

Terms of Reference for Site Clearance and Land Contamination Investigations

The following terms of reference have been compiled on the basis of BS 10175:2011+A2:2017

In view of the current state of the site and activities carried out to date which could potentially have led to land and groundwater contamination, clearance of the site and preliminary investigations for contamination are required. The documents detailed in the terms of reference below are to be approved by ERA prior to the commencement of any works on site. Malta Resources Authority (MRA) and Energy and Water Agency (EWA) shall also be notified of the activities on site so they will be able to take any action from their end that they may deem necessary. Should the site bear any legal restrictions / protections, consultation should be carried out with the relevant authorities.

1. Land and groundwater investigations

A proposal for land and groundwater investigations is to be submitted, prepared by experts in the field upon consultation with MRA and EWA (in relation to groundwater), which should include a chemist and/or a hydro geologist, with at least three years' experience in designing land and groundwater monitoring proposals and assessing land and groundwater contamination. Collection of samples should also be carried out by suitably qualified / certified persons familiar with the required methods.

CVs of the persons involved in developing and carrying out the land contamination survey, including assessment of the results, are to be submitted for approval by ERA prior to development of the proposal detailed below.

The proposal for land and groundwater investigations is to include the following:

- a. An overview of the site history including details on the activities carried out (such as illegal dumping and incineration of wastes) and the type of wastes that have been deposited on site and that could have led to land contamination. If information is not available, expert judgment should be used regarding assumptions on the type of activities and wastes associated with such sites and directly associated contaminants.
- b. A conceptual site model (CSM) is to be developed indicating:
 - i. Which areas have been used for the different activities (known / assumed);
 - ii. Which areas could have been potentially contaminated by said activities (clearly indicating the sources of contamination identified through the site history, related information and/or assumptions on activities and materials handled / deposited / incinerated), and
 - iii. The extent of areas that could have been affected through the different potential pathways of contamination identified; this needs to take into consideration sub-surface soils, groundwater and surface waters, potentially contaminated through direct exposure, leaching and run off, within and outside the site.
 - iv. The ecology, geology, hydrogeology and topography of the site and surrounding area shall be taken into account during the development of the CSM.
 - v. The proximity of the site to other potential sources of contamination that could have an impact on the site.
- c. A risk assessment evaluating the environmental setting of the site and identifying any sensitive receptors that may be impacted by potential contamination present within the site.

- d. Provide rationale / justification for the area of influence proposed for the preliminary investigation, and the number, location and depths of sampling points, making reference to the CSM. It should be noted that the number of sampling points should be statistically representative for the area under investigation, and ensure adequate coverage of the site as well as the greater area of influence (in line with requirements in Table 1 below). In view that groundwater could potentially have been contaminated; sampling of groundwater also needs to be included, preferably making use of existing boreholes¹. Consultation with the MRA and EWA is required in this regard.
- e. Based on the CSM developed, sampling locations shall be set to target locations being of a known or suspected source of contamination (ex. existing tanks, waste storage areas etc.) or observed environmental impact. Sampling locations may be set to target potential migration routes of mobile contaminants from such sources. The authority may instruct the person to carry out sampling from specific points in the case where reasonable suspicion persists on potential land contamination.

Should defined sources of contamination as described above not be identified by the CSM, the sampling locations proposed are to be evenly distributed to cover the entirety of the site.

- f. The following table is an indication of the expected sampling effort. Sampling locations shall not be set at a distance greater than 50m from each other. This may require modification based upon the CSM developed.

Table 1: Sampling requirements per area of investigation.

