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UNIQUE STRATEGIC PROJECTS IN THE SITES AFFECTED BY HCH IN ARAGON

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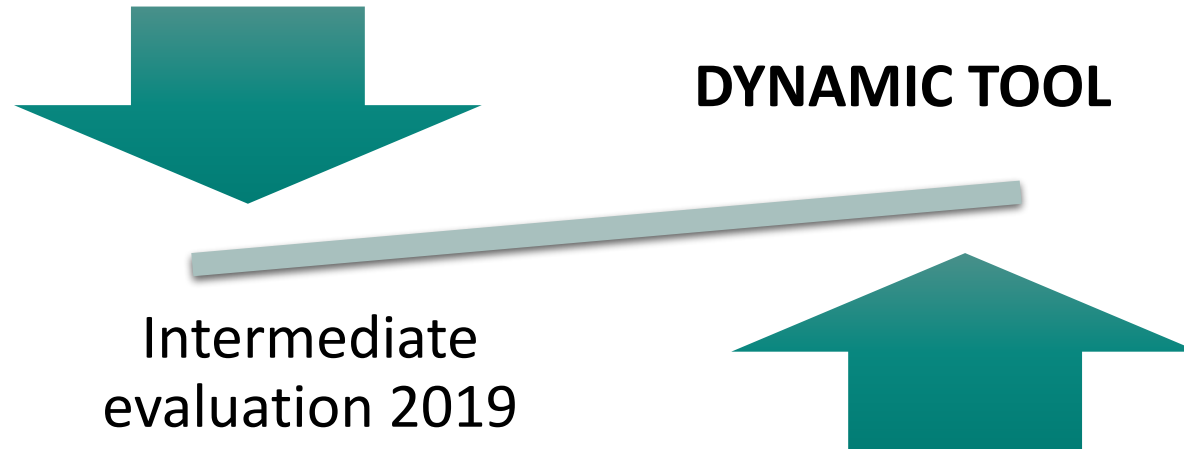
Strategic Action Plan

Definitive closure of the Bailín security cell

CORHIBA

Dismantling and demolition of the old Inquinsa factory

CALENDAR





MAIN IDEAS

LOW ENERGY REMEDIATIVE ACTIONS

risk reduction and sustainable solutions

ACTIONS PREFERABLY IN SITU

environmental risk reduction

FINAL PRODUCTS

less hazardous, shorter life, low mobility

COMMITMENT TO BIOLOGICAL METHODS

assisted with technological solutions

MODELIZATION

predict and determine the efficiency of the results

The Strategic Plan is a dynamic tool



**Incorporated as an Annex to the GIRA
2017-2022**

MAIN ACTIONS TO BE DEVELOPED

Action I

Ensure the supply of drinking water and the quality of the irrigation water.

Action I

Isolation of waste.

Action II

Pumping of the free phase (DNAPL) and decontamination of soils and the rocky substrate.

Action III

Decontamination of surface soils and restoration.

