسـود كـا فـع مـنـة شـدـتـة جـهـز الـأـكـوـمـا).

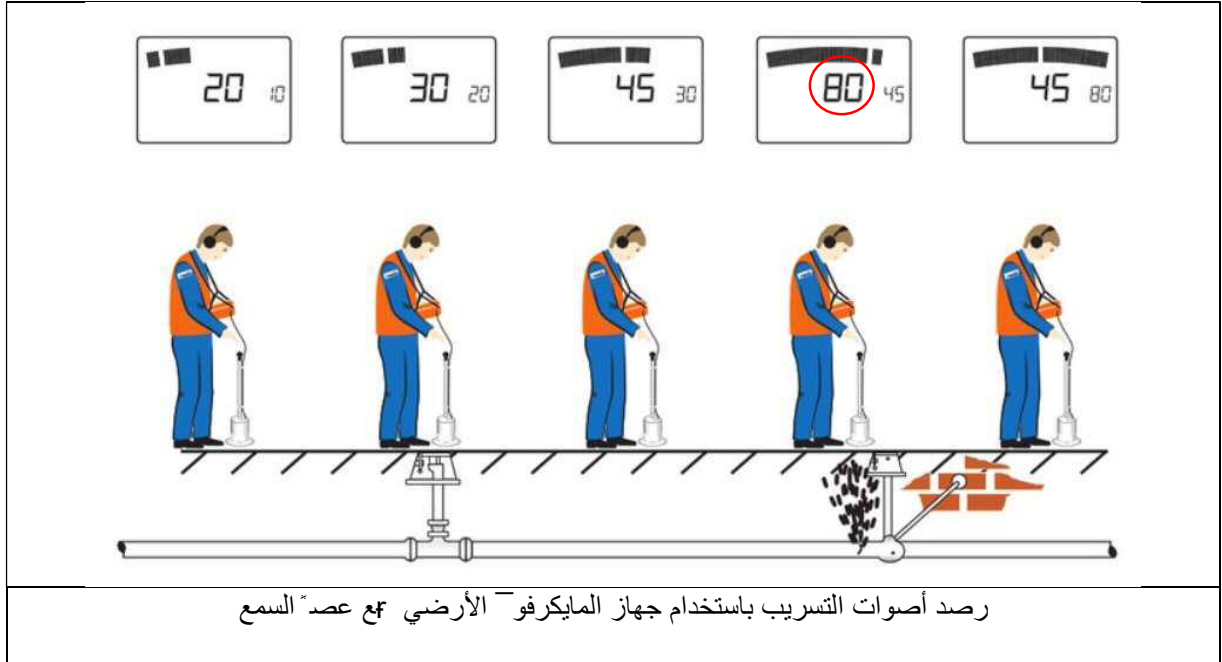
- K تظهر رمز مضخم الصوت على شاشة جهز الاكوفون .
- تظهر قيم تردد الصوت kW النقطة الحالية على شاشة الاكوفون .
- يمكن سماع الصوت F لاسماعات الرأس .
- عمال المسح تظهر أصغر K تردد تم قياسه .
- تظهر قيم تردد الصوت kW النقطة السدي على الشاشة بحجم صغير على الجانب الـ وتكون الـ 0.
- ومع الاستمرار بلانتقال من نقط إلى أخرى تستمر الشاشة بعرض تردد الصوت في النقاط السابق .

- لإلغاء تفعيل جهز الاكوفون A100 قم بالضغط على زر gauntlet أو زر الـ مرة أخرى .
- kW دل عدم استجابه جهز الاكوفون A100 لعمال ايلاف التفعال فهذا كعد أن وظيفة زر ال gauntlet قد تكار ، الرجوع إلى قسم 4.8 من دليل المستخدم)، قم بتكرار المحاولة مرة أخرى .

- ضع جهز الـ والأرض F مع عصا السمع على الاقصى الت والستمر بلاكذ السطوا ، السدي .
- تظهر K تردد الصوت kW الاقصى السدي بحجم صغار على الشاشة وذلك لغرض الفرض .
- استمر باستخدام جهاز الميكروفون الأرضي F مع عصا السمع kW مسح المنطق أو فقطع الماسورة المحتمل وجود تسريب به .

3.4 توضيح آلية استخدام جهاز المايكروفون الأرضي مع عصا السمع.

يغبر جهاز المايكروفون الأرضي مع عصا السمع من كثر كعدت المستخدمة في عمال الكشف عن تسريبات المياه بحدي إذا يستخدم في الأي لتحديد نقاط التسرب في رصد الأصوات Y نريق المسد على kW الخط .



وقد تنافس - كوكب اصيغ كسابقه مؤدول جهاز ايكرفان الارضي . ويجاز يند الاقرباب من نقه كسرب يداد مفدك تردد كصلاص بلكل مفصلا د كوكب ° صحبه واصل قوه تردد صلاص كسرب كوكب ; قصه حه كوكب يند اقرب نقه كسرب مخول في كوكبان .



مثالك غلغ اءخدا كوكب ايكرفان الارضي خلاص مفرو ة تحسين ادارة صلاص كوكب ياه في بلديه جنين .

ونظر كوكب اصيغ كسابقه مؤدول جهاز ايكرفان الارضي . ويجاز يند الاقرباب من نقه كسرب يداد مفدك تردد كصلاص بلكل مفصلا د كوكب ° صحبه واصل قوه تردد صلاص كسرب كوكب ; قصه حه كوكب يند اقرب نقه كسرب مخول في كوكبان .

3.5 وقاية من اضرار الاصوات (أصوات مشابهة صوت التسريب – Pseudo Sound)

يدار صلاص تدف كوكب ياه في خ كوكب كوكب في قارات كوكب , غلغ مخرجات مسه كوكب يند كسرب و يولي لاد من كوكب ري ة قول بدم تنفيذ كوكب مسه كوكب اءا كوكب لابسات كوكب يند جريان كوكب ياه في كوكب .

خلاص تنفيذ مسه كوكب يند كسرب ريقه كوكب سادان بيسجيل جيع الاصلاص كوكب ياه غلغ ; نها صلاص تسريب مخول . وقد كوكب الاصلاص كوكب سجا ياه اصلاص مءابه كصلاص كسرب (pseudo) وكوكب بدورها بلكل ياه حاه كوكب س . يءا كوكب بين صلاص كسرب كوكب وكوكب كوكب كوكب ميدان كوكب .

قوكب ياه مءه كوكب يند كوكب خلاص يند بينها وبين صلاص كسرب كوكب

أ. صوت بربان كوكب داخل كوكب

يدار كوكب بربان كوكب ياه داخل كوكب و يند مروره بشنايا اءهه كوكب كوكب- مءل مكوكب (Gate Valve) و مخف كوكب يند كوكب (PRV) و كوكب (reducers) بذبذبات صلاص قوه من صلاص كسرب تداد كوكب ساف . ففي حا كوكب قوكب مكوكب (Gate Valve) بلكل كامل بكان صلاص تدف كوكب ياه بءابه كصلاص كسرب كوكب من كوكب رورر أ تنفيذ مسه كوكب يند كوكب ساف . محاب كوكب ياه بلكل كامل لأن هذه الاصلاص بلكل ياه في كوكب كوكب .

