



Pipeline Infrastructure Limited

## ROU Maintenance & Management

*Ravikiran Vasant Gawde*

27<sup>th</sup> June 2024





**Ravikiran Vasant Gawde**

**Pipeline Infrastructure  
Limited**

**Years of Experience:** Overall 19 Years of experience in Right of Use management for Natural gas transportation project and in Civil Engineering field .

**Educational Background:**

B.E. Civil – Yr.2003 from Sardar Patel College of engineering , Mumbai

**Brief Job Profile:** Presently working as General Manager - RoU & Pipeline Surveillance , Operations & Maintenance.

**Professional Expertise:**

Project management and execution ( Right of Use management (Oil & gas projects), Structural repair and new construction projects)

Structural assessment and NDT

Technical supports for HRC projects , MoEF clearance , green building certifications

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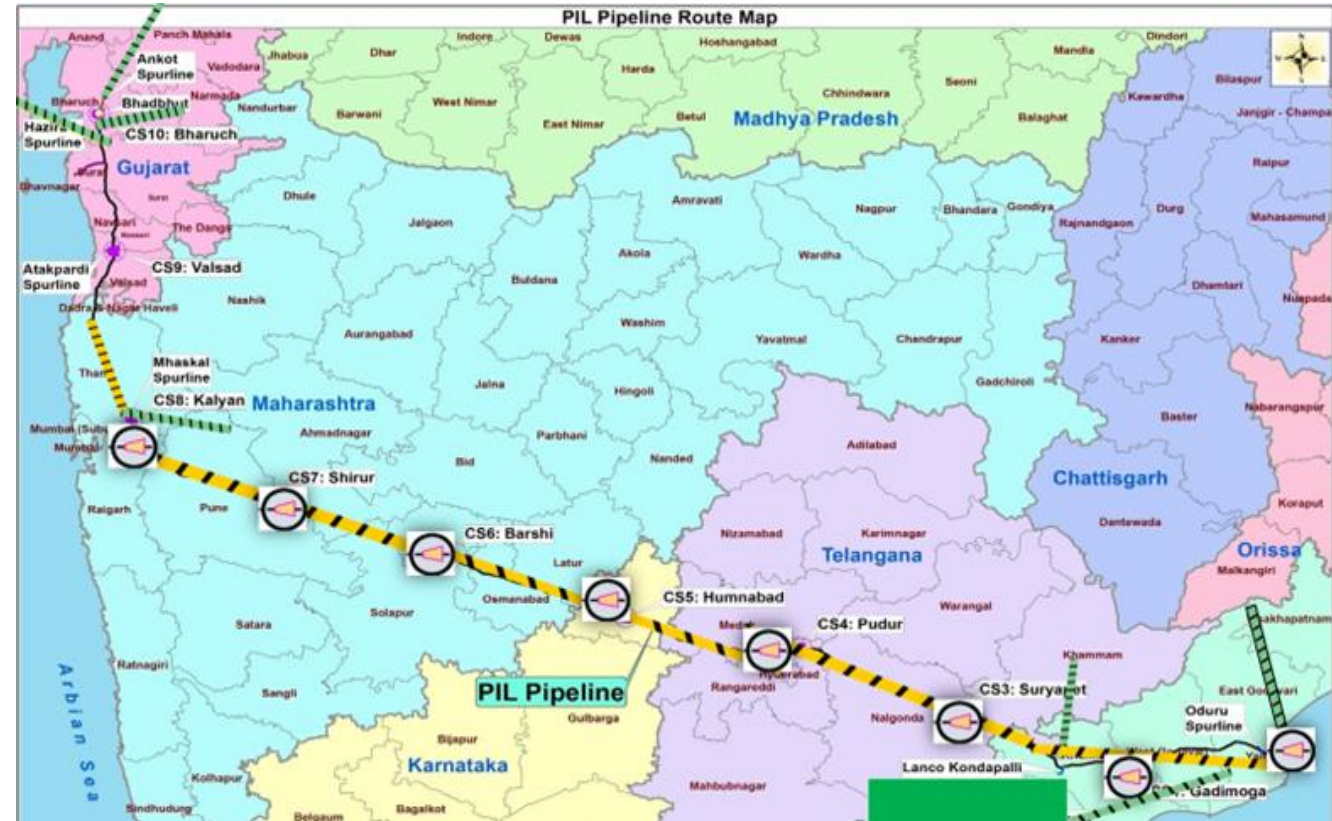
**09**

CONCLUSION

# INTRODUCTION

## Right of Use (RoU)

- PIL pipeline is laid underground originating from Gadimoga in Kakinada (Andhra Pradesh) to Bhadbhut in Bharuch (Gujarat)
- Traverses through five states Andhra Pradesh, Telangana, Karnataka, Maharashtra and Gujarat with 1375 km length for mainline and 105 km of associated spur lines .
- Pipeline is laid by acquiring a 30m RoU corridor for Mainline through gazette notification as per **PMP Act 1962** with some exceptions with restricted RoU of 15 m in forest area





# PROHIBITED ACTIVITIES WITHIN ROU

- Buildings, structures or foundations, overhanging roofs and balconies, garden sheds, Container yards.
- Swimming pools / Underground tanks
- Deep rooted trees
- Open wells and bore wells
- Pile-driving, Blasting, excavtion
- Electric Poles / pylons
- Construction of Brick Klin
- Dumping materials such as waste, scrap timber and slush.
- Storage of flammable materials
- Illegal tapping



# ACTIVITIES ALLOWED IN ROU

- Foreign Pipeline & other utility Crossings subject to approval
- Elevated Fishponds
- Hybrid varieties of trees beyond 5m distance from pipeline whose roots are not deeper
- Garden, lawn, paved approach roads etc.
- Fencing , compound wall crossing as per standard PIL design
- However, cultivation of small shrubs & crops is allowed within RoU



# INSTALLATION OF MARKERS

Markers are installed in the RoU to indicate the presence of pipeline and for contacting the pipeline operator before carrying out any excavation activities within RoU or during emergency