Action IV

Disposal of waste

ACTION I

- Definitive closure of the Bailín security cell

ACTION III

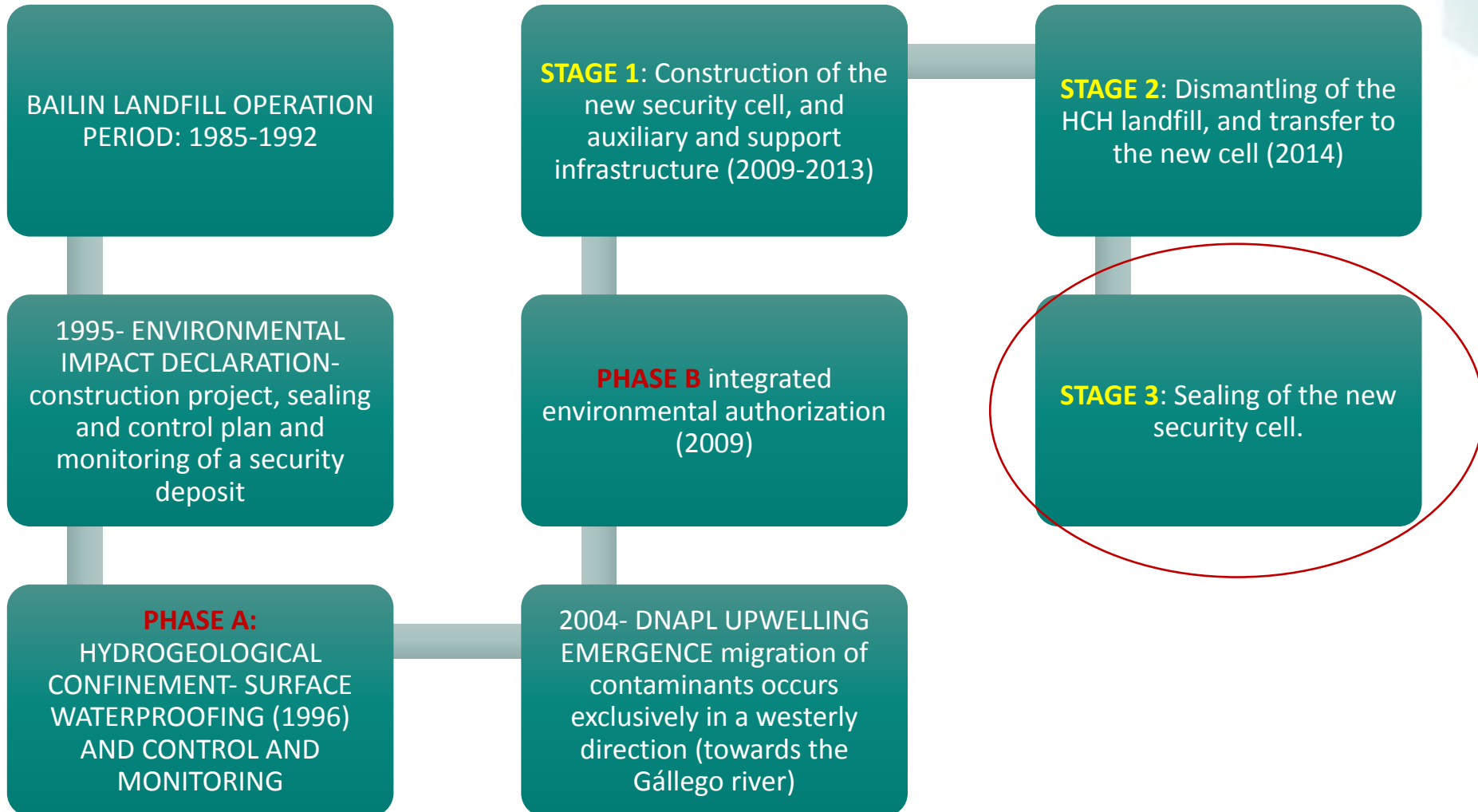
- CORHIBA
- Dismantling and demolition of the old Inquinosa factory

UNIQUE STRATEGIC PROJECTS IN THE SITES AFFECTED BY HCH IN ARAGON



DEFINITIVE CLOSURE OF THE BAILÍN SECURITY CELL ^(1/7)

BACKGROUND



DEFINITIVE CLOSURE OF THE BAILÍN SECURITY CELL (2/7)



DEFINITIVE CLOSURE OF THE BAILÍN SECURITY CELL (3/7)



