

Deliverable WP I2.1.3

Final Report

JUNE 2021



I. Introduction

The objective of this report is to summarise the information available on the landfill site of Les Champs Jouault for an accurate overview of the situation before starting the landfill characterisation (i.e. coupling geophysics and targeted waste samples). Detailed information is available in the [Deliverable WP I2.1.1 - Archives and Inventory report](#) and [WP I2.1.2. Remote sensing imaging](#). All the data collected in these two deliverables helps the building of a first conceptual site model which served as a base for the building of the Resource Distribution Model.

II. General information about the SAS Les Champs Jouault

The landfill site of Les Champs Jouault is a non-hazardous waste storage facility, which has been treating waste since April 2009 and is still in operation today. The site collects waste materials from regional private companies bringing non-hazardous non-recyclable waste, and local municipalities bringing bulky waste from waste collection centers and household waste.

A site visit was conducted in August 2017 to collect data. At that time, eight cells were filled and sealed. On average, one cell is filled per year for an approximate tonnage of 75,000 tonnes of waste materials. Regarding the landfilling operations, the waste materials are discharged by the delivery trucks directly into the cell in activity. Then, the waste materials are crushed and compacted. The cells are adjacent to each other and independent with geomembranes ensuring watertightness. For each cell, bentonite is placed under the geomembrane to provide additional sealing. The bottoms of the cells (above the geomembrane) are equipped with a drainage system to collect the leachate. The maximum height of the waste (including the cover layer) is around 17 meters.

III. Operating mode

SAS Les Champs Jouault operates its storage facility in bioreactor mode. This means that the biogas collection, traditionally present in this type of facility, is combined with the reinjection of leachate to optimise the degradation of the waste in an anaerobic environment. The biogas collection is ensured by the installation of horizontal tubes near the subsurface in the waste mass. From 6 to 12 meters long, these slotted drains allow the biogas to be sucked up before being valorised in cogeneration process. The leachate is reinjected through these same drains but in the opposite direction. A set of valves on the wellheads of the pits allows either the capture of biogas or the reinjection of leachate. The leachate reinjection is done periodically, on average, one reinjection episode every 3 months per cell. On the first cells, vertical wells were made as well to try to recover more biogas.

IV. Data collected and in-situ measurements in progress

A certain amount of data are already available for the landfill site of Les Champs Jouault :

- Biogas spot measurement data per cell (quality and quantity)
- Volume of leachate injected per wellhead
- Total volume of leachate collected
- Topographic surveys (every 2 months) to estimate the subsidence of the landfill
- Aerial photographs of the site taken by a drone
- Volume and density per cell
- Waste composition of the cell
- Detailed construction plans of the cells

Two cells (cells 3 and 4) are already equipped with geophysical equipment (i.e. ERT lines and optical fibers) within the waste mass. This device was installed by IRSTEA for the long-term monitoring of the cells.

V. Results of the Remote Imaging Report

The Champs Jouault landfill site covers an area of approximately 38 ha (see red polygon in **Figure 1**), of which approximately 14 ha is dedicated to landfill (see yellow polygon in **Figure 1**). Aerial photographs of the site taken at different times reveal the expansion of the site over the years as illustrated in **Figure 2**. Fig. 2A shows an image from 2009 before the installation of Les Champs Jouault where most of the site was agricultural fields and meadows. Fig. 2B shows an aerial view from 2010 where cells 1 and 2 have already started to be filled. Note that the main building, the leachate and rainwater collection ponds are also visible. Fig. 2C shows an aerial view from 2012 with cells 1-5, 7, 8 and 10 partially filled. Other paths/roads along the site are also present. In Figs. 2D, 2E and 2F corresponding to 2015, 2016 and 2017 respectively, changes concern the exploitation of cells 9, 13 and 14 and the use of the land further east. In 2016, the site underwent several structural changes (e.g. see bare soil eastward of the cell area possibly due to expansion and filling processes).