**Boundary Marker**



**Kilometer Marker**



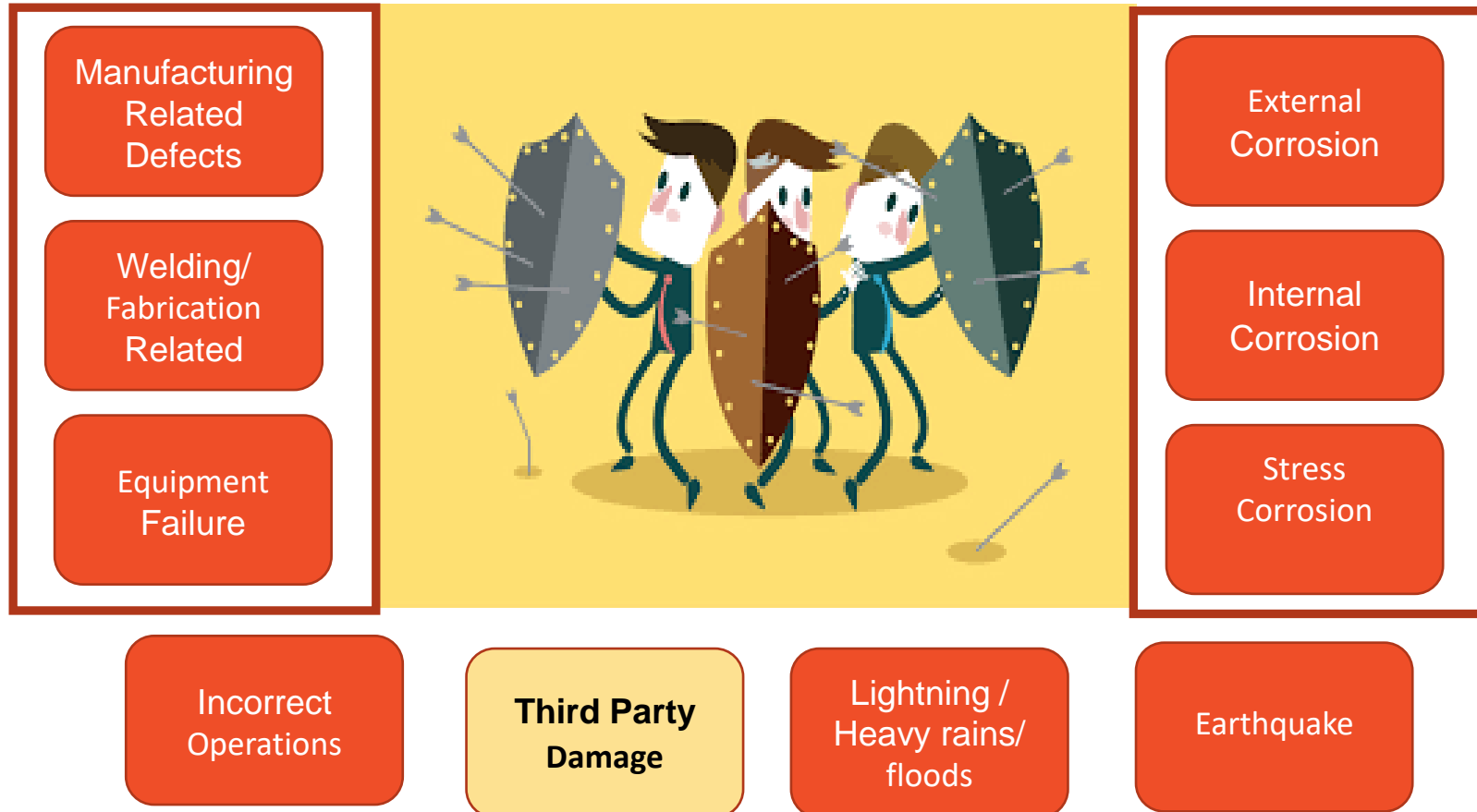
**Warning Marker**



**Navigation Marker**

\* Missing Markers identified during patrolling are recorded & replaced in a time bound manner

# THREATS TO PIPELINE





# THIRD PARTY DAMAGE



Casualties

Keep depth of cover  $\geq 1$  m



Repair and maintenance costs



Operation loss

Ensure the frequency and type of patrolling in line with pipeline sections



Company reputation loss

Levy penalties on prohibited acts under Section 9 (PMP Act, 1962) and penal action under Section 15



Ensure Pipeline Marker Availability



Use of the Pipeline Intrusion Detection System (PIDS)



# RoU MONITORING & SURVEILLANCE

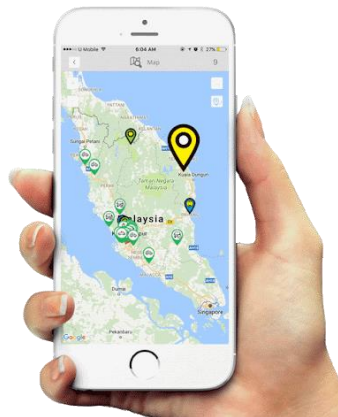
Type of Patrolling /Survey	Frequency
Line walk patrolling	Twice in a year ( Pre-monsoon & Post-monsoon)
HCA monitoring	Monthly
Vulnerable location monitoring	Monthly
Aerial Patrolling using Drone survey	Monthly except during Monsoon
Inspection of Crossings ( Road, Rail & Rivers )	Quarterly

# TECHNOLOGY ENABLED ROU MONITORING & SURVEILLANCE

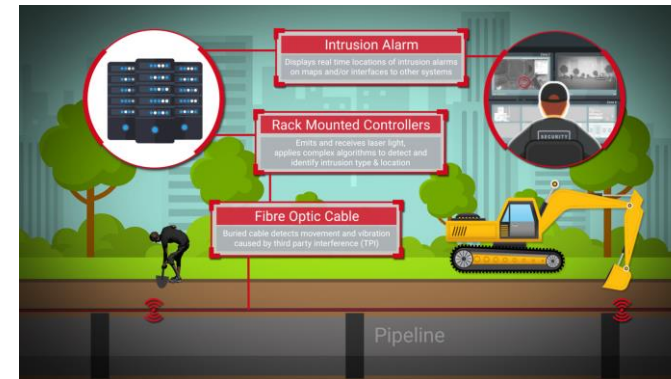


➤ Drone Surveillance

➤ Pipeline Intrusion detection System



➤ Mobile based guard tracking device for Surveillance



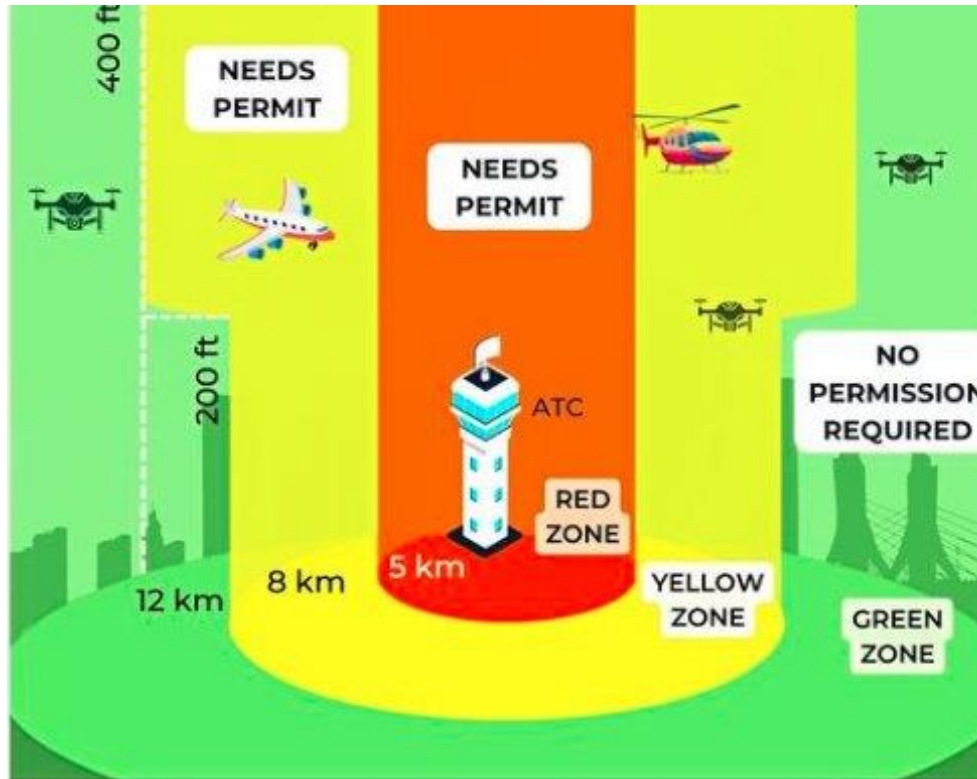
# DRONE SURVEILLANCE

Rapid technological advancement, innovation and integration with other emerging technologies such as 5G, AI/ML (Machine learning), IoT, and drones have the potential to have a broad impact across all industries including Oil and Gas to improve operational efficiency, safety and cost effectiveness.

1. High resolution photographs are recorded
2. Output in digital format
3. RoU Demarcation can be marked digitally
4. Low potential risk and low chances of fatalities
5. Low GHG emissions







## System Zones :

The airspace above the defined dimensions of 120 defined in the airspace of defined dimensions above the land areas or territorial waters of India, up to a vertical distance of 400 feet (120 meters) above the surface of the ground, has been divided into three zones as shown in the diagram. The airspace map for unmanned aircraft system operations and the operational rules for the operation of aircraft up to a vertical distance of 60 meters (200 feet) above the area located between a lateral distance of 8 kilometers and 12 kilometers from the perimeter of an operational airport. Central Government only by the Central Government.