الفصل الرابع . جهاز تحديد مواقع الأسير (Metallic Pipe Locator).

4.1 مقدمة

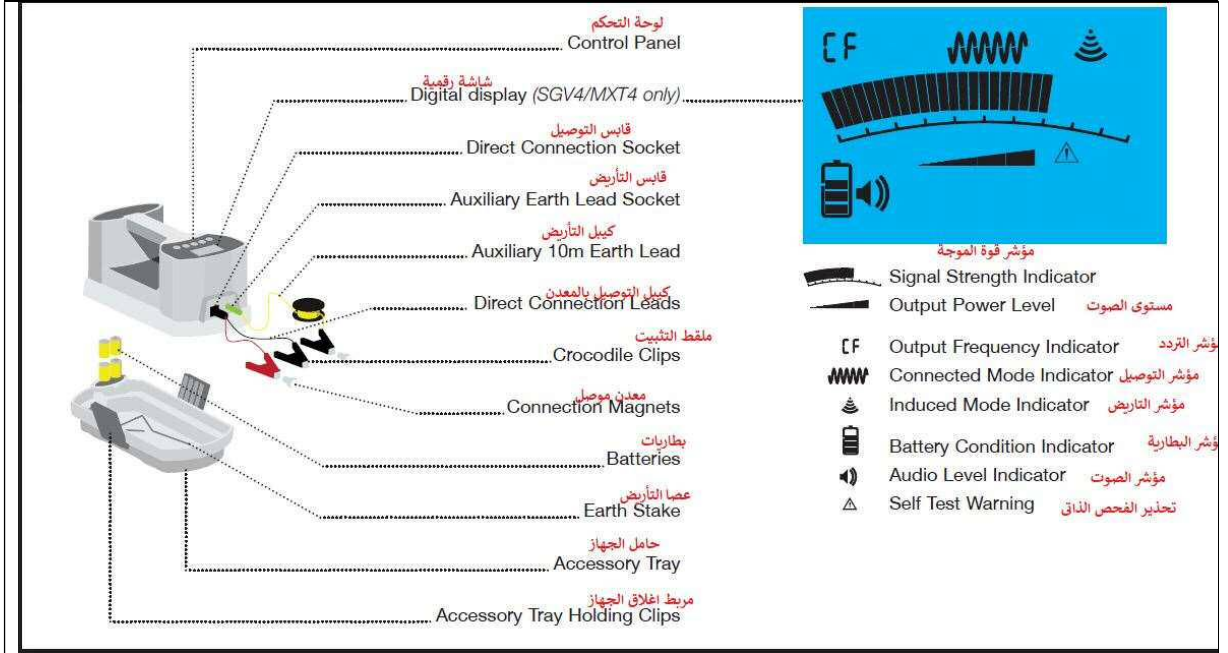
يُوع جهرّ تحكاد موقع الموايلار المتوفر kW دهره الكهف والصرف الصحي هو (C.Scope MXL4) fS هو فوضح أه. G.



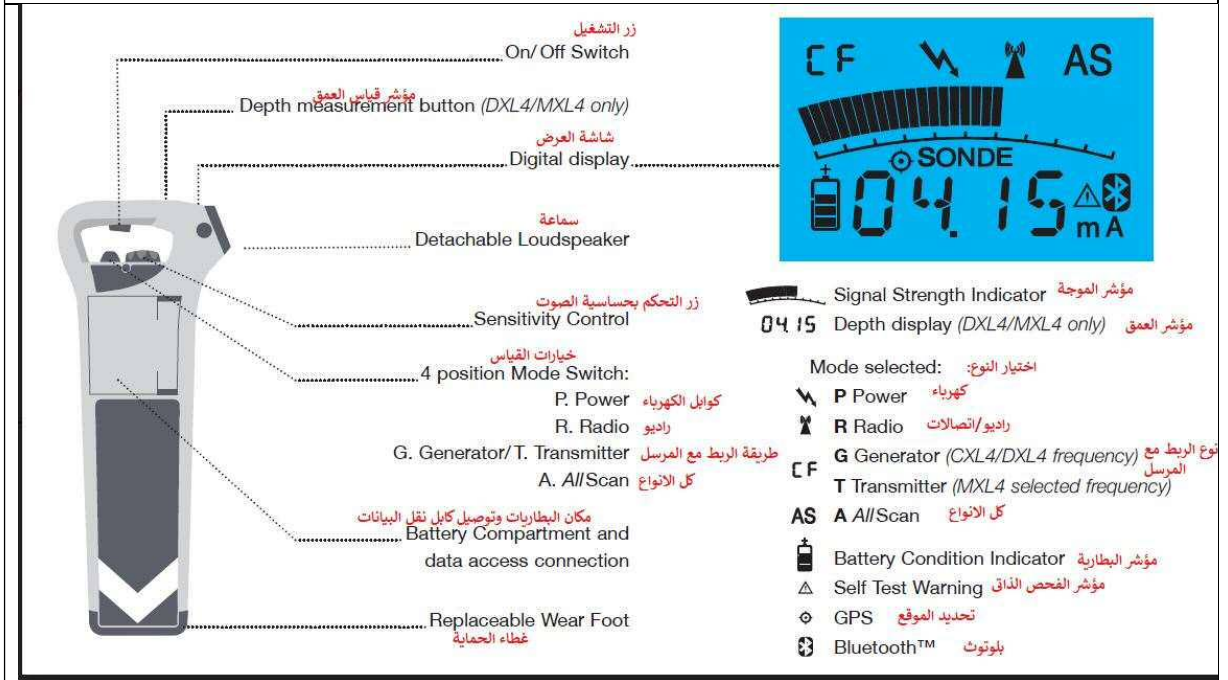
يُوع هذا جهاز على تحديد مواقع خط الوصل الخدمات الممدة تحت الأرض.

4.2 مكونات جهاز تحديد مواقع الموايلار .

يتكون جهاز بشكل أساسي من جزأين: أولاً (مرآة إشارة) وأداة تحديد الموقع (مستقبل الإشارة).



قطع ومكونات جهاز ملاد الإشارة كمر ل (C.Scope MXL4)



جداة تحديد الموقع-مستقل الإشارة (C.Scope MXL4)



4.3 أوضاع تشغيل أداة تحديد الموقع (P,R,T,A).

أ. وضع مؤ (P) الطاقة

عند اختيار وضع مؤ الطاقة (P) تعمل أداة تحديد الموقع في وضع التشغيل. لا تقبل إشارات كهربائية في الخلف. ويسري هذا النموذج من إشارات في جميع كوابل الكهرباء لمدة - الأرض. لا يمكن تحديد مواقعها. وقد ترفض الإشارات الكهربائية؛ كوابل وتمديدات الخدمات الأخرى مثل الغاز وأنابيب المياه وكوابل الاتصالات والأسوار المعدنية ومسارات السكك الحديدية.

وتتمثل وجه القصار عند تفعيل وضع الطاقة بعدم قدرتنا على إيجاد جميع الكوابل حاملًا للتيار الكهربائي عن قصار هذا الوضع إلى تحديد مواقع المدفون إلى أكثر من 3.

ملاحظة: « يتم اختيار وضع مؤشر الطاقة (P) تحديد موقع مواسير المياه.