Temporary sealing



Current situation

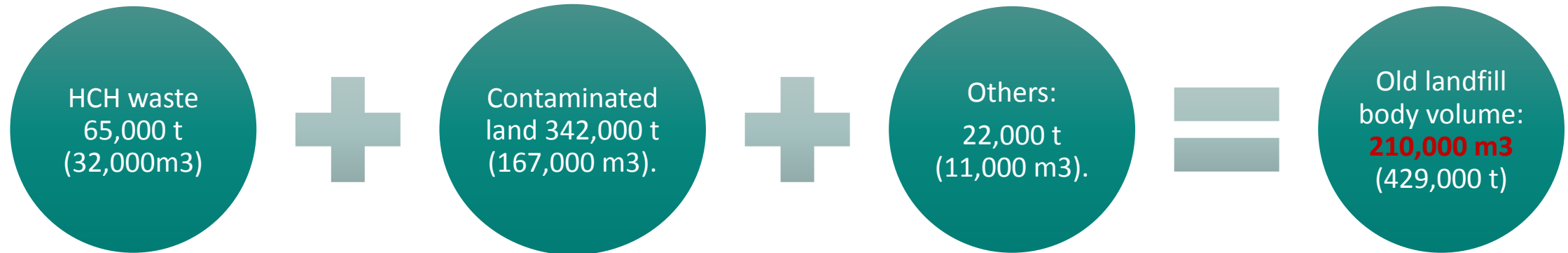
HDPE CHECK 2021

DEFINITIVE CLOSURE OF THE BAILÍN SECURITY CELL ^(4/7)

QUANTIFICATION



maximum
security cell
capacity:
400,000 m³



Is estimated that **1,400 m³** of DNAPL were spilled, most of which escaped into the receiving channel before sealing the leakage

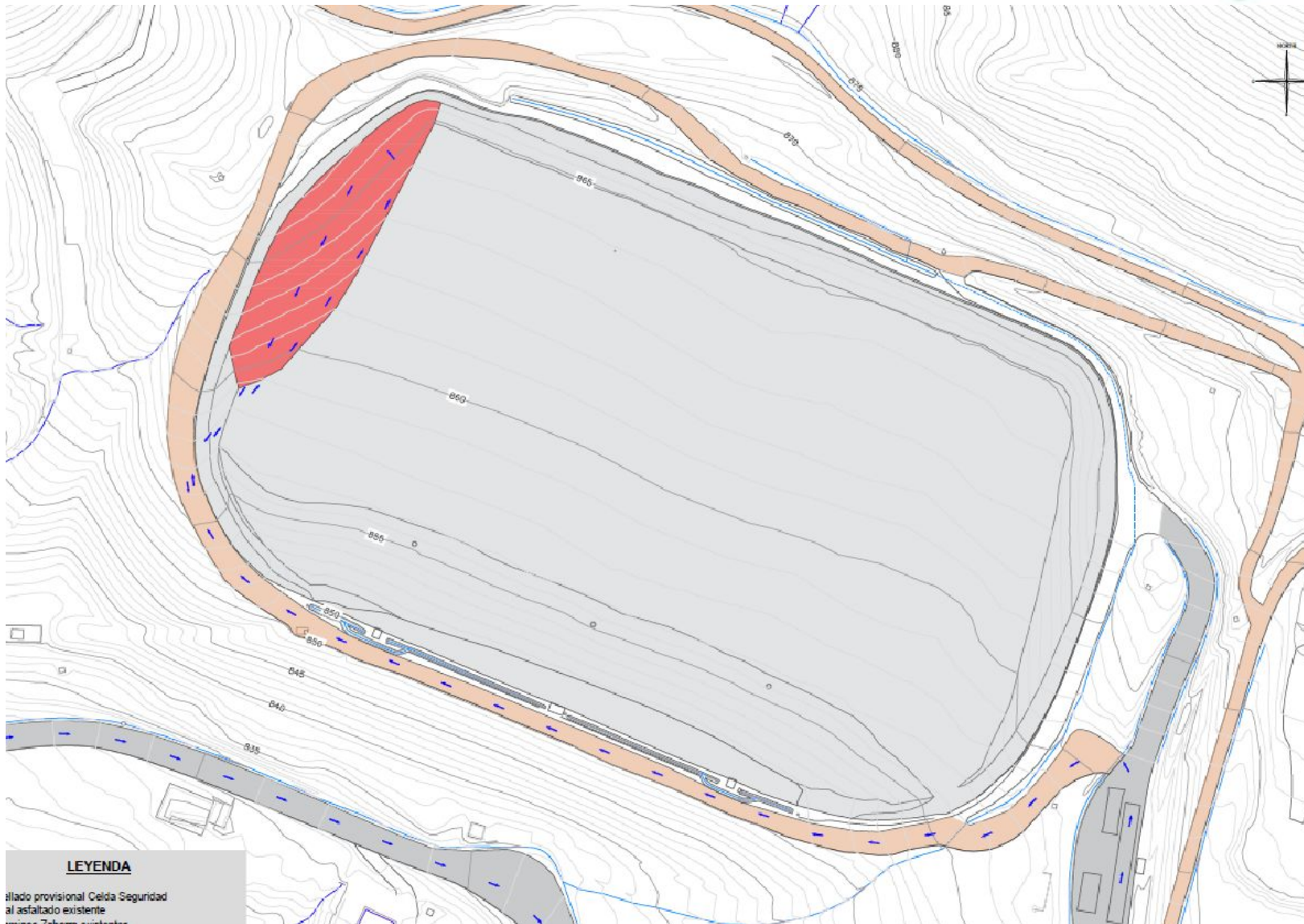
DEFINITIVE CLOSURE OF THE BAILÍN SECURITY CELL (5/7)