No permission required for drone of Nano, Micro and small categories



# NON-TECHNICAL CHALLENGES

- **Regulations are evolving on drone usage**
- **Local flight rules issues as transportation**
- **Required continuous development of manpower for long stretch of pipeline**
- **Badly affected by ground conditions resulting in safety issues**
- **Missed or delayed operations of teams**
- **CA Certified Training Institute comprising the privacy of the people**
- **long distances.**



# TECHNICAL CHALLENGES

- **Wind Resistance and Safety**
  - **Weather and Accessibility**
- Poor Weather Conditions may result in collisions and can not tolerate high wind, above 12 m/sec put human lives and property in danger.





# TECHNICAL CHALLENGES

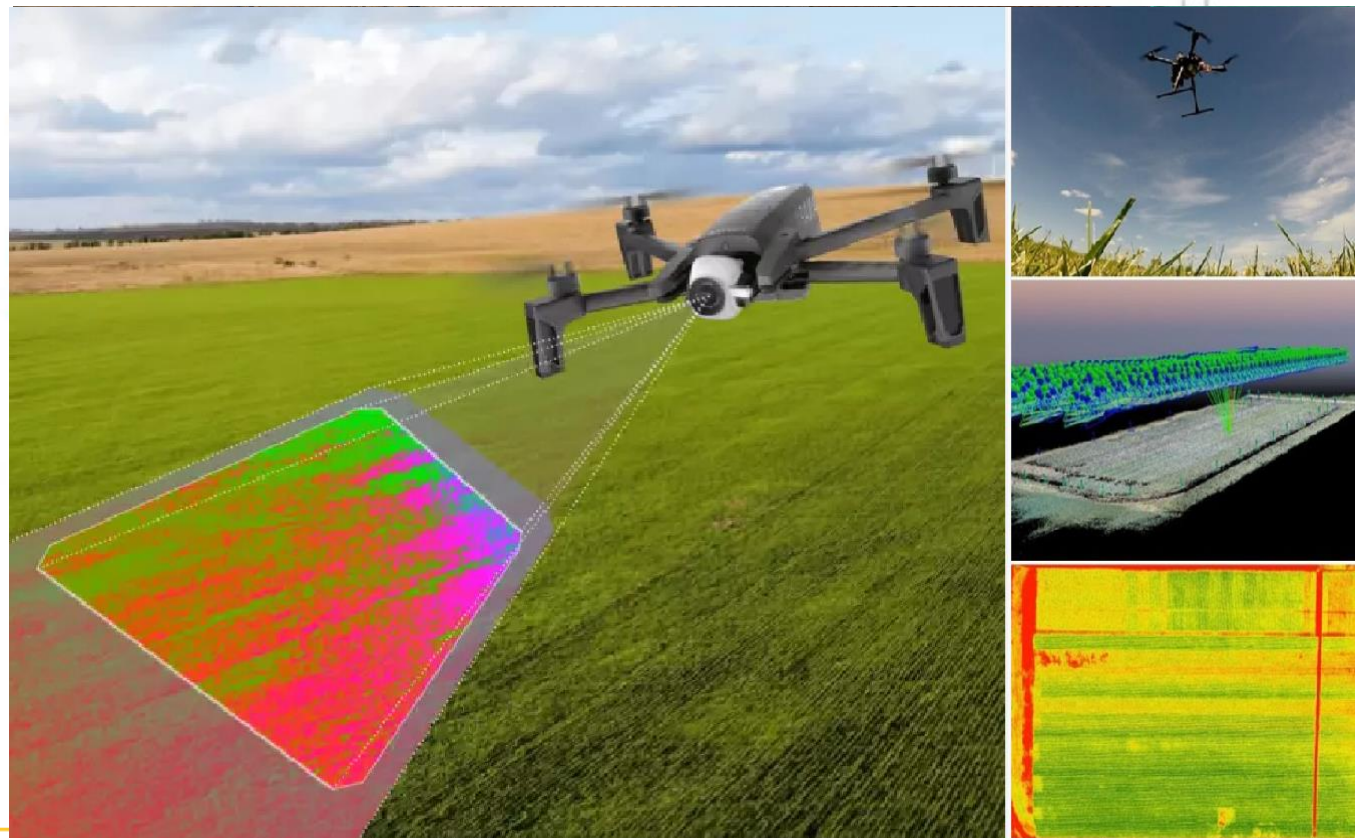
- **Battery overheating issues** in high ambient temperature during summer is common in UAVs. This may cause fast discharge and swelling leading to the disintegration of the battery unit from the UAV. Safety feature for low battery in some of the drones will trigger landing.
- **Difficulty to find or lost** a presence of GPS trackers on affordable drones and selective signals affect its endurance. Operator has to carry multiple batteries.



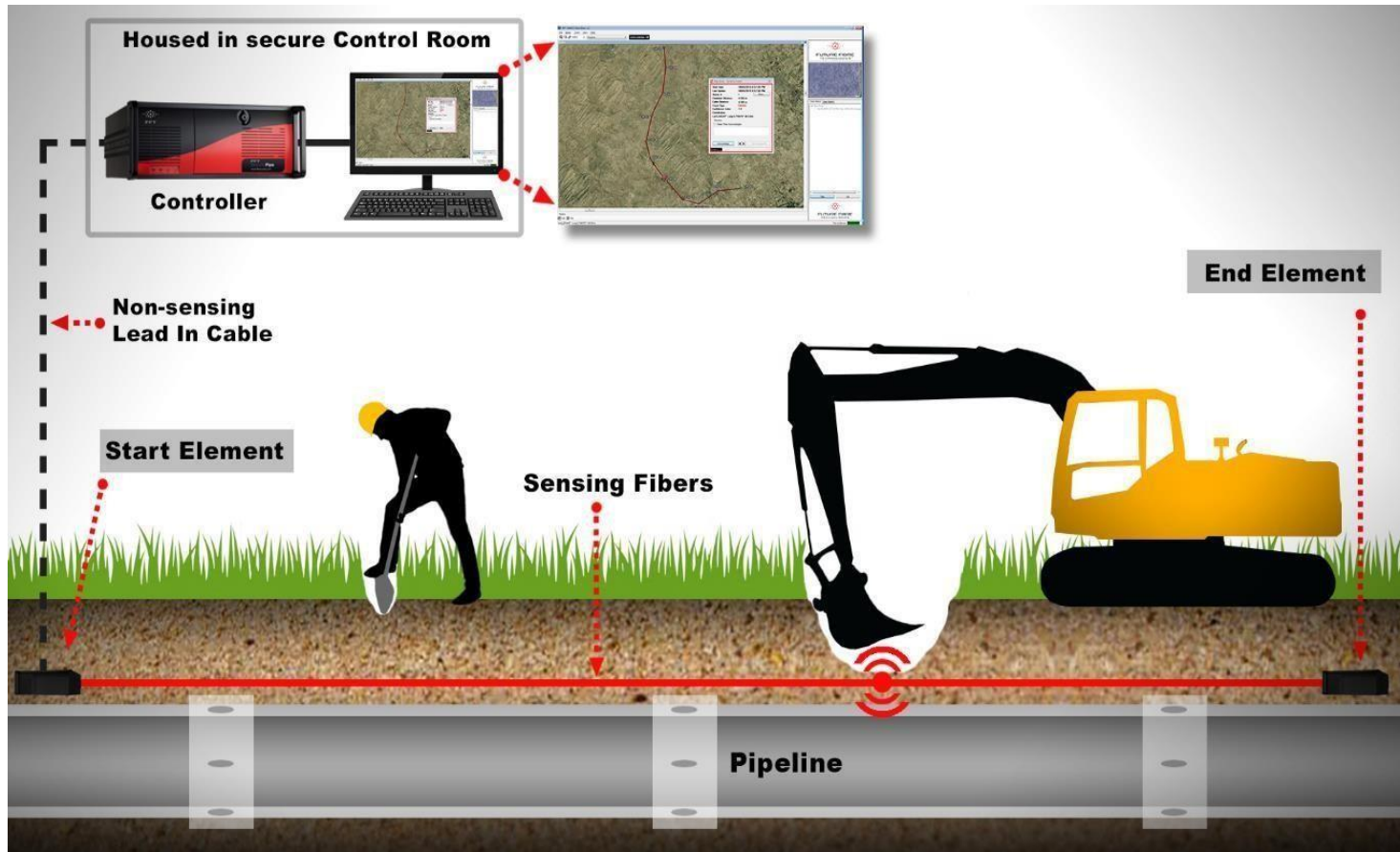


# TECHNICAL CHALLENGES

- Data collection is not a real-time process due to line-of-sight. The high-resolution camera can be used to capture images from a 480cm altitude.
- Multiple reports in the form of analysis, data report prepared during survey.