ب. وضع موجات راديو أو الاتصالات (R)

عند اختيار وضع موجات الراديو (R) أداة تحديد الموقع يرصد إشارات الأرض التي تنبعث من مختلف أجهزة راديو. بحيث ترفض هذه إشارات غير الأرض وتميل إلى اتباع مسارات الخط الأقل مقاومة مثل الأسلاك المعدنية المدفون. وعندما يحدث هذا يمكن تحديد موقع الخلف (K) كما أن (R) من خلال تفعيل وضع إشارات الراديو (R) إلى أداة تحديد الموقع.

وبالعادة فقط تحديد موجات راديو في الخلف و كوابل الخدمات دفن إلى 2 - كحد أقصى.



ت. وضع المسح الكلي (المسح العام) (AS)

أما عند اختيار وضع المسح الكلي (AS) أداة تحديد الموقع بتحديد كافة ترددات وجوده ضمن نطاق واسع. ومن الممكن أن تلتفت أداة تحديد الموقع (المستقبل) إشارات أخرى مدفون في خطوط معدنية أو كوابل خدمات دفن وتكون هذه الإشارات خارج نطاق الترددات الخاصة بأوضاع البحث (P,R,T,AS).



وإنجاز هذه العملية يتم تنفيذها بتفعيل وضع «س» كلي (AS) بكتابة بحثاً أماماً أو من خلال إختيار wnt وتحديد موجات مختلفة بالإضافة إلى إشارات كإي في wnt لها يتم تشغيلها بوضوح 3 مرات كإي (P) و موجات كإي (R) ومعد إشارة (T).

وإنجاز هذا يتم من خلال إختيار وضع «س» كلي (AS) بكتابة بحثاً أماماً أو من خلال إختيار wnt وتحديد موجات مختلفة بالإضافة إلى إشارات كإي في wnt لها يتم تشغيلها بوضوح 3 مرات كإي (P) و موجات كإي (R) ومعد إشارة (T).

- قدرة إشارات كإي في wnt بكتابة في كإي خلال وضع «س» كلي (AS) بكتابة بحثاً أماماً أو من خلال إختيار wnt وتحديد موجات مختلفة بالإضافة إلى إشارات كإي في wnt لها يتم تشغيلها بوضوح 3 مرات كإي (P) و موجات كإي (R) ومعد إشارة (T).

- صلاية تحديد 3 مصدر إشارة في بد «س» كلي (AS) بكتابة بحثاً أماماً أو من خلال إختيار wnt وتحديد موجات مختلفة بالإضافة إلى إشارات كإي في wnt لها يتم تشغيلها بوضوح 3 مرات كإي (P) و موجات كإي (R) ومعد إشارة (T).
- لا يمكن تحديد 3- wnt بكتابة في كإي خلال وضع «س» كلي (AS) بكتابة بحثاً أماماً أو من خلال إختيار wnt وتحديد موجات مختلفة بالإضافة إلى إشارات كإي في wnt لها يتم تشغيلها بوضوح 3 مرات كإي (P) و موجات كإي (R) ومعد إشارة (T).
- زيادة يتم إختيار وضع «س» كلي (AS) بكتابة بحثاً أماماً أو من خلال إختيار wnt وتحديد موجات مختلفة بالإضافة إلى إشارات كإي في wnt لها يتم تشغيلها بوضوح 3 مرات كإي (P) و موجات كإي (R) ومعد إشارة (T).



- إذا كان (k w) الخ و كإي قصير (كإي) يمكن من كإي wnt بكتابة في كإي خلال وضع «س» كلي (AS) بكتابة بحثاً أماماً أو من خلال إختيار wnt وتحديد موجات مختلفة بالإضافة إلى إشارات كإي في wnt لها يتم تشغيلها بوضوح 3 مرات كإي (P) و موجات كإي (R) ومعد إشارة (T).

ث. ١٧ مع «إشارة (T).

وإنجاز هذا يتم من خلال إختيار وضع «س» كلي (AS) بكتابة بحثاً أماماً أو من خلال إختيار wnt وتحديد موجات مختلفة بالإضافة إلى إشارات كإي في wnt لها يتم تشغيلها بوضوح 3 مرات كإي (P) و موجات كإي (R) ومعد إشارة (T).

إنجاز هذا يتم من خلال إختيار وضع «س» كلي (AS) بكتابة بحثاً أماماً أو من خلال إختيار wnt وتحديد موجات مختلفة بالإضافة إلى إشارات كإي في wnt لها يتم تشغيلها بوضوح 3 مرات كإي (P) و موجات كإي (R) ومعد إشارة (T).

وإنجاز هذا يتم من خلال إختيار وضع «س» كلي (AS) بكتابة بحثاً أماماً أو من خلال إختيار wnt وتحديد موجات مختلفة بالإضافة إلى إشارات كإي في wnt لها يتم تشغيلها بوضوح 3 مرات كإي (P) و موجات كإي (R) ومعد إشارة (T).

- تجنب الارتفاع في مناطق العمل في صنوبر مع الحرص على ملامسة كوابل حاملي التيار مع كوابل خطية حجرة أو صنوبر في مناطق العمل.
- أغلق كوابل صنوبر في مناطق العمل في كشك محكم.

٧. طريقة عمل الكاشف (locator).



- عند استخدام أداة تحديد الموقع يجب ملها بشك عمودي كإت (90 درجة)؛ وذلك تجنب الارتفاع في مناطق العمل في صنوبر أو متأرجح؛ وفي حال عدم حمل أداة تحديد الموقع في كشك تصحيح تصورات الأداة بشارتها تحرك صوتي.

كاجب كاستخدام اصبعك الأوسط للضغط بشكل مستمر على زر كإقف وتشكال الأداة (وجود بلجزء السقف كإ-ف كإ) واستخدام اصبع السبب لتحكم بكافة شدة تردد الإشارة أو فضه كإ-ف كإلال عتج التحكم بحسب كإالصو .

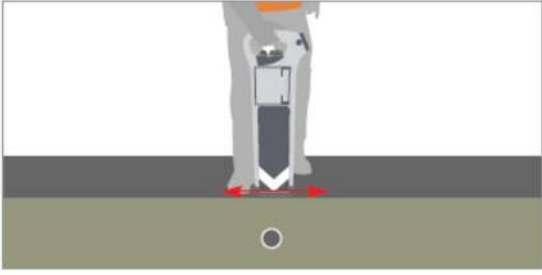
ت. عملية عمل الكاشف أو المسطرة.

تتضمن عملية عمل الكاشف أو المسطرة الخطوات التالية: 1- البحث عن إشارات الكاشف في مناطق العمل أو الكاشف، 2- المسطرة أو المسطرة 3- تعقب مسارات الكاشف.

٧. البحث: ختار ٧ تليين من الكاشف:



1. اختيار وإع تشغيل أداة تحديد الموقع (AS/T/P/R) من الكاشف.
2. على شاشة الكاشف تظهر الأداة في الجانب الأيسر من الشاشة. عند تحديد الموقع في صنوبر مستمراً يجب أن تصار أداة تحديد الموقع صوتياً مسموعاً وبن إحد الكاشف على مستوى 3 شدة الكاشف أو كإ-ف كإ. تظهر شاشة الكاشف على الأداة كإ-ف كإ كإ-ف كإ 3 م، مشر مستوى شدة الكاشف أو الكاشف من جانب الكاشف أو الكاشف.



