Product Description

Prev leak is a battery-operated **smart polymer composite manhole cover/lid** fitted with an ultra-sonic proximity sensor, micro controller and Sigfox network module that communicates to our progressive web App. The smart manhole cover is placed or replaces standard concrete or steel manholes covering sewage manholes to detect and report blockages of sewage on our progressive web App before there can be an overflow which brings health risks, pollution, and contamination of water sources affecting B2b and Municipalities.

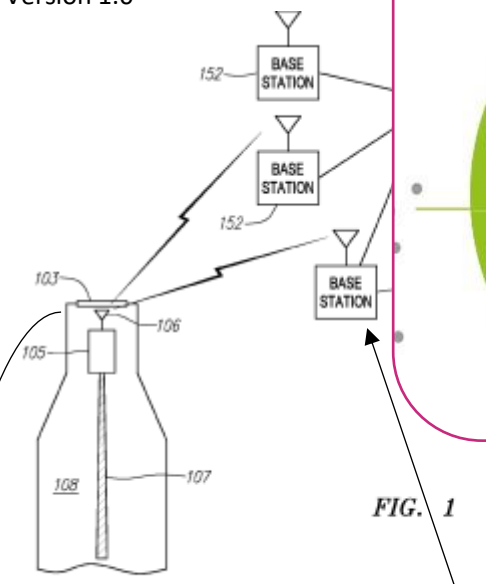
Technology readiness Level = TRL 8 Small manufacturing

1. Prev leak Hardware

Features

- **Proximity sensor**
  - IP67 rated
  - Detection range: 30cm wide -5m length
  - Resolution 1mm
  - Operating temperature range from -40°C to +65°C
- **Battery**
  - Primary lithium-thionyl chloride (Li-SOCl2)
  - Open circuit voltage (at + 20°C): 3.67V
  - Nominal voltage (at 0.7 mA + 20°C): 3.6V
  - Operating temperature range: -60-85°C
  - 5-10 year lifetime
- **Sigfox network**
  - RC1: Tx: 868.130 MHz, Rx: 869.525 MHz
  - Tx output power: 13-14dBm
  - Frequency Error Tolerance(+25℃): -2.5 – 2.5 dBm
  - Rx Sensitivity(@600bps, GFSK): -127 dBm
- **Enclosure**
  - IP68 rated
  - Polycarbonate
  - Watertight lid.
- Configurable periodic readings.
- Alerts for low battery conditions.

Version 1.0



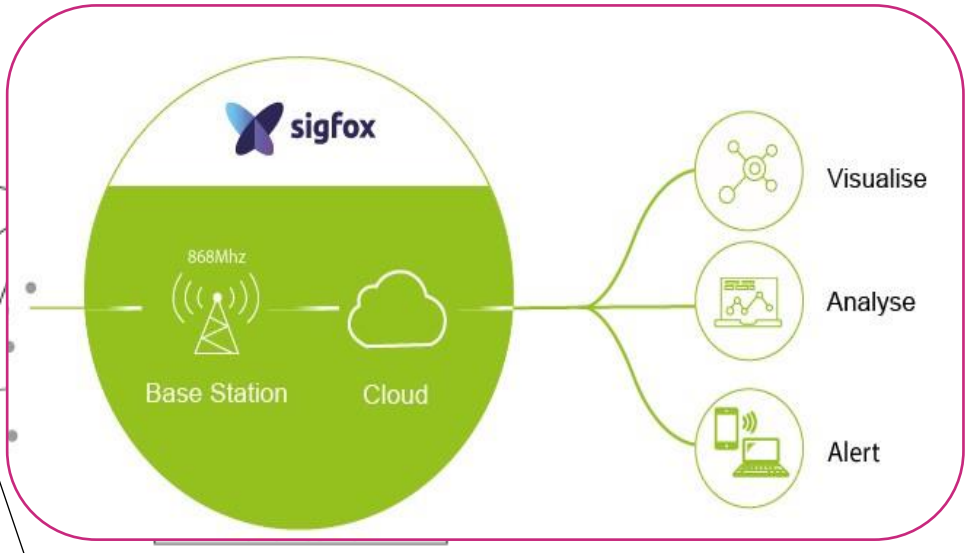
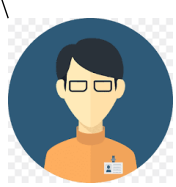
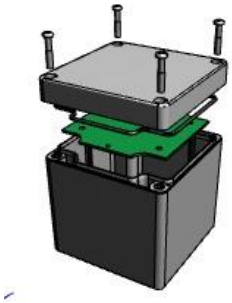


FIG. 1

Local reporting clean water leaks
By just taking a picture which saves geo location using our progressive web app.