# PIPELINE INTRUSION DETECTION SYSTEM



## APPLICATION

- Deep Buried- For pipeline applications OFC cable is buried along the pipelines typically at a depth of 1m – 1.5 meters from ground level.
- The medium to transmit the vibrations is ground/soil to detect activities like Manual Digging, Mechanical Digging and vehicle movement.
- Signals (vibrations caused by activities near OFC) travels better in good compact soil & similarly travels poorly in wet/loose soil, affecting the range of detection.



# PIPELINE INTRUSION DETECTION SYSTEM

Intrusion alarms are displayed in three different places.....



The screenshot displays the MPOC - Mumbai | PIL software interface. The main window shows an aerial map with a pipeline highlighted in yellow. A red line indicates an intrusion event. Three yellow arrows point to specific features:

- 1. In the popup alarm message box**: A popup window titled "Ch999.35 to Ch998.347\_Sensor 2" is visible on the right side of the map. It contains the following information:

Start Time:	04-07-2022 10:11:43
Last Update:	04-07-2022 10:11:49
Alarm ID:	3
Chainage:	998.524
Cable Distance:	17342 m
Event Type:	Vehicle
Coordinates:	Lat 18.804175° Long 73.715986° Alt 0.0m
Remarks:	<input type="checkbox"/> Reset When Acknowledged
- 2. Active alarm windows**: A panel at the bottom right of the interface shows a list of active alarm windows. The list includes:

Zone Name	Laser Alarm
Ch999.35 to Ch998.347_Sensor 2	04-07-2022 10:11:43 - Pos: 998524, (91) - D1
	04-07-2022 10:11:50 - Pos: 998496, (92) - D1
	04-07-2022 10:12:21 - Pos: 998494, (91) - D1
- 3. As a signature on GUI line to show where it occurred**: A red line on the map indicates the location of the intrusion event. A yellow arrow points to this line, which is labeled "Ch999.35 to Ch998.347".

# TPI (THIRD PARTY INTERFERENCE) ACTIVITIES DETECTION

Challenges- The Challenge – Is Detected Activity a Threat

Threat

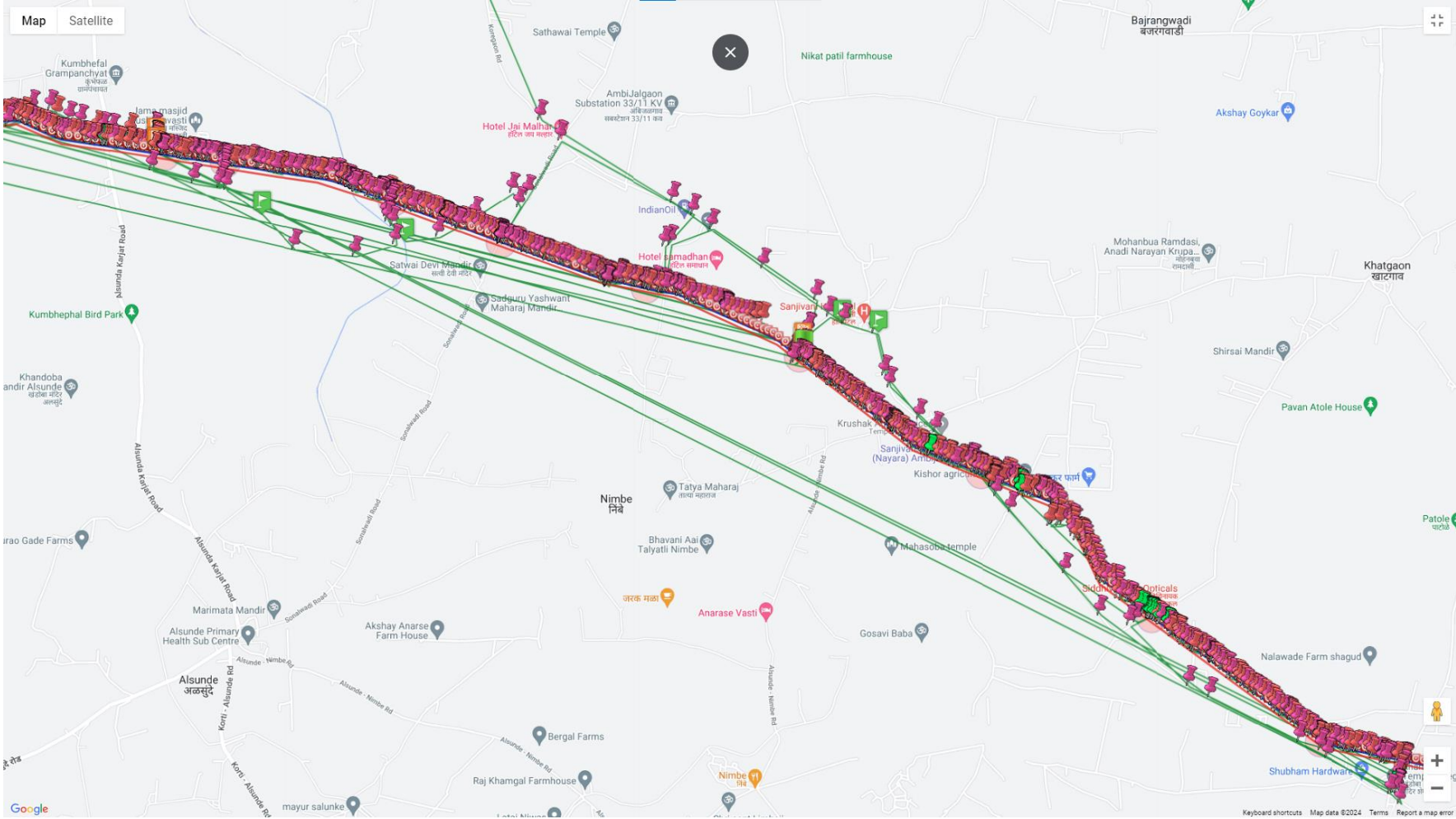


No Threat





# GUARD TRACKING SYSTEM

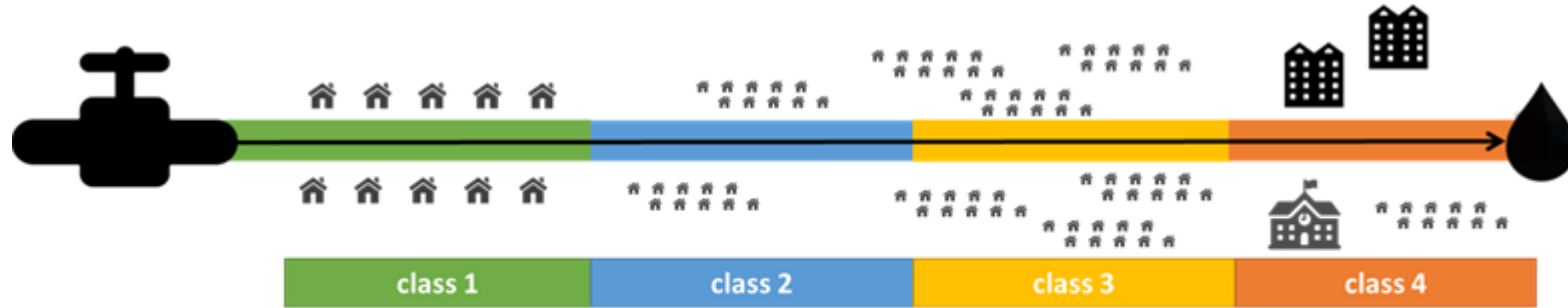


## Mobile based Guard Tracking System features and Benefits

- This system offers real-time monitoring data for patrolling activities, including TLP, HCA, and monitoring vulnerable locations.
- It maintains comprehensive historical records of all patrols and generates detailed patrolling reports instantly.
- The system visually displays device locations on a map, providing precise location details.
- AVT functionality enables capturing photographs using the mobile device at the location, with records integrated into both map details and system-generated reports.
- Key advantages include the ability to send SOS messages via email and SMS in emergencies, including live location details.
- This system ensures comprehensive tracking of patrolling activities and immediate response to emergency situations using the SOS functionality.