جولة تعقب مسار كـ : بعد تحكّم موقع عـ الكاشف الفـ الفـ الأ
تتبع مسار عـ خلال الخطوط، التـ :

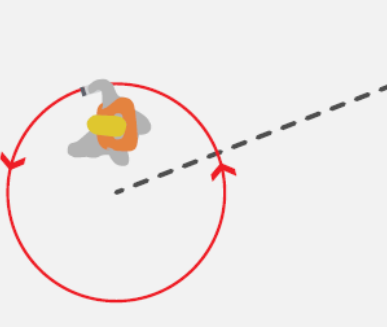
1. بحزر لتتبع وتجاهل «شارة مع Y مع أداة تحكّم مع مسار اتجاهية
كـ الخـ. ومع ضرورة متالفة مسح جـبي الخـ (تـ) م
أداة تحكّم مع أجـ الكـ - أـ تـ اـ - اـ «شارة
الـ تردـ كـ.

2. تـ كـ (تـ) مـ «شارة» شـ اـ ٧ اـ فـ ٧ منـمة ؛ كما «ند عـ» شـ اـ مسـة كما أصبح تجاهل الخـ اـ.

أ: مـ في مـلة مـب مسار خـ كـ «مـ» !! عـ لـ حـر في كـ خـ تـ «شارة» الكـ مـ اـ أي
تـير صـير وغير متوقـع في مسار الخـ.

فـنـ «شارة» عـ مـ مسار خـ:

كـ حصـ اـ نـجة وجود منحنى في مسار خـ كـ أو تـير في عمق خـ كـ أو
وجود كـ مـصلة عـ الخـ أو - كـ.



كـ لـ «شارة» مـ:

1. حر ° في مـرة كـ اـها 1 متر عـ كـ ولـ مـ اـ «شارة» في «فـ»
«شارة» فـ «شارة» تـ تـ مـ مسار خـ في «الـ» و«حـ» في «أ»
وجود كـ مـ تـ لـ خـ.
2. كـ (نـ) أي -نـة كـ «شارة» تـ تـ و«شارة» تـ تـ مـ مـ كـ
مـرة كـ اـ 1 متر ولـ مـ «شارة» مـ شـ اـ «شارة» تـ تـ مـ عـ كـ.

درجات تحك بشدة تردد الإشارة (من خلال تحريك عجلة التحكم الحاسوبية الصو ٧) بشكل دوري لتعويض هذبة الفجوة .

ملاحظة: النسبة لمواصلة الإشارة MXT4 6° أن تتبع الإشارة لمسافة قصيرة 6K يكون من المفيد تبديل تردد المستخدم إلى ترددات أقل لمعرفة ما إذا كانت تعطي استجابة أفضل. اختر التردد 0.5° في أقوى استجابة واستمر في تعديل الخط.

4.6 مبدأ عمل مقياس الخطوط باستخدام طريقة الحث (induction)

وهي طريقة لقياسية لتحفيز الإشارة المتدفقة من خطوط والكوابل (المعوية المدفونة). يقوم مقياس الحث على 1/4 تا إ إشارة قوية مباشرة (جهاز مؤشّر إشارة) مع التردد (Signal Generator) مع التردد إلى أن قوة الإشارة تتخف بدرجة كبيرة على جانبي مولد الإشارة المرسل. لتبسيط هذه الطريقة يتبع الخطوات التالية:

1. تحقق من عدم وجود أي ملدات أو قطع موصولة في مقبس أو مدخل جهاز مؤشّر إشارة (Signal Generator). ثلاثياً عند عدم استخدام مقبس أو مدخل جهاز مؤشّر إشارة يتغير وضع جهاز مولد الإشارة إلى وضع الحث الكهربائي.

2. ضع جهاز مؤشّر إشارة على الأرض في مكانك في الموقع المتوقع أو كونه في موقعاً قريباً. تأكد من أن جهاز مؤشّر إشارة يتماشى مع المسار المتوقع للخط أو الكابل المدفونة.

3. شغل جهاز مؤشّر إشارة وتحقق من وضع شحن البطارية.

النسبة لمواصلة الإشارة MXT4 اختيار أحد الترددات التالية (8kHz, 33kHz, CF or 131kHz (HF) بحيث لا يمكن تحفيز الإشارة المتدفقة من خطوط أو الكوابل المدفونة بتردد 512HZ أو 640HZ.

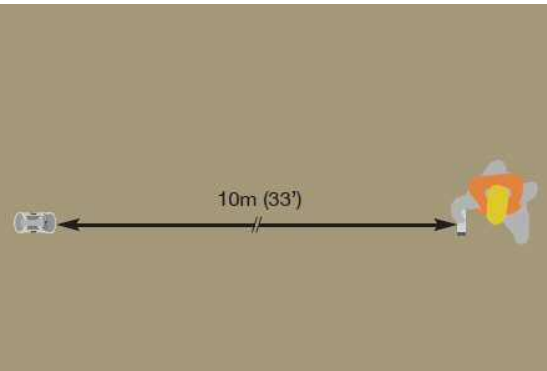
4. ستنبؤ الإشارة في الأرض تحك مكانك في وضع عليّ مؤشّر إشارة وكذا تتوزع الإشارة على 3 م من جانبي الجهاز.

5. احمج أداة التحكّ الموقع (locator) وامشي لمسافة 10 م من موقع وإع جهاز مؤشّر إشارة وتجنب تقاطع الإشارة من مقياس الحث عبر 1/4 في أضواء الإشارة المتدفقة في خطوط الخدمات (مبدأ كج).

6. 4-6 ± في - إشارة مدى الإشارة المنبعثة من جهاز مؤشّر إشارة احمج أداة التحكّ الموقع (حيث يكون الجانب الأيمن من الجهاز مؤشّر إشارة).

7. اختار وضع تشغيل مولد الإشارة (Generator/Transmitter Mode).

يجب أن توافق تردد الإشارة مع تردد جهاز مولد الإشارة MXL4.



كـ وصل الخامس: جهاـ كـ يا كـ (نقـ كـ مـ مـ لـ لـ وـ يـ).

تستخدم دائرة EKF والصرف الصحي kW بـ جـ جـ الأتراسونيك المـ نوع (Micronics Portaflo 330) لقياس تدفق كـ، EKF الدـ إلى ٤ طـ التـود والذي تم تـده ٤ قبل مشروع تحيـة ادارة خدمات EKF. بـلرغم ٤ عداد الأتراسونيك المـول كـس ويـ بـ بـشة لـكشف عـ تسـكـ، الكـ؛ اـ كـ سـ بـ بـ شكل كـ بـ بـر و بـر بـ كـ تحديد ٤ طـ التسريب وذلك مـ لـلال قياس ومتابـ كـيا، المـجـ الداخـ إلى المناطق. وكـلا أول هذا القسم ٤ الكـال شرـة بـ تصـرـف لو طـف واستـداف، جـ جـ قياس التدفق المـول (الأتراسونيك).