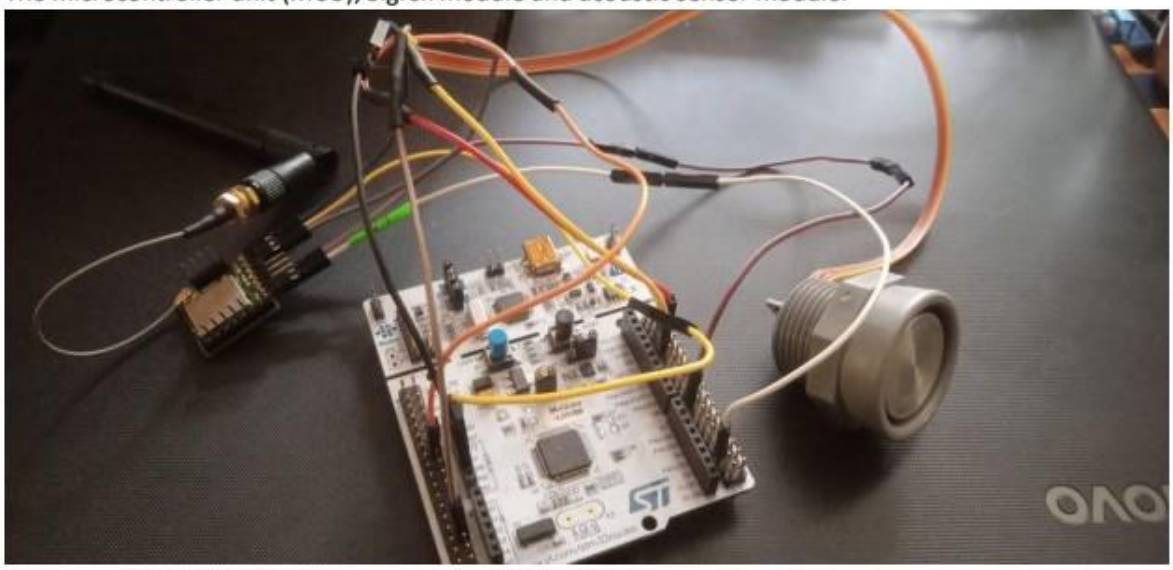




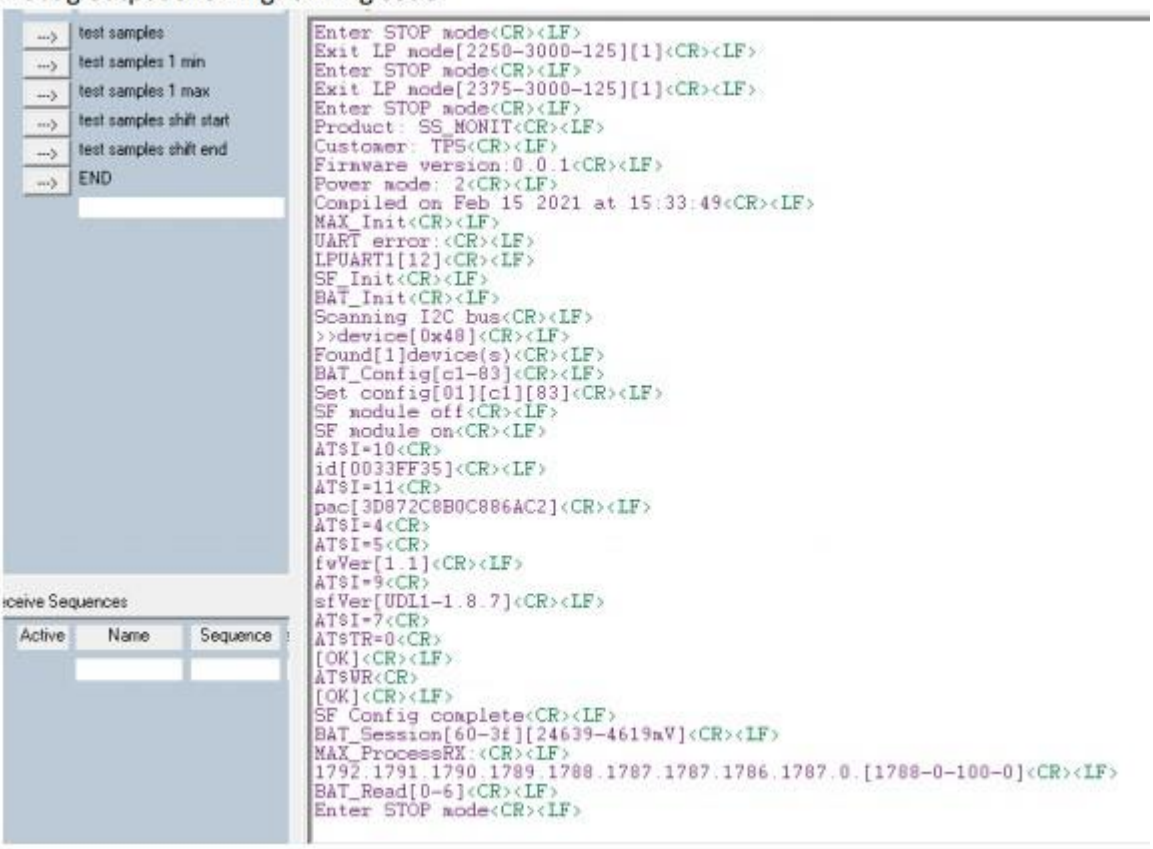
Version 1.0

Main software development components.

The microcontroller unit (MCU), Sigfox module and acoustic sensor module.



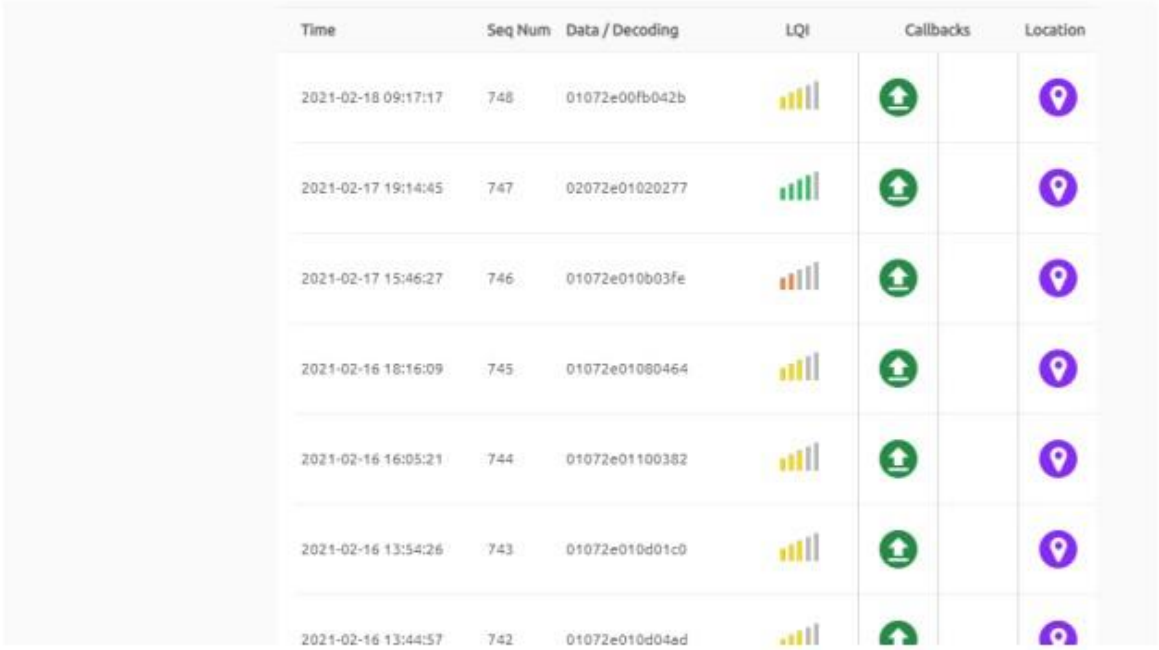
Debug output showing running code



Version 1.0

Messages at Sigfox backend showing packed data structure.

Device 33FF35 - Messages



Time	Seq Num	Data / Decoding	LQI	Callbacks	Location
2021-02-18 09:17:17	748	01072e00fb042b			
2021-02-17 19:14:45	747	02072e01020277			
2021-02-17 15:46:27	746	01072e010b03fe			
2021-02-16 18:16:09	745	01072e01080464			
2021-02-16 16:05:21	744	01072e01100382			
2021-02-16 13:54:26	743	01072e010d01c0			
2021-02-16 13:44:57	742	01072e010d04ad			

POST message that is sent from the Sigfox backend to backend server showing location information derived by Atlas.