# CLASS LOCATION AND MITIGATION MEASURES



**Class 1 Location** Any 1-mile section of the pipeline with  $\leq 10$  buildings

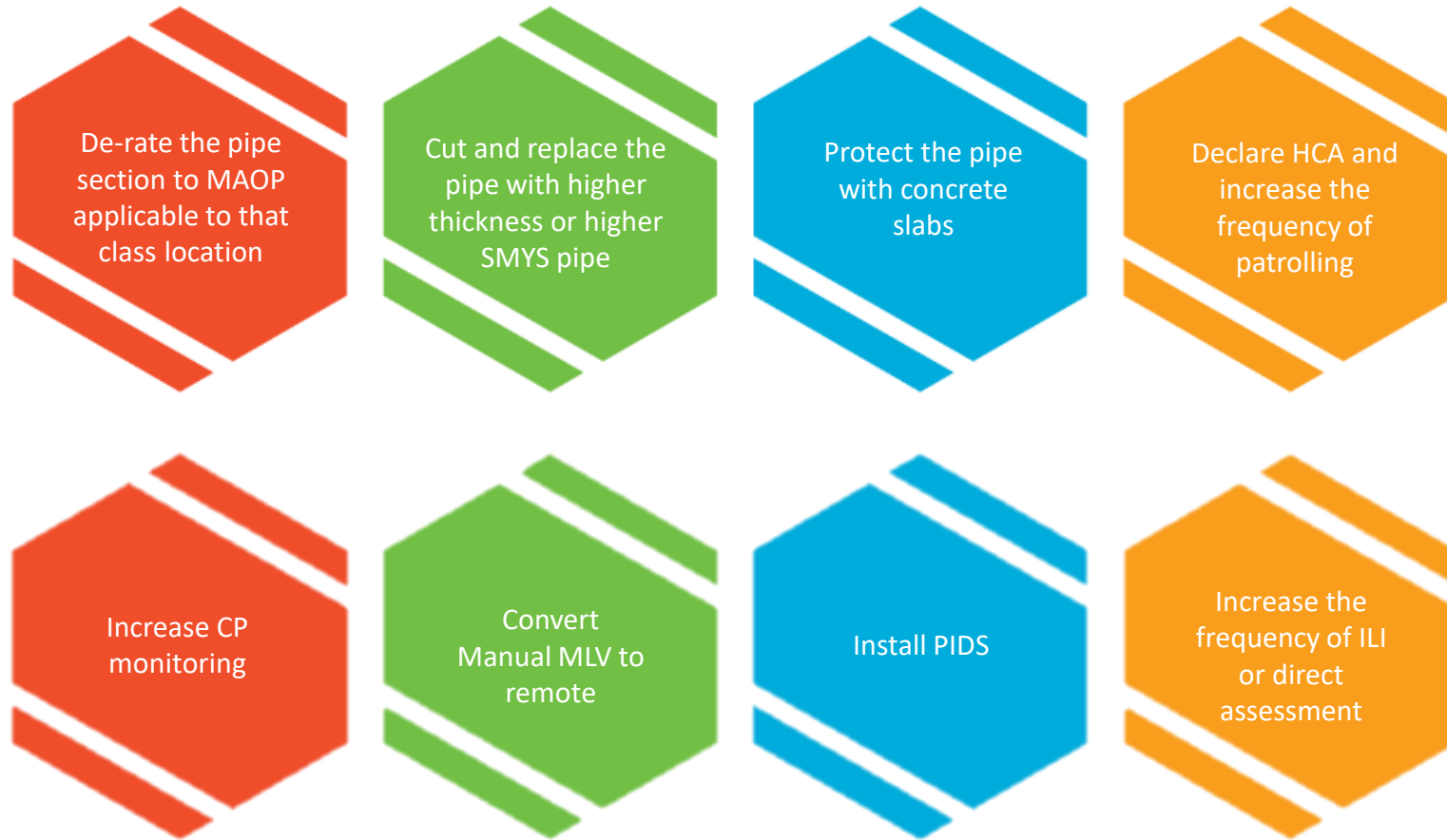
**Class 2 Location** Any 1-mile section of the pipeline with  $> 10$  and  $< 46$  buildings

**Class 3 Location** Any 1-mile section of the pipeline with  $\geq 46$  buildings

**Class 4 Location** Any 1-mile section of the pipeline with multi-storey buildings, heavy or dense traffic, and numerous other utilities underground.

**Population Density Index Survey** is conducted to identify change in the class location of the pipeline section.

# CLASS LOCATION CHANGE & MITIGATION





# CLASS LOCATION CHANGE & MITIGATION

## Mitigation measures for location class changes



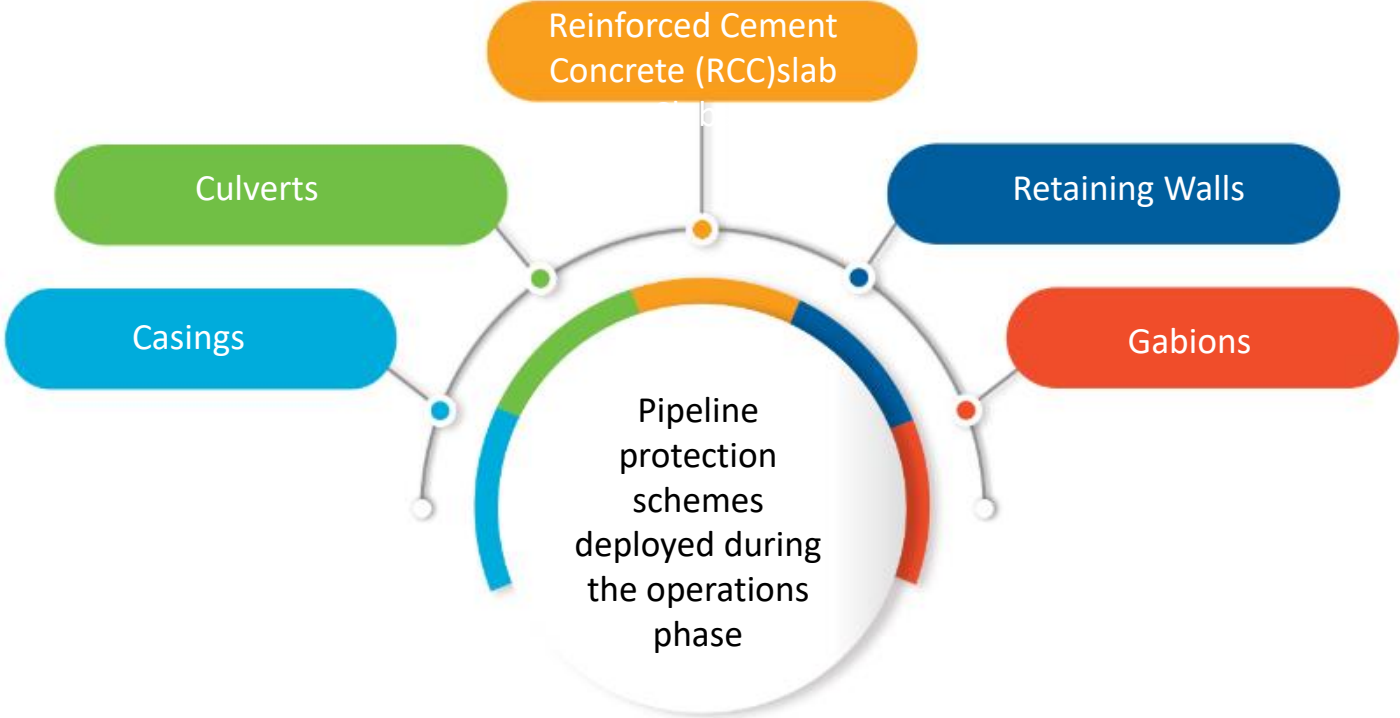
**Concrete Slabs – Future Development Areas**