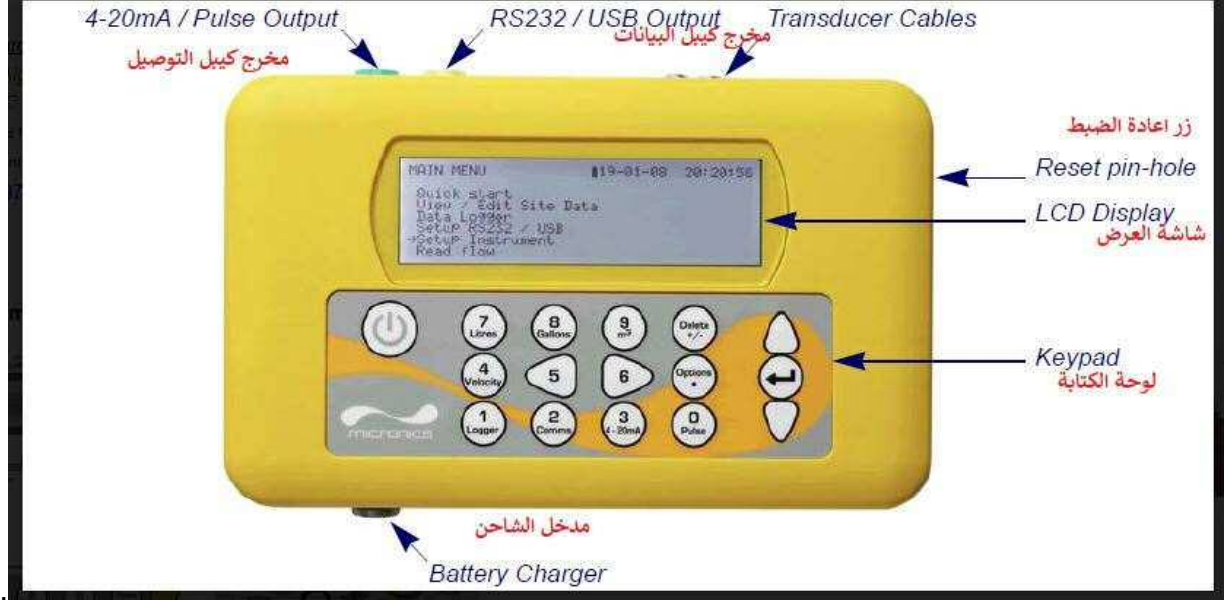
5.1 مكونات جهاز قياس التدفق المـول (الأتراسونيك) ومبدأ قياس.

كـ استـجـع هذا النوع ٤ العدادا، كـ سـ بـعدل نـاق الكـ الكـط أو الفـسورة دوـ الحـ إلى قطعها قصهـ أو إضـ أي أجزاء أو قطع فيـكـنـ إلى جدار الماسورة. توضـح الصورة أدـ الأجزاء الأسـ لـ لجـ الأتراسونيك المـول.

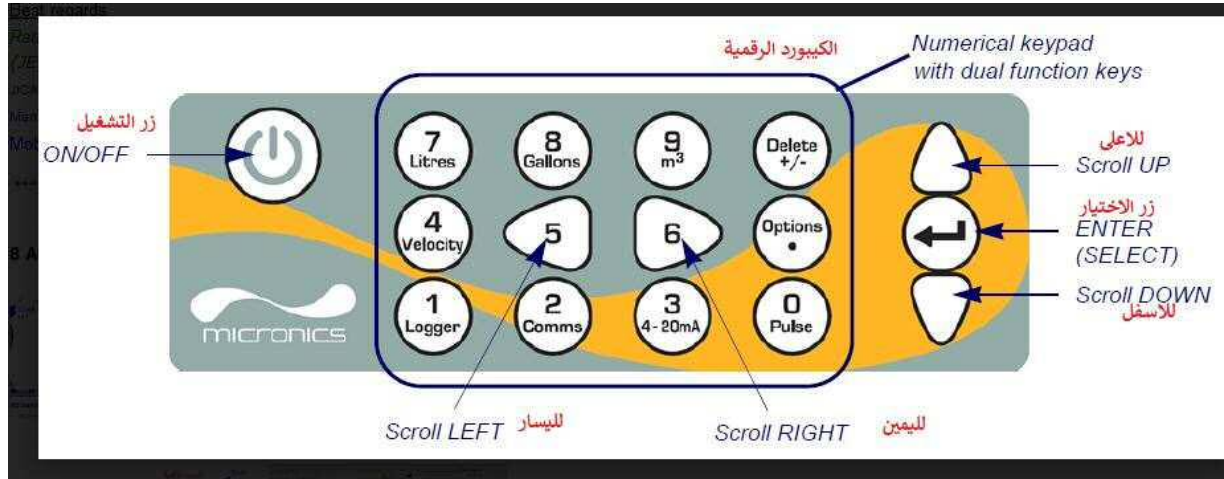


المكونات الأسـ لـ لجـ الأتراسونيك المـول

توضح الصورة أدناه مرفق وصله , الجهاز .



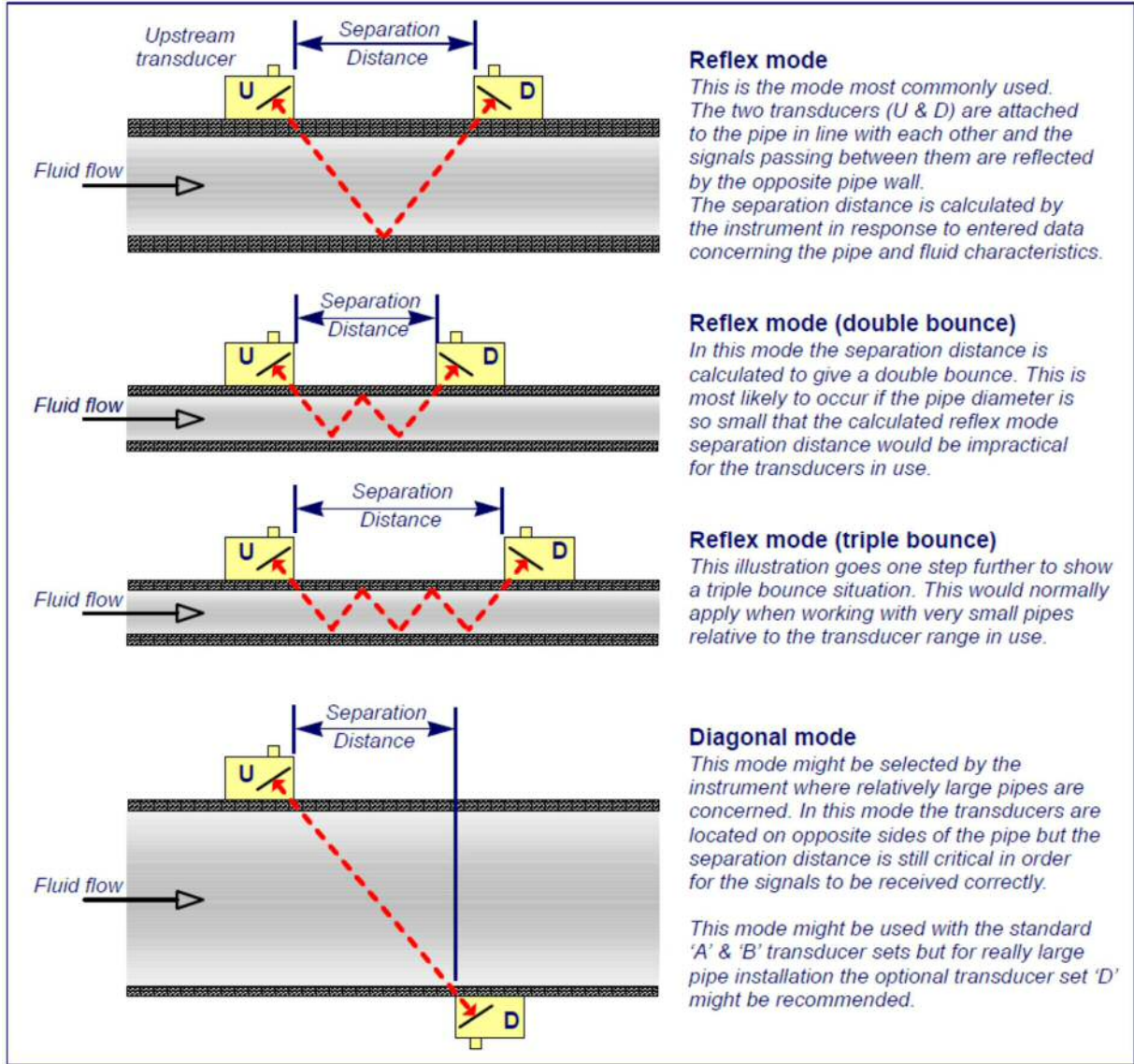
توضح الصورة أدناه تفاصيل لوحة المفاتيح الرقمية لجهاز الألتراسونك المحمول.