POST message that is sent from the Sigfox backend to backend server showing location information derived by Atlas.

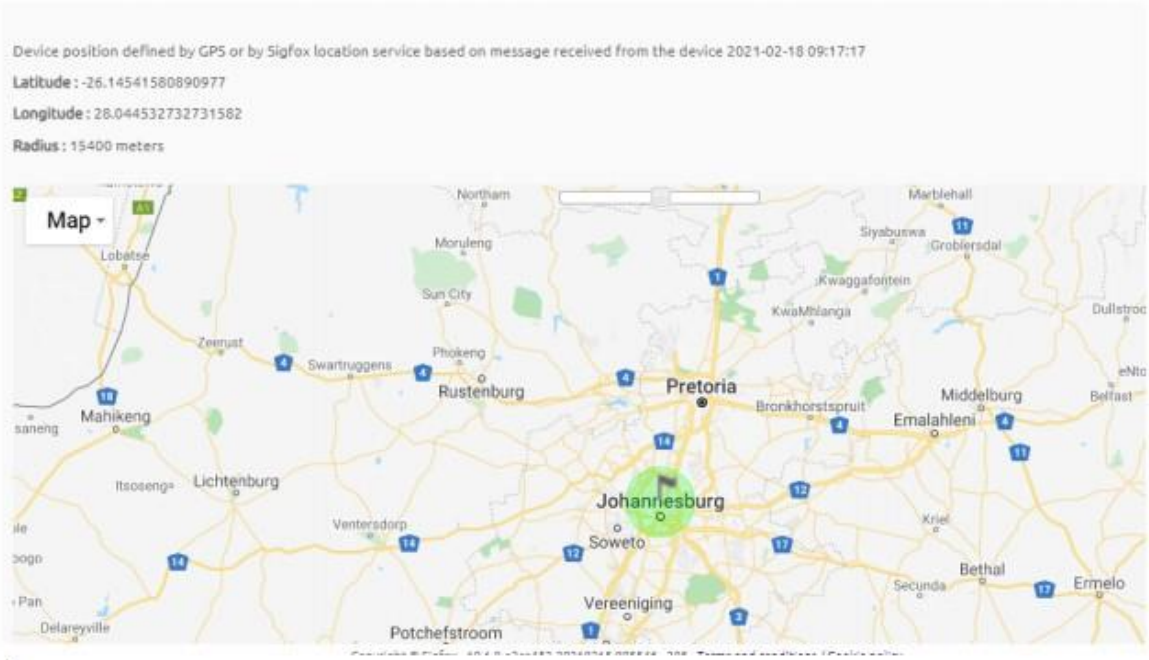
```
POST https://sigfox.api.teksolve.co.za/v1.0/networks/geo HTTP/1.1
authorization: ***************
content-length: 366
accept-language: fr
host: sigfox.api.teksolve.co.za
content-type: application/json
accept-encoding: gzip,deflate
accept-charset: UTF-8;q=0.9,*;q=0.7
user-agent: SIGFOX

{
"device": "33FF35",
"time": "1613632637",
"data": "01072e00fb042b",
"seqNumber": "748",
"lqi": "Average",
"linkQuality": "1",
"fixedLat": "0.0",
"fixedLng": "0.0",
"operatorName": "SIGFOX_South_Africa_Sqwidnet",
"countryCode": "710",
"computedLocation": {"lat":-
26.14541580890977,"lng":28.044532732731582,"radius":15400,"source":2,"status"
:1}
```

Version 1.0

Location information visualised using the Sigfox backend.