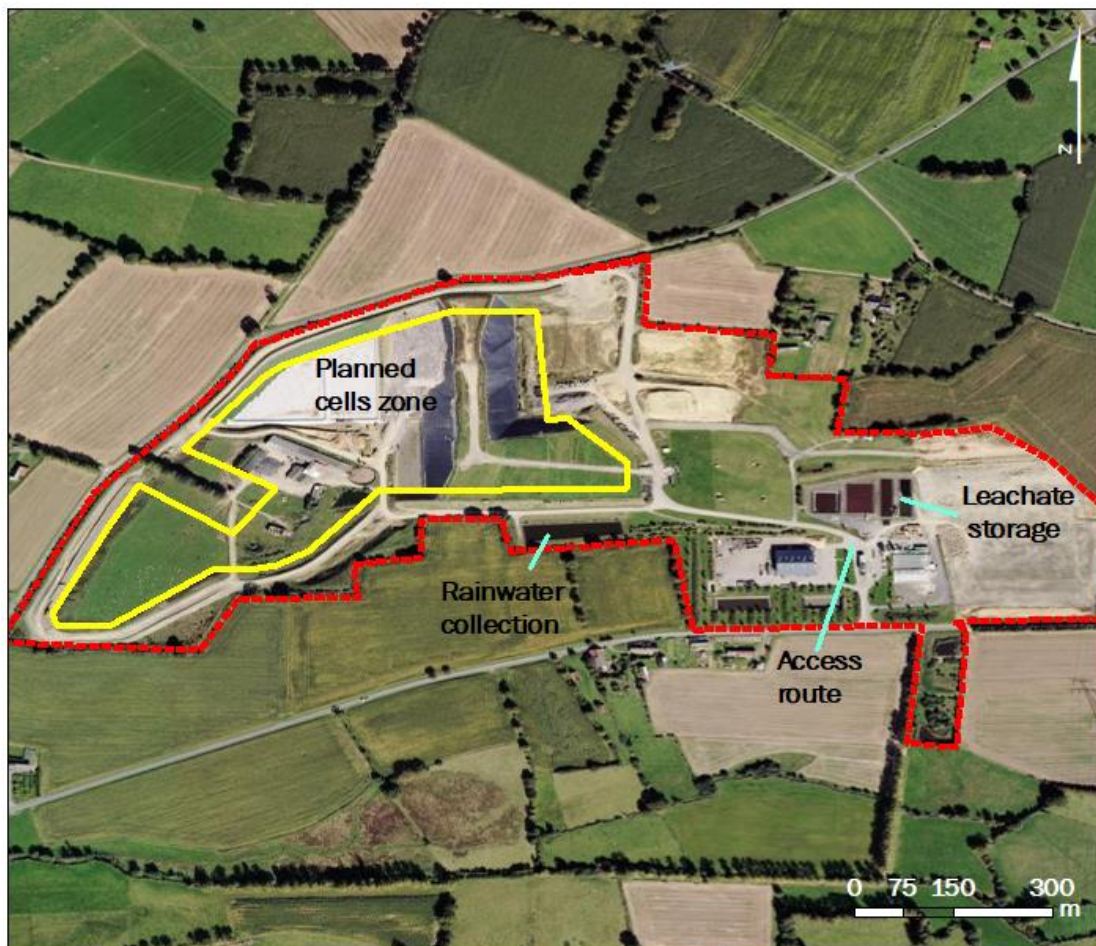


Figure 1: Extension of Les Champs Jouault landfill (red) and planned delimitation of cells zone (yellow), general aerial view from 2017. Image from Institut National géographique et forestière (IGN), France.

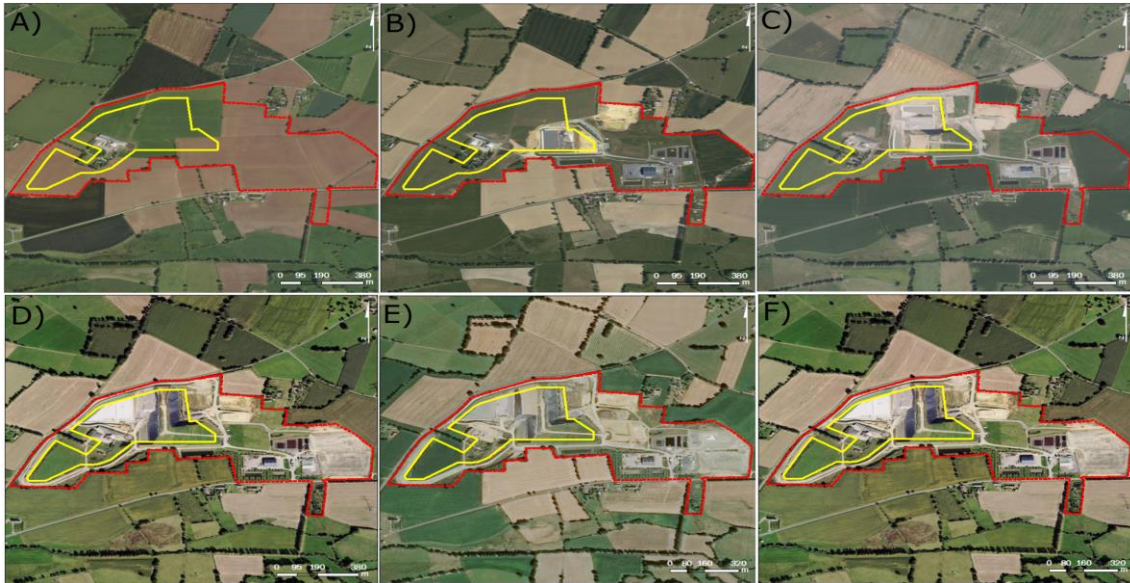


Figure 2: Evolution of Les Champs Jouault site. Images from A) 2009, B) 2010, C) 2012.