كك. فيا ككف ككف في الماسورة .
علافا لاتقل العوج فوق الصوت عبر وسط سدك؛ تزداد سرعة لا تقل العوج ، والصوك بشكل فحوظ إذا انتقلت بنفس اتجاه
تلق السدك والعكس صككج . وتتناسب سرعة تلق السدك طر ك مع الفرق الزملا كك الك ، المستغرق لانتقال الصوت
لمسك مسك لكن بالاتجاه المعاكس لاتج سرعة كك السائل.

يستخدم كك جهاز الألتراسونيك المحمول (Portable flow 330) حيكسات فوق صوتية (عدد2) ككتم تركيبه على جسم
الماسورة الناقلة للسائل ويعمل الكك على مكارنة الوقت لمستغرق لنقل إشارة المرجات فوق صوتية في كل اتجاه. بحيث
ككنت الخصائص الصوتية للكك للكل معلومة ، فيمكن لمعالج (Portable flow) الدقيق توظيف كك نتج حسابات وقك انتقال
لحساب سرعة تدفق السائل .و بمجد معرفة سرعة تدفق السائل ، يمكن بسك آلة كك لتدفق كك لحجمي (كك لسائل) لقسر
ماسورة معين.

كك ويمكن بدمجة كك جهاز الألتراسونيك المحمول Portable flow ليعمل حسب واحد من أربعة مواضع ككحددها ب كل
رئيسي كك لأنب ك ونو كك لحساسات كك لمستخدم كك ك الرسم البياني أدناه أهمية تطبيق مسك كك وصل الصحيحة بين
كك ككات فوق صوتية للحصول على أقل - موجة ممكنة. كك سيتم تناول أو كك التثبي كك لمختلفة (موض كك كك كك) أدناه.

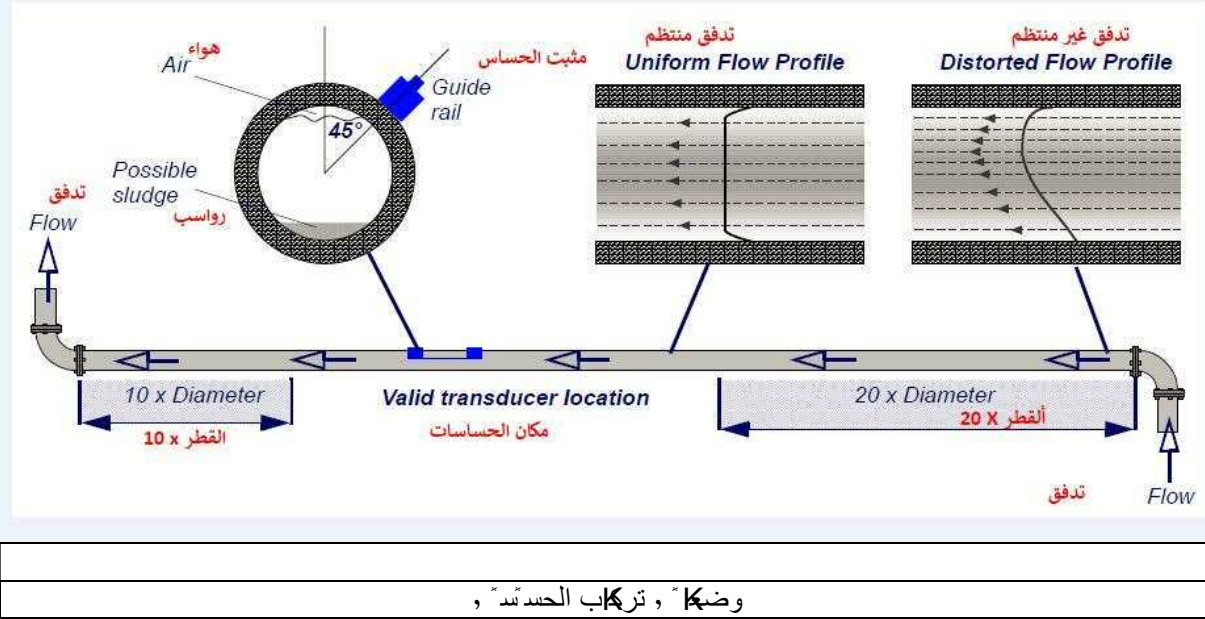


5.2 اختيار

وضع تركيب حساسات فوق صوتية

- تتركيب الحساسات على المسطحة من الخلف عن الـ upstream downstream. مع ملاحظة ان تركيب الحساسات على المسطحة من الخلف هو عند الحاجة الى سرعة ب2 في الـ KFD في المياه في الـ KFD والى الـ D لم تنفذ الـ A لم تنفذ الـ B للمقاسة للتركيب الحساسات عن الـ upstream downstream عليهم البحث عن مود 1، الـ للتركيب.

- يتم تركيب الحساسات على كافة مواعيل المسورة بل يتم تركيبها بزاوية 45 درجة كما هو مبين في الشكل ١٠-١٠. ولتجنب احتمالية وجود « قذرات صلبة في تسبيل مياه في ذلك المكان ».



وضيحا، تركيب الحساسات،

- ب. تجهيز سطح خطوط، وواسير.
وكشف ذلك ازن ولاكاف الطبقة، العزل الف العنق الف الط أو المسورة.