Device 33FF35 - Location

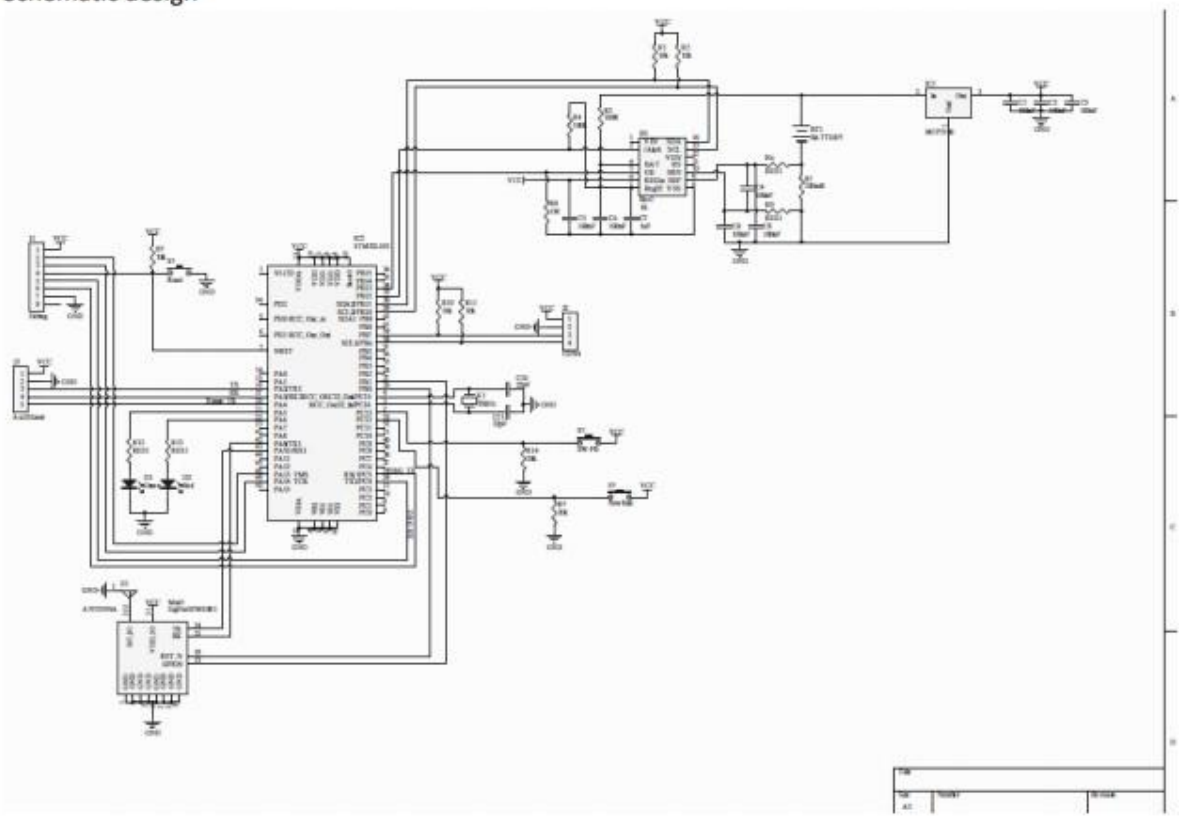


}

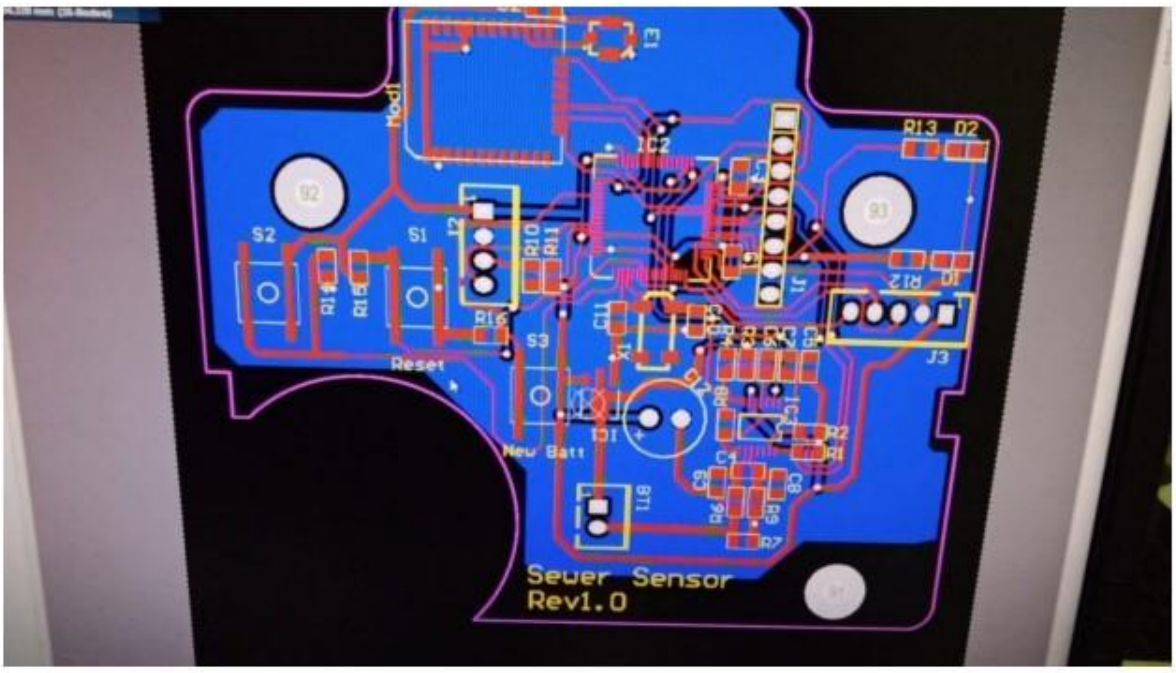
Processing the output to display level, battery and temperature readings