SITE (square m ²)	LAND	GROUNDWATER	
	DRILLING/ TRENCHES	DRILLING WELLS	SAMPLING
< 5,000	At least 2 points	At least 1 point	n. 1 samples per point
5,000 - 10,000	At least 5 points	At least 3 points	n. 1 samples per point
10,000-50,000	From 5 to 15 points	From 4 to 6 points	n. 1 samples per point
50,000-250,000	From 15 to 60 points	From 6 to 10 points (subject to a risk analysis) ²	n. 1 samples per point

- g. Samples from various depths are to be taken from each sampling location identified, however the Authority may amend sampling depths on a case-by-case basis. The first sample is to be within 0.5m from the surface, subsequent sampling depths are to be set at intervals of 1m. The extent of investigation for each sampling location is to be:

¹ To note that drilling of any borehole requires authorization from the Competent Authority, and drilling works must comply with the provisions of S.L. 423.32; drilling rigs must also be registered with the Competent Authority as per S.L. 545.06.

² If such plants are located inland, the drilling of 6 to 10 monitoring points per plant is considered to increase the pollution potential of the plants and acceptability would need to be assessed on a case by case basis.

- i. A minimum depth of 4m
OR
- ii. until the target depth has been reached if this extends beyond the boundaries set in (i) above.
OR
- iii. until proposed excavation depth is reached
OR
- iv. a different geological stratum has been encountered.

h. Provide information on sampling procedure to be followed including:

- i. The drilling/coring equipment to be used;
- ii. Any *in-situ* testing that may be required (ex. PID / FID)
- iii. Methods to be followed during sampling to ensure cross-contamination does not occur and that samples are handled/stored appropriately until delivery to the lab for testing;
- iv. Proposed method for backfilling of voids left by extraction of cores including the use of appropriate impermeable compounds such as bentonite.

It should be noted that dry-drilling is recommended to avoid flushing and dispersion of the contaminants which may be present

- i. Provide rationale / justification for contaminants selected for analysis of land and groundwater samples based on the site history and CSM developed. Consultants are to provide a list of contaminants to be investigated in this regards. Proposed omission of analytes is to be duly justified.

The assessment should consider analysis for:

- Heavy metals
- Total organic carbon (TOC)
- Hydrocarbons
- BTEX
- Dioxins & furans
- Cyanide
- Fluoride
- MTBE
- PAHs³
- PCBs
- Chlorinated aliphatic hydrocarbons
- Halogenated aliphatic hydrocarbons
- Asbestos

ERA may request testing for additional contaminants other than those proposed depending on the results obtained during the works on site as well as following consultation with MRA and EWA.

- j. EPA, ISO, EN or equivalent standards to be used to test for the different contaminants shall be provided, together with the detection limits. Certification of the laboratory/ies chosen for testing is to be provided; Laboratory is to be accredited to at least EN ISO 17025:2005/Cor 1:2006 and accredited for each and every analysis⁴.

k. Sample containers are to be sealable and of the appropriate material so as not to cause

³ 16 PAHs: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k) fluoranthene, Benzo(g, h,i) perylene, Chrysene, Naphthalene, Anthracene, Phenantrene, Fluoranthene, Dibenzo(a, h)anthracene, Indeno (1,2,3 – c,d) pyrene, Pyrene, Acenaphthylene, Acenaphthene, Fluorene

⁴ Unless substantiated that accreditation is not technically feasible for certain analytes.

contamination of the sample, absorb any sample components nor allow losses of volatile compounds. Routinely, wide-mouth amber glass containers are used for analyses of non-volatile organic compounds and PET containers for water-soluble analyses. Containers with a pierceable-septum screw cap can be used to allow for head space analysis for VOCs as required. Any container pretreatment is to be specified. The use of appropriate containers is to be determined in conjunction with the instructions provided by the analyzing lab.