**Concrete Slabs – In Developed areas**



# PIPELINE PROTECTION SCHEMES





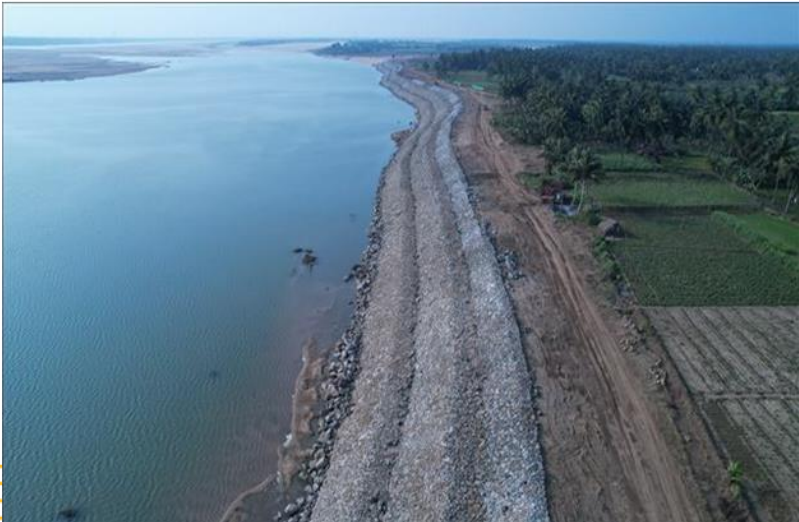
# PIPELINE PROTECTION SCHEMES





# PIPELINE PROTECTION SCHEMES

Riverbank Protection



## ROU WASHOUT

A washout is the sudden erosion of soft soil or other support surfaces by a gush of water, usually occurring during a heavy downpour of rain

**Washouts are preventable if suitable actions are taken and proper methodologies are adopted during the**

✓ **Design Phase-**

Topographic Survey, High Flood levels, Soil Survey( Geotechnical),  
Identification of washout Prone area.

✓ **Construction Phase-**

Implementation as per design specification, Quality Plan, Compaction of soil during backfilling, Slope/trench breaker

✓ **Maintenance phase-**

Surveillance, control water movement across RoU, Riverbank monitoring ,  
Soil stabilization measures as per requirement



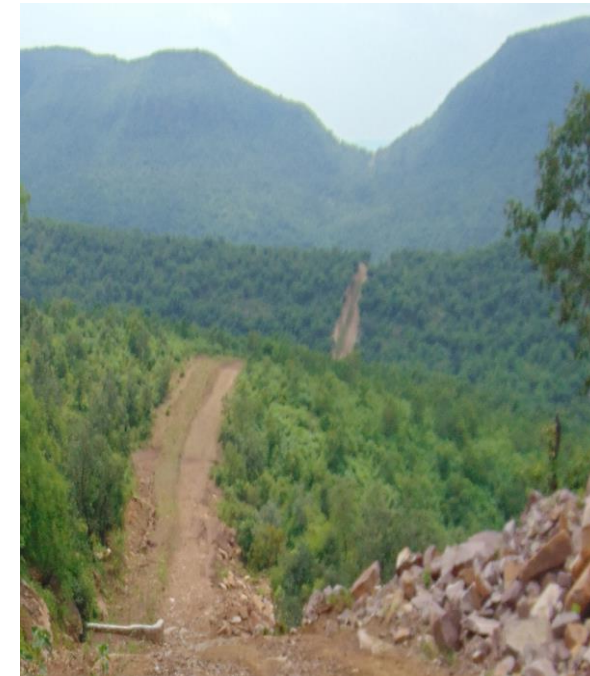
# PIPELINE PROTECTION SCHEMES



Slope Breakers



Reno mattress & Coirmat



Vegetation with the Slope Breakers

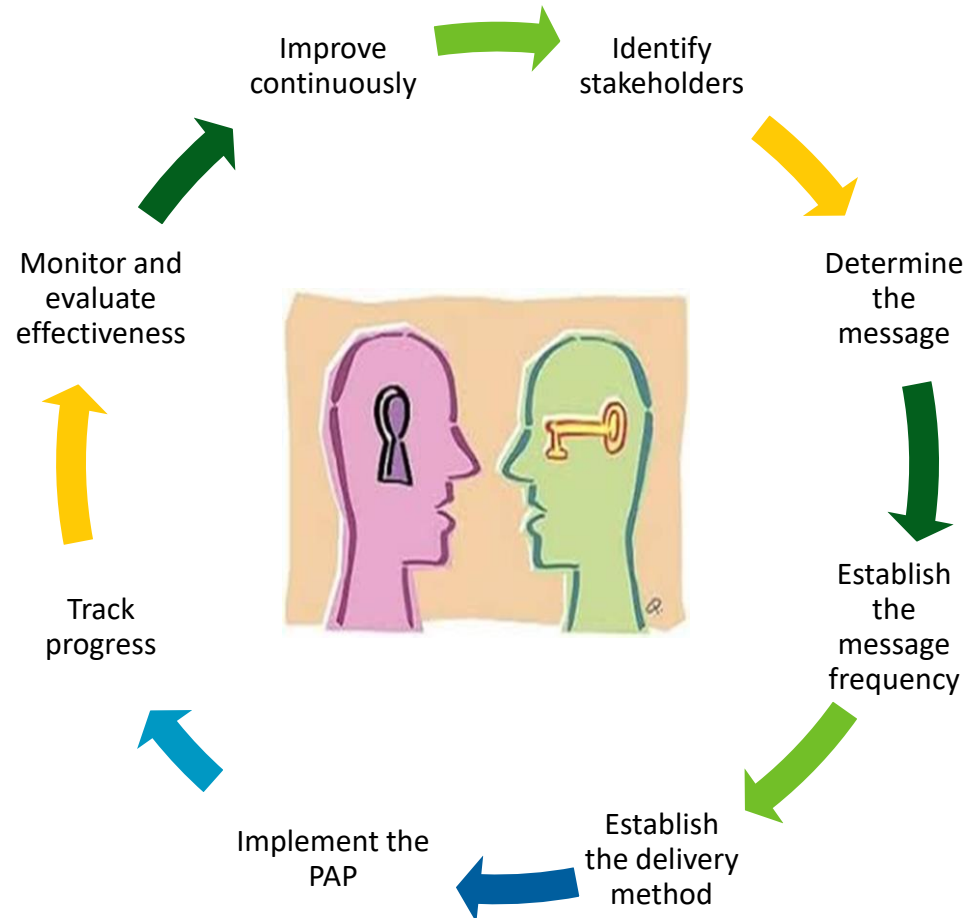


# PUBLIC AWARENESS PROGRAM



- Product & Its Hazards
- Safeguard Public /Pipeline Assets
- Population & Sensitive Areas
- Different Local Activity Types
- Various Stakeholders
- Enhanced Emergency Response
- Build Trust & Ease of RoU Access





## How to Ensure PAP Effectiveness?

- Implementation & completion of PAP as per the schedule
- Ensure availability of targeted audience.
- Maintain database of landowners within RoU & ensure PAP given to all landowners
- Ensure all the desired information is passed & It is understood by the attendees