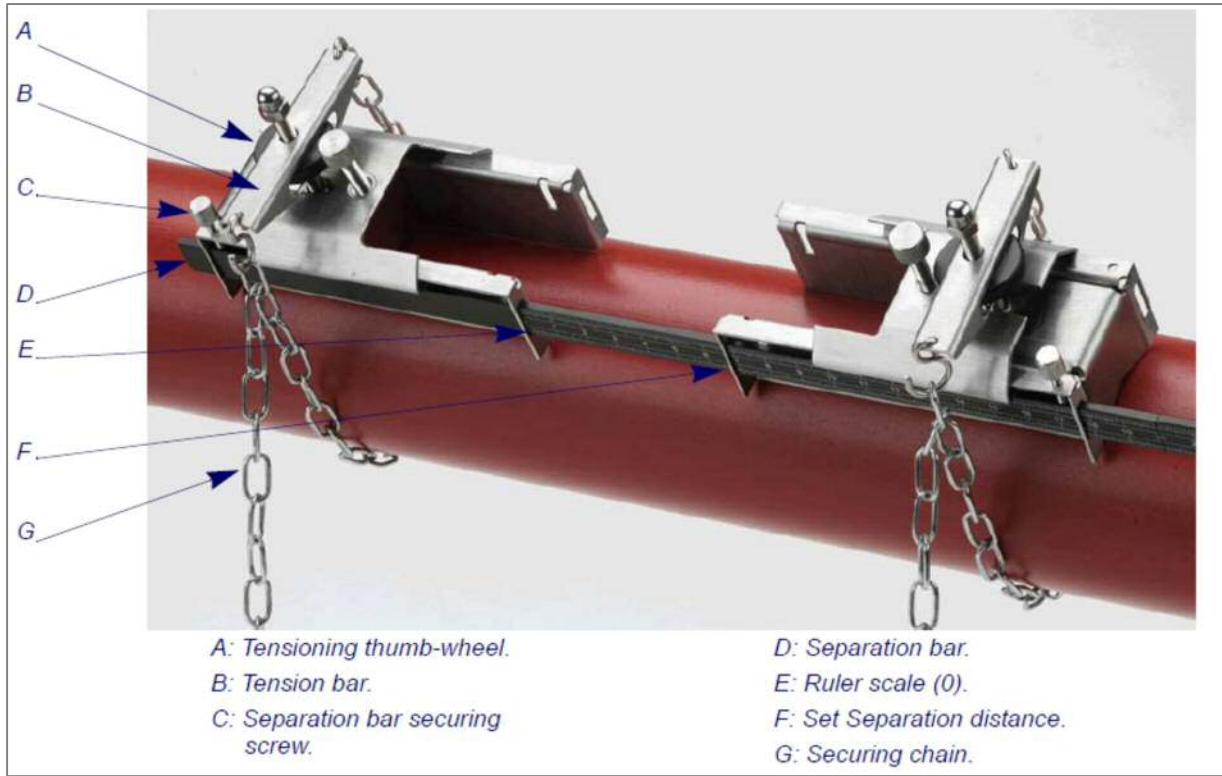
استخدام الحرارة لإذابة طبقة العزل العزل.



تغطية سطح الخط ولاكافه

- ت. تركيب حساسات.

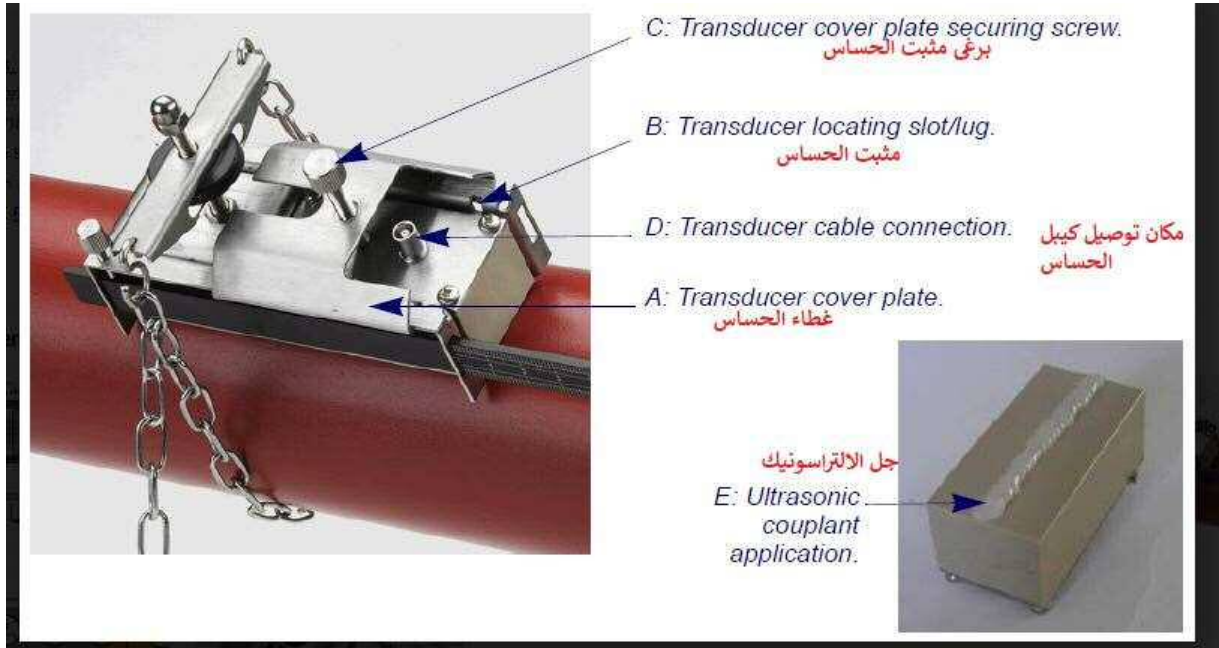
لاظر إلى الصورة أدناه.



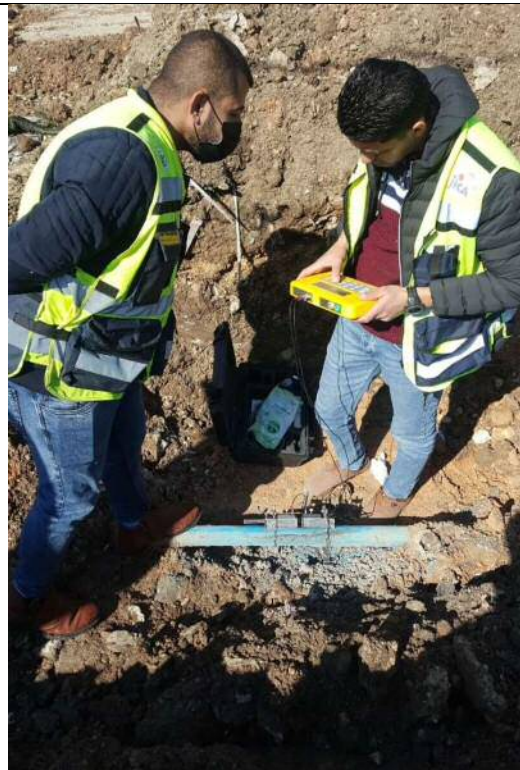
تركاب الحسدئد ، على ع الكك بعد ازن طبق العزل العزج .



قطع وأجزاء الحسدئد ، .