- l. Collected samples are to be maintained at 4°C - 8°C and retained in darkness at all times up to delivery to the analyzing lab. Samples collected from land are to be maintained under such conditions upon immediate retrieval from the ground and dispatched for analysis at the earliest. Samples to be kept for long-term storage pending further testing shall be maintained at -20°C.
- m. Drilling logs and photographs are to be taken of the collected cores in their entirety and presented in the final report.
- n. Locations of core samples are to be confirmed with the Authority on-site prior to initiation of works.
- o. The results of the investigation and their interpretation are to be presented in a report which includes:
 - i. Description of ground conditions encountered at the site, including groundwater regime and surface water features
 - ii. Cross-sections showing site strata and shallow and deep groundwater levels
 - iii. Summary tables of chemical analyses and site monitoring
 - iv. Description of type, nature and spatial distribution of contamination, with plans where appropriate
 - v. Statistical analysis of the data set and derivation of representative concentrations for individual contaminants to a suitable level of statistical significance
 - vi. Evaluation of site investigation results against the outline conceptual model
- p. Further to (o), presentation of the raw data is to be included as an Annex to the report including:
 - i. Plans showing monitoring and sample point locations including the GPS coordinates (Geographic WGS 84 in degrees).
 - ii. Description of site works and on-site observations
 - iii. Exploratory borehole (where applicable), core or drilling logs including the GPS coordinates.
 - iv. Details of response zone and other construction details of borehole monitoring installations
 - v. Monitoring results
 - vi. Description of samples submitted for analysis
 - vii. Relevant Quality Assurance/Quality Control (QA/QC) data – this may include accreditations of staff, calibration certificates of equipment, laboratory accreditations (national and international standards)
 - viii. Laboratory analytical reports, completed in accordance with the relevant QA/QC data, including relevant international analytical or test method standards

2. Clearance of the site

Method Statement is to be submitted outlining how clearance of the site shall be carried out, including:

- a. Details of when site is planned to be cleared.
- b. How all wastes shall be identified and separated according to the different waste streams as per European Waste Catalogue (EWC) codes defined in Commission Decision 2000/532/EC. A list of these wastes and projected quantities is to be included.
- c. How all wastes shall be characterised according to the hazard properties (HP) codes as per The Waste Regulations - S.L. 549.63, Schedule 3.
- d. Indicate disposal facilities for all wastes stream identified on site. In this regard it should be noted that:
 - i. All wastes leaving the site after storage and/or processing must only be sent to facilities licensed to accept the individual waste stream, either locally or abroad.
 - ii. Only registered waste carriers as per activity 38 of Schedule 1 in S.L. 549.45 - Waste Management (Activity Registration) Regulations, 2007 are allowed to transport waste to and from this site.
 - iii. The applicant shall keep records for every consignment of wastes removed from the site indicating the EWC Code, description, quantities, date of removal, contractor name (including for transport), consignment note number (where applicable) and manner and place of final disposal/recovery. Such records will need to be submitted as part of the final report submitted to ERA for approval documenting the site clearance.
 - iv. Contaminated excavated material are to be managed and disposed of as waste.
 - v. Wastes identified as inert are to be tested if suspected to be contaminated by other deposited material.
 - vi. Should any of the excavated material from the contaminated land be destined for disposal in a landfill, in addition to the abovementioned characterisation analysis, leaching tests should be carried out according to the Waste Acceptance Criteria set out in Council Decision 2003/33/EC.
 - vii. Should any of the excavated material from the contaminated land be destined for disposal at sea, testing for additional parameters may be requested in addition to the abovementioned characterisation analysis, in line with ERA's [Terms of Reference for the Management and Disposal of Dredged Material](#).

Aspects indicated in Parts 3 and 4 below will need to be included in the final report submitted to ERA (post survey/analysis), which should include the results of the investigation and assessment thereof.

3. Way Forward following site clearance and land/groundwater investigations

Action may be required by ERA depending on the levels and location of contamination found. The requirement for remediation will depend on the eventual associated risk to human health and the environment from any contamination of land and groundwater, which would need to be assessed following a preliminary screening of the results obtained from the preliminary investigations.

The engagement of experts for further investigations/assessments and proposals for land decontamination and remediation may be required following the preliminary assessment of contamination. Consultation with MRA will also be required in the event of risks to groundwater.

4. Documents to be submitted

- a. List of consultants to be commissioned for approval by ERA
- b. Land investigation proposal for approval by ERA
- c. Method Statement for site clearance for approval by ERA
- d. Site clearance report following works
- e. Land investigation report.

Further assessment may be required depending on the results obtained.