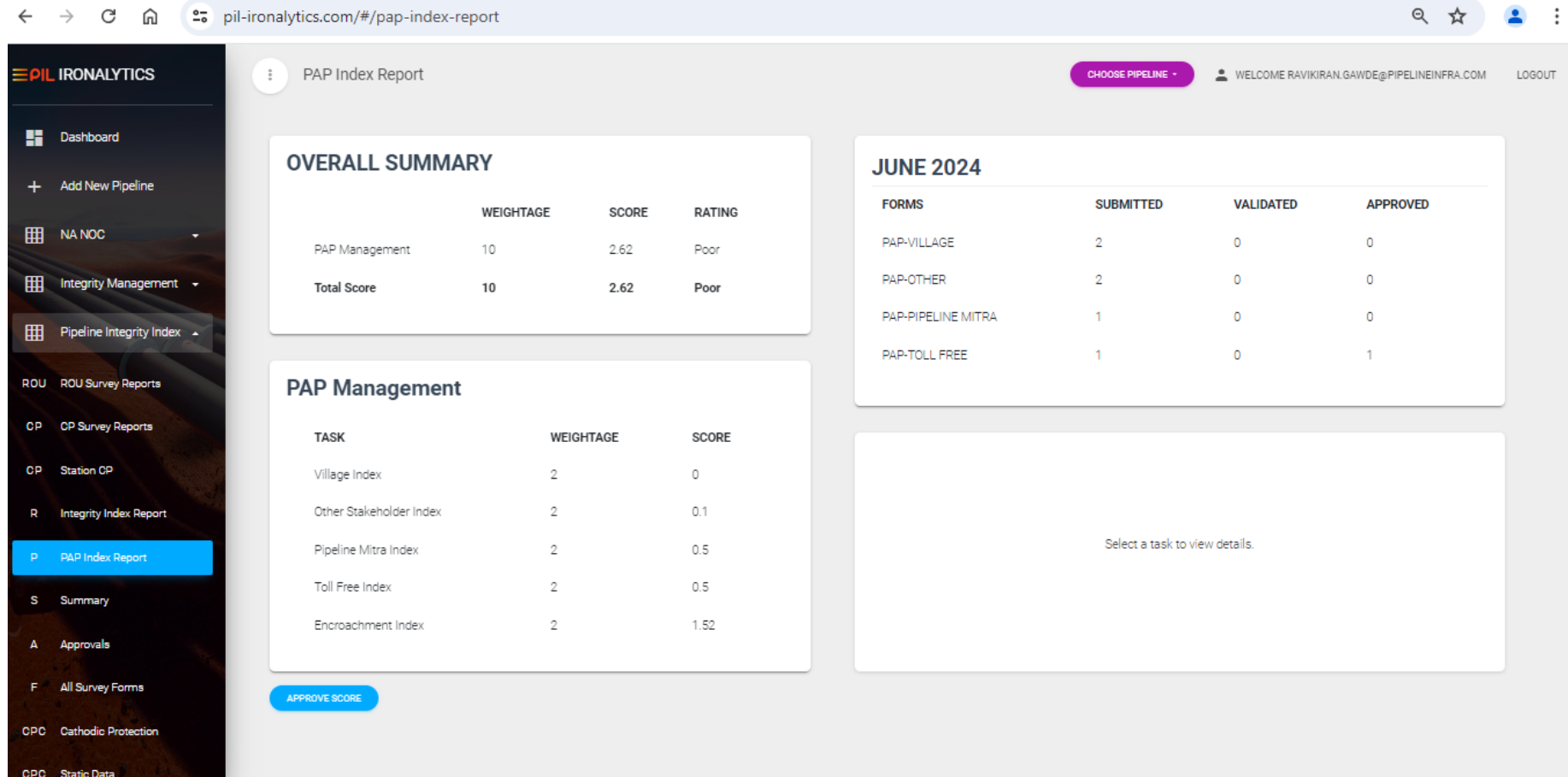
# MODES OF PUBLIC AWARENESS PROGRAM

- Face to Face Interaction / Door to Door Contacts
- Letters / Emails/ Phone Calls/ SMS
- Leaflets /Stickers & Banners
- Local events



# INTEGRATED PIPELINE INTEGRITY MANAGEMENT SYSTEM ( IPIMS )

## PAP EFFECTIVNESS MONITORING



The screenshot shows a web browser displaying the 'PAP Index Report' page. The browser address bar shows 'pil-ironalytics.com/#/pap-index-report'. The page header includes the PIL IRONALYTICS logo, a 'PAP Index Report' title, a 'CHOOSE PIPELINE' button, and a user profile 'WELCOME RAVIKIRAN.GAWDE@PIPELINEINFRA.COM' with a 'LOGOUT' link.

**OVERALL SUMMARY**

	WEIGHTAGE	SCORE	RATING
PAP Management	10	2.62	Poor
<b>Total Score</b>	<b>10</b>	<b>2.62</b>	<b>Poor</b>

**PAP Management**

TASK	WEIGHTAGE	SCORE
Village Index	2	0
Other Stakeholder Index	2	0.1
Pipeline Mitra Index	2	0.5
Toll Free Index	2	0.5
Encroachment Index	2	1.52

**JUNE 2024**

FORMS	SUBMITTED	VALIDATED	APPROVED
PAP-VILLAGE	2	0	0
PAP-OTHER	2	0	0
PAP-PIPELINE MITRA	1	0	0
PAP-TOLL FREE	1	0	1

Select a task to view details.

Navigation sidebar (left): Dashboard, Add New Pipeline, NA NOC, Integrity Management, Pipeline Integrity Index, ROU Survey Reports, CP Survey Reports, Station CP, Integrity Index Report, **PAP Index Report**, Summary, Approvals, All Survey Forms, Cathodic Protection, Static Data.

Buttons: APPROVE SCORE (bottom left), CHOOSE PIPELINE (top right).