Version 1.0

Schematic design



PCB design



Version 1.0

2. Progressive web App

Admin-CMS

- Collective Cost of building the Multi-user CMS. This is capable of managing, viewing and downloading all data about the system from users to job cards. This also accounts for the cost of the api integration.
- Admin login details and link.

https://tpsadmin.web.app/

- this is the overall cms (Admin)

Login details: Test-Accounts:

  - This is the overall admin CMS
  - testaccount.s@motech.dev –
  - Password: 0000000000 (this account if for a general user from a municipality)

Content CMS

- CMS portal for management by the plumber staff and water teams. Its capable of carrying out the field teams tasks.
- This is the municipality CMS

https://tpscms.web.app/

- This is the municipality cms
- testaccount.ss@motech.dev –
- Password: 0000000000 (this account if for a super user from a municipality, that can edit municipality settings and add users.

UI/UX interface

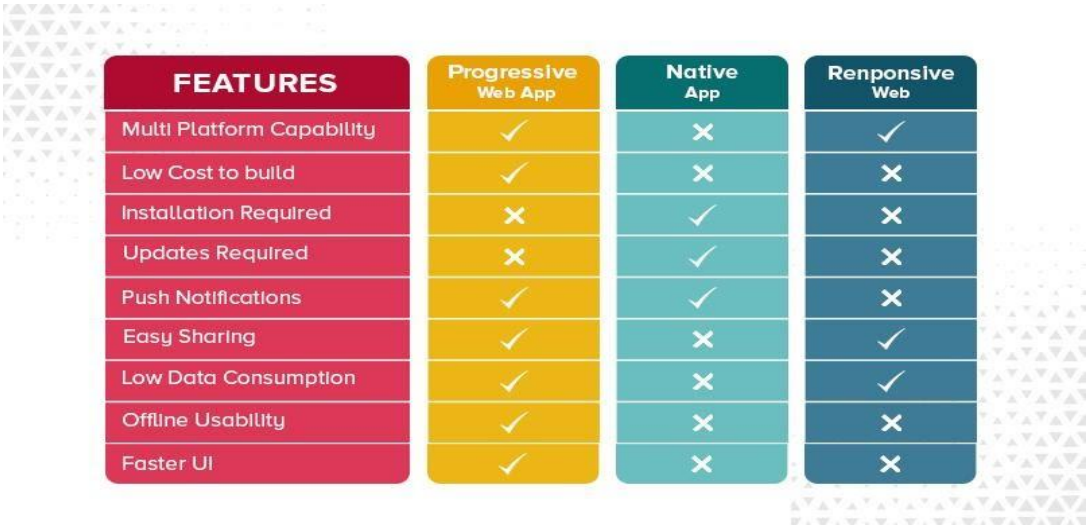
Plumber Android App This is the android side of plumber application. ✓ Uses push message notifications, ✓ Plumbers receive maintenance schedules updates, ✓ Job card reports, ✓ Route navigation, ✓ Help request, ✓ Submit duties by just taking a picture before and after it has been fixed. Plumber Application: https://xd.adobe.com/view/79721ed3-ed73-432e-b3a2-43a2fcdf1aab-2c21?x_product=cc-slack/1.5.0
General user Android App

Android application for the customer side.

- ✓ Allows customers to take pictures to report sewage and clean water leaks which saves geo location for accurate addresses after which
- ✓ Customers receives push message notification updates and statuses.