WASTE PENDING



1.232,29 m3

DEFINITIVE CLOSURE OF THE BAILÍN SECURITY CELL (6/7)



PHASE 1
Transfer of
waste
2 weeks

DEFINITIVE CLOSURE OF THE BAILÍN SECURITY CELL ^(7/7)

EXECUTION, SCHEDULE & BUDGET



UNIQUE STRATEGIC PROJECTS IN THE SITES AFFECTED BY HCH IN ARAGON



DISMANTLING OF THE OLD LANDFILL IN 2014

Surface: 3,1 Ha

Runoff coefficient nearly of 1

| AÑO | DISCHARGES (m ³) |
|------|------------------------------|
| 2012 | 1.760,80 |
| 2013 | 17.166,40 |
| 2014 | 23.749,20 |
| 2015 | 18.621,20 |
| 2016 | 35.663,40 |
| 2017 | 16.792,52 |
| 2018 | 40.969,60 |
| 2019 | 17.858,90 |
| 2020 | 26.707,80 |
| 2021 | 17.753,50 |
| 2022 | 9.161,70 |

2 ACCESSSES IN THE NORTH AREA

ACCESS WIDTH: 5 meters with transversal slope towards the side of the basin

MAXIMUM HEIGHT OF ACCESS WALL: 4 meters

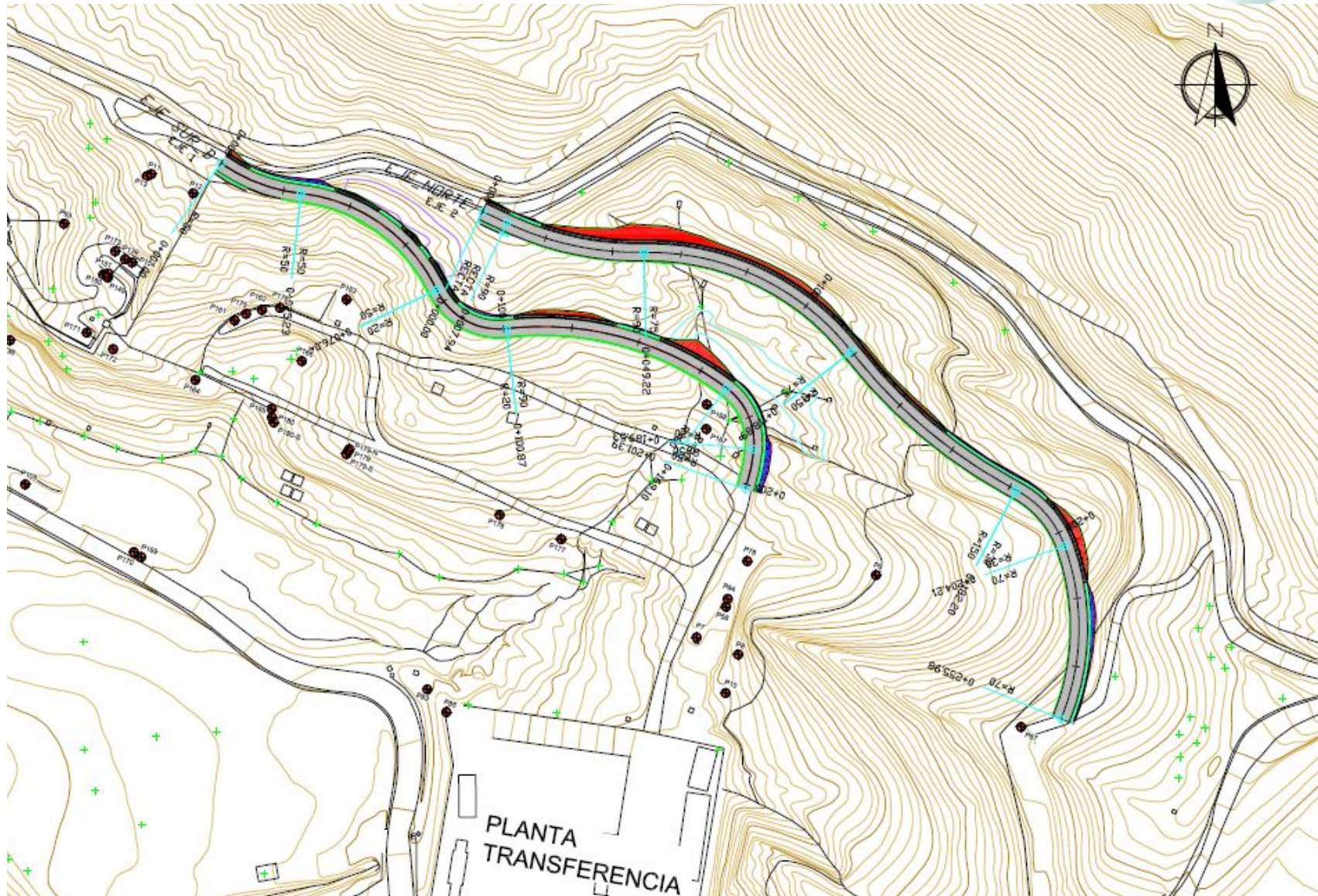
MAXIMUM HEIGHT OF TERRACES: 3 meters

TERRACES

Minimize dragging produced by runoff

Bioremediation of the superficial zone of the surface and vadose zone

Ability to retain and degrade contaminants