**Category I:** Illegal Work Like Mining, Soil theft /removal, blasting, quarrying within RoU.

**Category II:** Third party damage like TLP Damage/theft, OFC/Cable cuts, Coating damage, Pipeline damage etc.

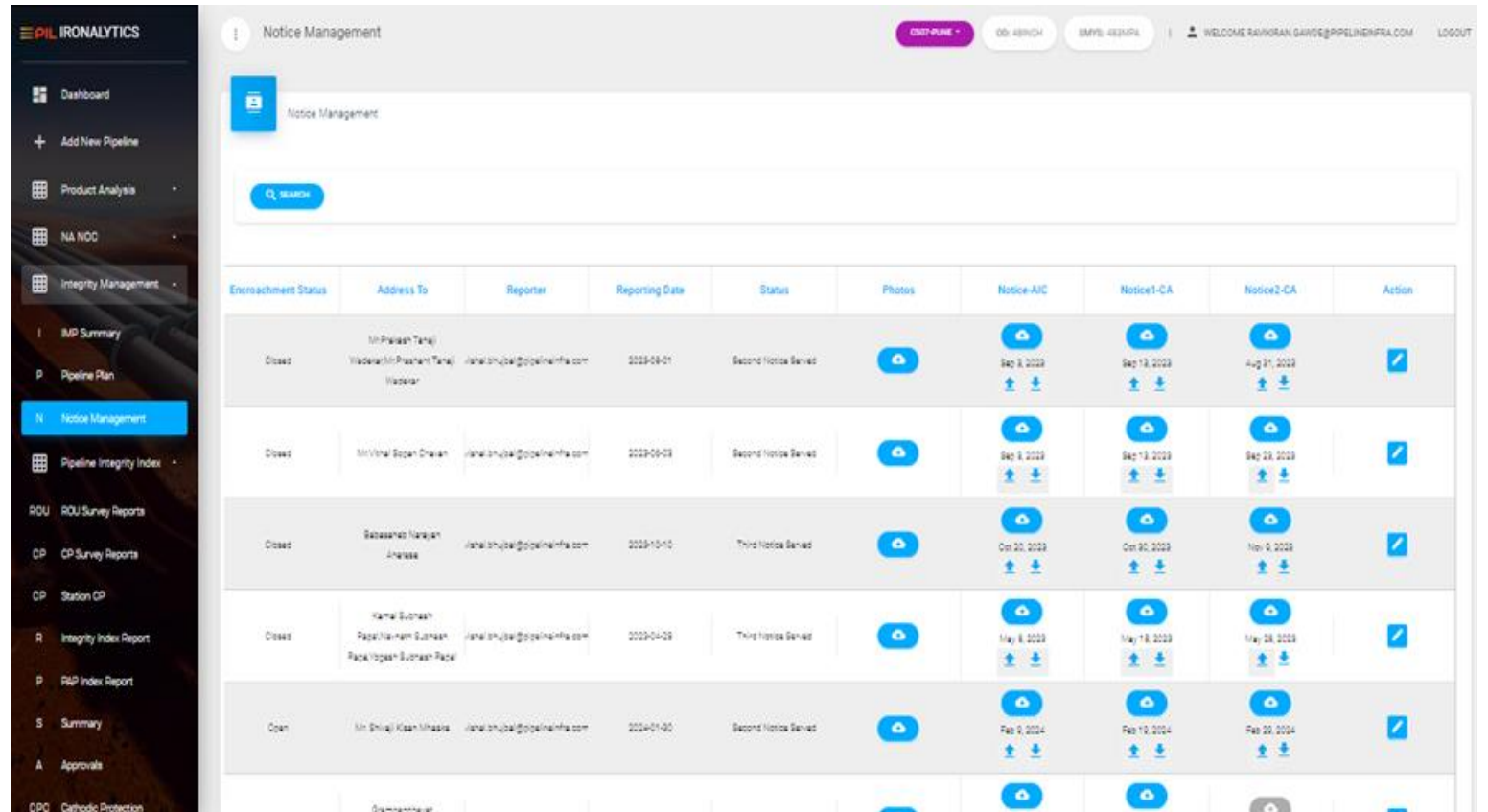
**Category III:** Encroachments like Construction of any building or any other structure, Construction of water tank, well, reservoir or dam, Tree

**Category IV:** Wash outs and incomplete ROU Restoration

**These RoU issues are tracked through Integrated Pipeline Integrity System (IPIMS)**

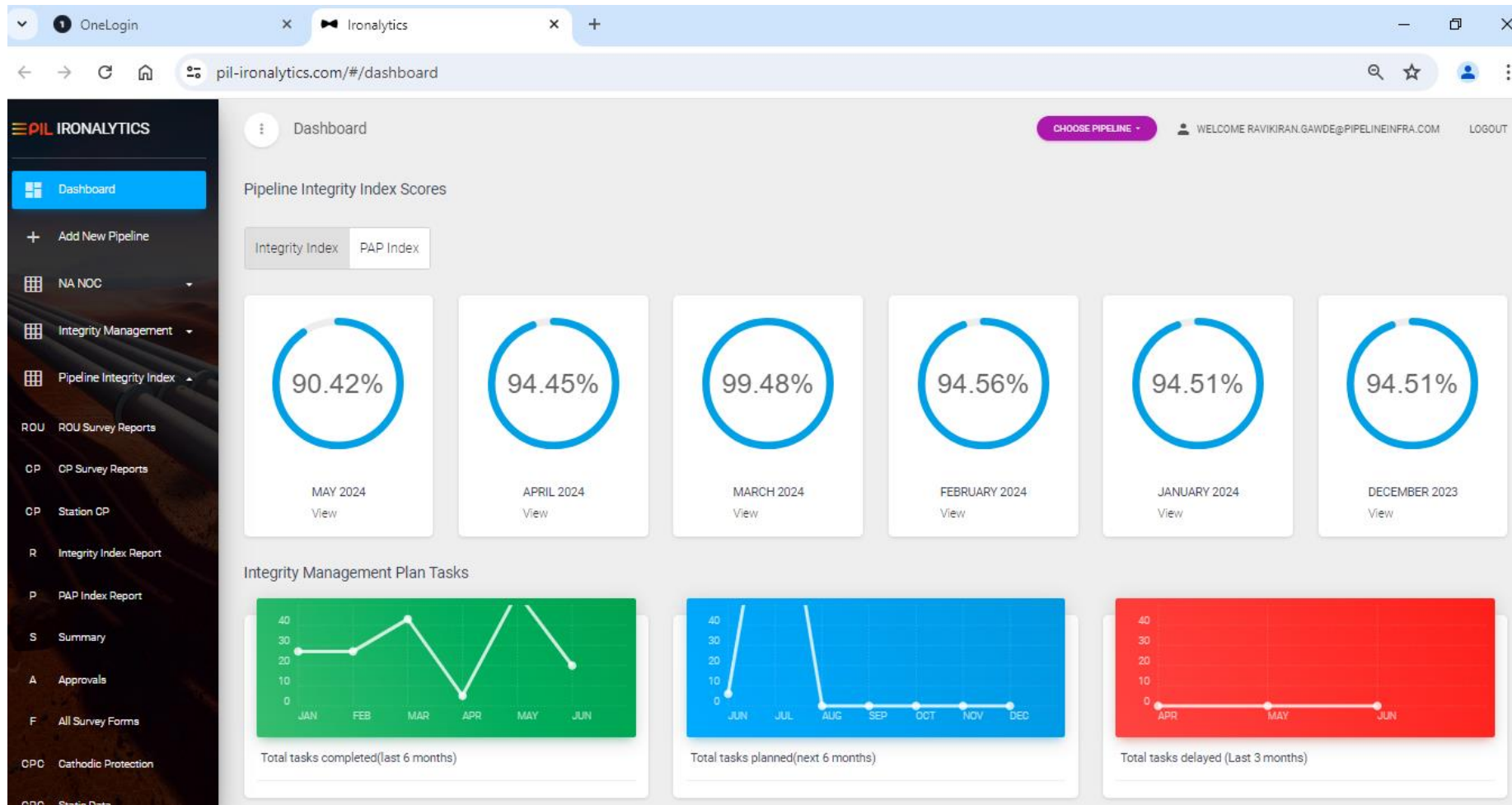
## RoU ISSUE MONITORING AND MITIGATION

The Notices for removal of the encroachment are generated automatically as per defined frequency through portal for issuing to the farmer



Encroachment Status	Address To	Reporter	Reporting Date	Status	Photos	Notice-AIC	Notice1-CA	Notice2-CA	Action
Closed	M/Prajan Tanaji Wadekar/M/Prajan Tanaji Wadekar	jatalshubal@pipelineinfra.com	2023-08-01	Second Notice Served		 Sep 8, 2023	 Sep 18, 2023	 Aug 31, 2023	
Closed	M/Vinay Suresh Chavan	jatalshubal@pipelineinfra.com	2023-06-03	Second Notice Served		 Sep 8, 2023	 Sep 18, 2023	 Sep 28, 2023	
Closed	Bateshwar Narayan Anwar	jatalshubal@pipelineinfra.com	2023-10-10	Third Notice Served		 Oct 20, 2023	 Oct 30, 2023	 Nov 9, 2023	
Closed	Kamal Suresh Palkhavanam Suresh Palkhavanam Suresh Palkhavanam Suresh Palkhavanam Suresh Palkhavanam Suresh	jatalshubal@pipelineinfra.com	2023-04-28	Third Notice Served		 May 8, 2023	 May 18, 2023	 May 28, 2023	
Open	M/ Shilpi Kishu Mhaske	jatalshubal@pipelineinfra.com	2024-01-05	Second Notice Served		 Feb 9, 2024	 Feb 19, 2024	 Feb 29, 2024	
	Omprakashat								

# INTEGRATED PIPELINE INTEGRITY MANAGEMENT SYSTEM ( IPIMS )



# CONCLUSION

## Due to effective use of technology enabled RoU monitoring

- Early detection of RoU Issues is possible
- More accurate recording of observation
- Faster data retrieval is possible
- Digitized output is auditable
- Reduce potential risk due to remote operations low chances of fatalities.