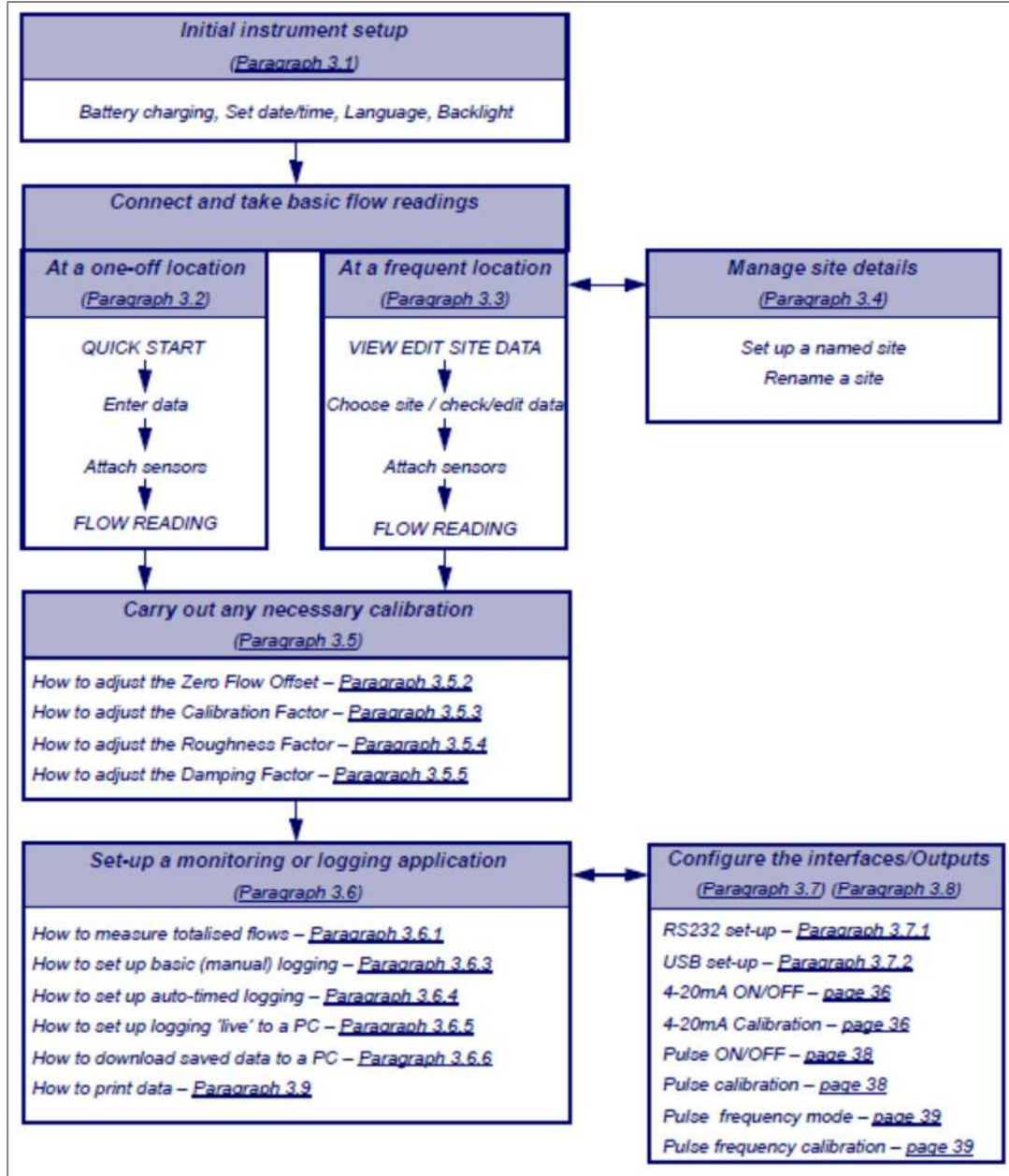


تركيب الحساسات



البدء بأخذ القراءة

ث. تجريد المسافة فاصلة بين الحساسات.



وذكر في السديف الخطوات التركيبية لتشغيل جهاز قياس النضيق المدفول (الأنتراسوك) : (1) ادخل البطارية، والأسديف (قطر الفسورة، سدك جداره، قطر طبق العزل الداخلي). (2) تركيب الحسد، ووذقراء، والنضيق الأول. أف الخطوات، الأخرى كمن استداهم بالتدريج وحسب الدقي .

كرجى الإشرارة إلى آ جمع الخطوات، والسديف فوجوده بشكل تفصلي كWR كمال استخدام جهاز الأنتراسوك المدفول.

Y زرفاق QK مستخدم جهاز PF330 من E مصنعهم وفق 3. بحيث كطبي QK، فافان جتناب متعلقة بجهاز بما في IS عطل المحتمل التي يصيب جهاز وكيفية "لا فها

PORTAFLOW 330

Portable Ultrasonic Flowmeter

User Manual



الفصل الساد : مسجيت الضغط الرقمية



6.1 مقامة

كفك استخدام قيم ضغوط ، الكفك أجزاء مختف ف الشبك ؛ لفهم الصورة الصكف ل الكفك توركع الكفك الشبك . بك ؛ يشير الالكفك المتوقع لكاف الضغط الكفك مقطع ع المبع إلى انسداد الفسورة أو كسر الكفك جسم الخط (التسرب) أو وجود تفرع ، ع الكفك غير معروف فوقها الكفك حدود الالكفك التي تم تركاب فسجس ، والضغط الرقمة الكفك . عا ع كوشد قياس ضغوطت المبع ضرور ك ل ف ا شكوك الفشرك الفتكف بضعف ضغط الكفك الشبك .

ولتحقق الأهداف المذكورة سبف ؛ قم فسروع تحيكة ادارة فسك ، الكفك بتوركاد مسجس ، ضغط رقمة (keller (Leo 5)). تحتوي هذه المسجس ، على حساسات ضغط الكفك تستطيع فكاس ضغط الكفك الشبك وتخزين الكفك الكفك كرت الذاكرة الكفك . وقد استعد فسك ، والضغط الرقمة الكفك على نطاق واسع لكاس كام ضغوطات الكفك أجزاء مختف ف شبك الكفك جنين ، وبالتالي فسك موظفي الكفك على دركف بكاف عمل وتشكال هذه المسجلات .



وتمتاز بة الجسم الكارجي لمسجس ، والضغط الرقمة بالقوة والصلابة؛ كما ك برمف فسجس ، والضغط الرقمة ع طرقات وصلها بأجهزة الكمبيوتر لبدء تسجل قيم الضغط على الفور أو بعد سة . وبالمثل ، بك بر فكتف لإيقاف التسجل عند وقت

 <div style="border: 1px solid black; padding: 5px; margin-left: 200px;"> <p>لا تفرغ أو تضغط الجهاز.</p> </div>	
<p>لا تفرغ أو تضغط الجهاز</p>	<p>يجب استخدام الجزء المخصص لتثبيت الجهاز، هو موضح اعلاه) وتثبيت لف الجهاز في الفتحة التي سودي هذا الشدء الى تلف الاسلاك الداخلي وتعد الجهاز</p>

أعلى تركيب مسجل، ضغط رقمي على وصلا، الكشوف والكشف.