General user: https://xd.adobe.com/view/9cb493b7-8aeb-49ce-9c1f-9922d487e9e0-c9e7?x_product=cc-slack/1.5.0

Advantages of a progressive web app



FEATURES	Progressive Web App	Native App	Renponsive Web
Multi Platform Capability	✓	✗	✓
Low Cost to build	✓	✗	✗
Installation Required	✗	✓	✗
Updates Required	✗	✓	✗
Push Notifications	✓	✓	✗
Easy Sharing	✓	✗	✓
Low Data Consumption	✓	✗	✓
Offline Usability	✓	✗	✗
Faster UI	✓	✗	✗

3. The polymer Manhole cover

- ✓ Polymer composite manhole cover is made of engineering plastics as the main raw material and strengthened with glass fibre.
- ✓ The manhole cover can completely replace cast iron.
- ✓ FRP manhole cover
- ✓ No recovery value
- ✓ No impact noise
- ✓ Corrosion resistance
- ✓ Friction resistance
- ✓ High temperature resistance
- ✓ and can adjust various colors as needed.

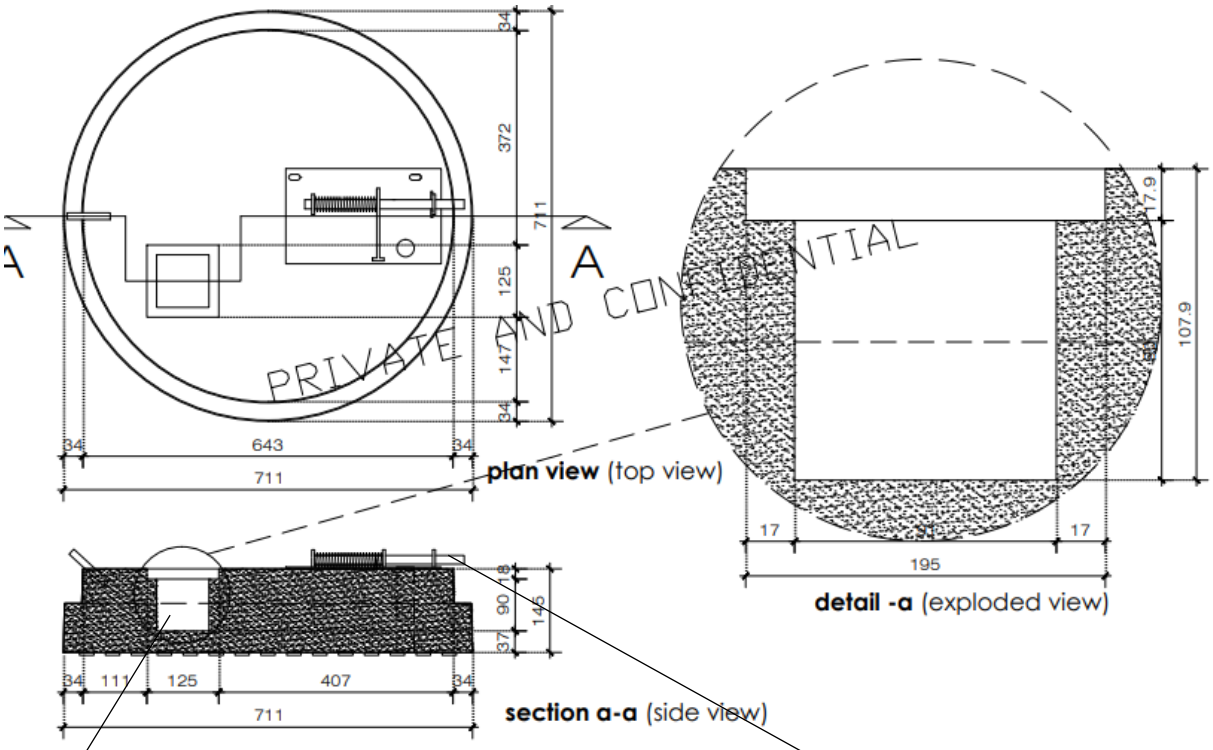
To address Theft

The manhole cover comes with **Locking mechanism** which solves the urban trap problem and improved the taste of the city road.

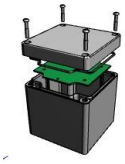
It not only has high strength, beautiful appearance, but also has the advantages of

- ➢ Anti-aging
- ➢ Acid and alkali resistance

- Impact resistance
- Long life, long design, good design,
- Good sealing performance,
- Silent, low price and so on.