VI. Implementation of the RDM

Based on the data available, a first conceptual model was built. This model was relatively simple and consisted of the structure of the landfill based on design plans. This serve as a base for the building of a Resource Distribution Model (RDM) of the landfill site by integrating geophysical data and ground truth data (see Deliverable **WP 12.3.4. Correlation analysis report**). The aim of the RDM is to estimate the spatial distribution of resources available within the landfill and volume at a scale suitable to assess the economic viability of future landfill mining operations.

Geophysical data was used to delineate the waste cells and estimate their volumes. The resulting waste cells are displayed in **Figure 3** and the estimated volumes per cell presented in **Table 1**.

	Cell 1	Cell 2	Cell 3	Cell4	Total
Volume [m ³]	31.158	42.201	32.859	38.588	144.806

Table 1: Estimated volumes of waste deposits per cell.

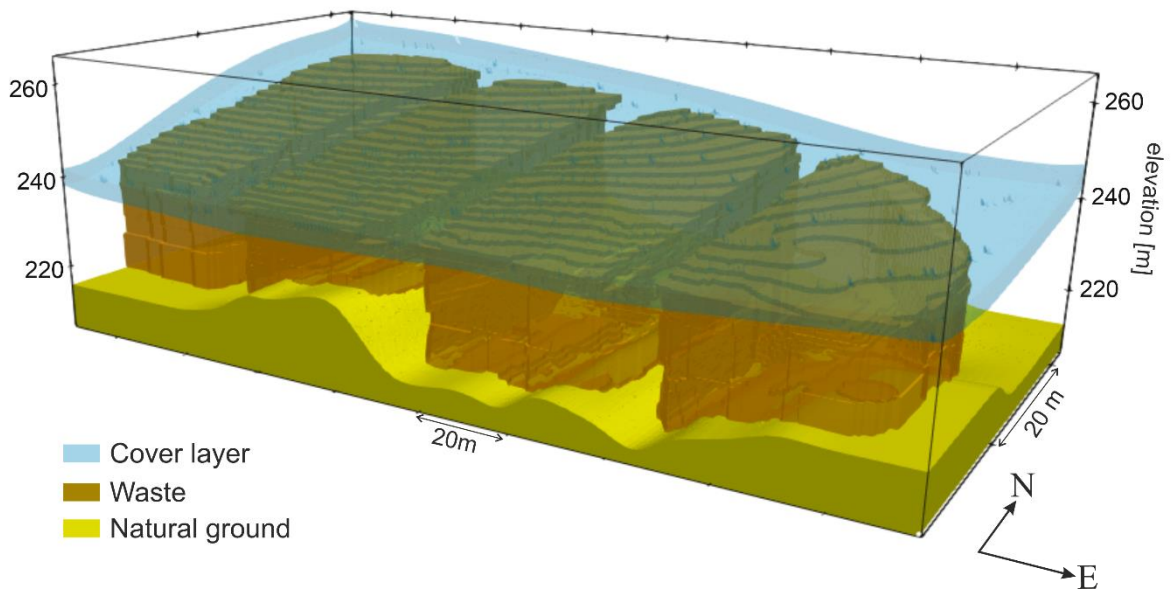


Figure 3 : Resource Distribution Model of Les Champs Jouault landfill site.

It should be noted that the volume estimates are very rough approximations. The lack of available ground data, due to technical issues during the waste sampling campaign, made the calibration of the geophysical results difficult and therefore increased the uncertainties of the RDM. Moreover, the limited spatial coverage of the GPR limiting the available information on the cover layer thickness in the southern part of the landfill. Similarly, the uncertainty related to the landfill base is relatively high because the landfill base was estimated from only two seismic profiles and the interface waste/natural ground did not reach during the drilling operation making the validation of the geophysical interpretation impossible. Furthermore, according to the landfill construction plan, the cell boundaries are actually not vertical but inclined such that the waste materials of newer cells cover the waste material of the older cells at the boundaries. However, the geophysical data could not resolve the inclined cell boundaries at depth and therefore the cell boundaries of the landfill model were approximated to be vertical.

Contact

Feel free to contact us.

Coordination office:

BELGIUM	SPAQuE Boulevard M. Destenay 13 4000 Liège	c.neculau@spaque.be
----------------	--	---------------------

Contact details of the project partners:

BELGIUM	Atrasol Cleantech Flanders / VITO OVAM Université de Liège	renaud.derijdt@atrasol.eu alain.ducheyne@vito.be ewille@ovam.be f.nguyen@ulg.ac.be
FRANCE	SAS Les Champs Jouault	champsjouault@gmail.com
GERMANY	BAV	pbv@bavmail.de
THE UK	NERC	jecha@bgs.ac.uk

