

# ENVIRONMENTAL SITE ASSESSMENT OF TONDIARPET OIL SPILL SITE

Final Report

Submitted to

**Bharat Petroleum Corporation Limited**



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## Executive Summary

A detailed environmental site assessment of the impacted area due to a potential hydrocarbon leak of pipeline at Tondiarpet was carried out. The study was conducted in conjunction with Tamilnadu Pollution Control Board (TNPCB), IIT Chennai, and BPCL.

This report documents the findings of the study to ensure that the future land-use will be at its best. The Environmental study will thus enable the stake holders to make an informed decision to revive the site for future uses.

Prior to initiation of field activities IIT, BPCL and TNPCB had preliminary meetings to finalise study methodology, borehole locations and plume mapping techniques.

Hydrocarbon contamination in existing wells were mapped using sophisticated equipments. 20 handbores were drilled that ran to a depth of 30 ft below ground level at available open locations around the plume area. The samples were collected and observations were made that includes parameters such as odour, moisture, contamination characteristics, lithology, and extent of soil contamination. Moreover, a multigas detector was used to detect hydrocarbon presence in the soil.

Based on the results of the field investigation and testing, the following inferences are drawn.

1. Fill material to 3 ft followed by different grades of alluvial sand upto 30 ft was the geology observed in the area.
2. Free phase hydrocarbons is present in 15 existing borewells and 3 newly drilled boreholes.
3. The product thickness in borewells ranges from 1 inch to 33 inches.
4. Free phase hydrocarbon is present on either side of the pipeline on Varadaja Perumal Koil street close to junction of TH road and Varadaja Perumal Koil street. The plume is confined to a limited area.

5. A review of plume delineation map indicates that the source of hydrocarbon leak is somewhere in VPK street close to TH Road. This was confirmed by drilling borewells below the pipeline in that stretch of the road.
6. The free product in the borewells in the residences indicated diesel range organics where as the free product in the borwells dug below the pipeline indicated a highly viscous heavier fraction. This is quite possible since multiple products were pumped in these pipelines.
7. The areal extent of the oil spread in the aquifer is around  $7141 \text{ m}^2 - 7580 \text{ m}^2$  and volume of the free phase hydrocarbon spill is approximately  $270 \text{ m}^3 - 320 \text{ m}^3$ , respectively. These numbers are based on the interpolation of the oil depth data measured on field.
8. Soil contamination was observed in 18 newly drilled exploratory wells.
9. The depth of soil contamination starts from 19 to 20 ft below ground level in all regions except the zones below the pipeline where it was much shallow close to the bottom of the pipeline indicating that the source could be the pipeline.
10. The contaminated soil thickness ranges between 10 to 12 ft spread over a limited area. Contamination of soil in the range 5g/kg to 20 g/kg was observed above and below the water table indicating the smearing of the oil pool due to water table fluctuation.
11. Ground water in the region was contaminated with many compounds as listed in the Appendix III. Benzene and Toluene in groundwater as high as 23 ppm and 108 ppm, respectively

## **5.2 Future Directions and Challenges**

Based on our results and observations it is recommended that the following steps could be undertaken for complete cleanup of the area:

1. Installing monitoring wells in the core area of the plume and in the periphery of the plume to monitor the oil removal and ground water contamination removal.
2. Removal of free product through a combination of proven techniques such as dual phase pumping surfactant enhanced removal.

3. Removal of trapped oil from the vadose zone through proven techniques such as soil vapour extraction and airsparging
4. Insitu treatment of contaminated groundwater in saturated zone by chemical or biological methods.