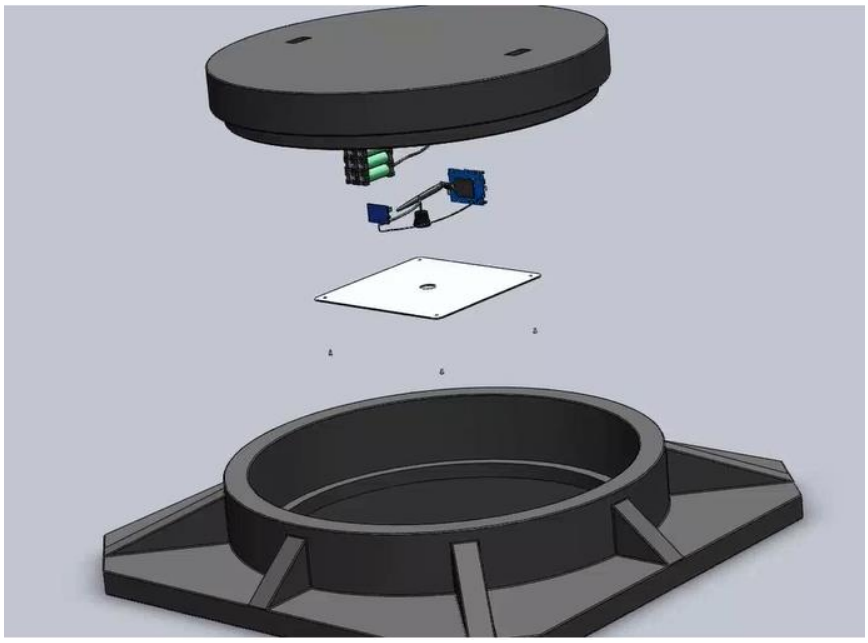


Locking Mechanism



Where we fit the Prev leak technology.

Version 1.0



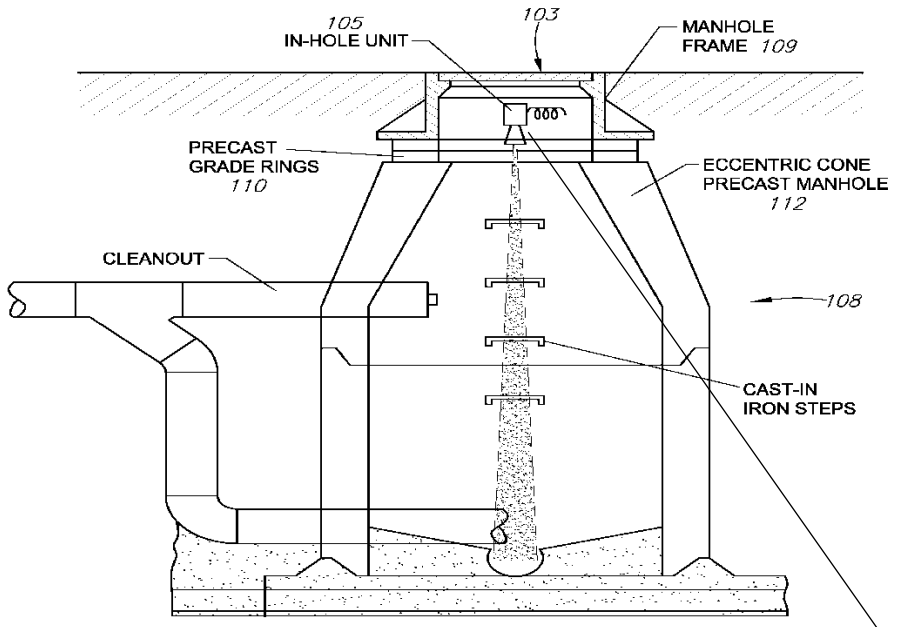


FIG. 2

Prev leak ultra sensor

The Problem statement

Globally,1.7 billion children under 5 die from water born illnesses and unsafe sanitation.

- In South Africa, 55% of our rivers and dams are in chocked in sewage.

This Happens because;

1.Government agencies still use telephonic reporting systems which lead to daily backlogs of up to 2 weeks.

2.Theft of steel manhole covers

3. Lack of maintenance.

- ❖ This impacts on human health, economic productivity and the quality of ambient fresh water resources and ecosystems.
- ❖ One estimate puts this cost at 3,5 billion per year with the problem rising each year by 24.5%.

The Value proposition

- ✓ Early detection of blockage before it can overflow.
- ✓ Simplification of waste management services by automating the response.
- ✓ Generation of data to help identify potential "hot-spots".

The Need

Our solution helps to save human lives and promotes the conservation of ecosystems.

- By Preventing human contact with disease infested sewer and limiting raw sewage pollution.
- By preventing raw sewage from overflowing into residential areas and the environment.
- Our solution positively contributes to these 2 Sustainable Development Goals indicators.
-