IN-SITU CONCRETE WALLS

ADVANTAGES

- Great heights can be reached.
- Possibility of small foundations and therefore little movement of affected land.
- Conventional construction systems.
- High degree of durability

DISADVANTAGES

- Average visual and environmental impact
- Cost
- Complicated execution considering the location

BREAKWATER WALLS

ADVANTAGES

- Ease of drainage through the stone blocks.
- Easy to adapt to differential ground movements
- ease of integration of the breakwater into the environment. natural material

DISADVANTAGES

- Pipelines for services will not pass through the wall or its back



GABION WALLS

ADVANTAGES

- High resistance: totally permeable and relieve of tensions that accumulate in the extrados of traditional walls.
- Great flexibility: support differential movements and settlements without loss of efficiency.
- Built easily and cheaply

DISADVANTAGES

- Galvanized steel mesh will corrode in acidic environments. Quality control- galvanized gabions

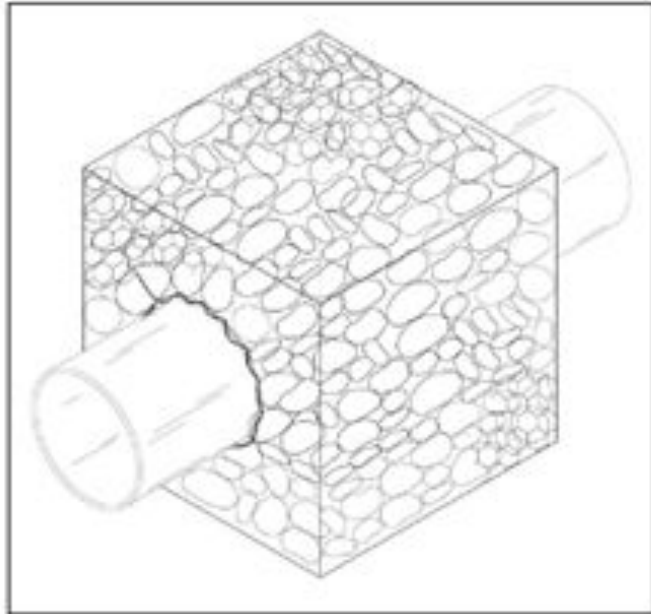
REINFORCED EARTH WALLS

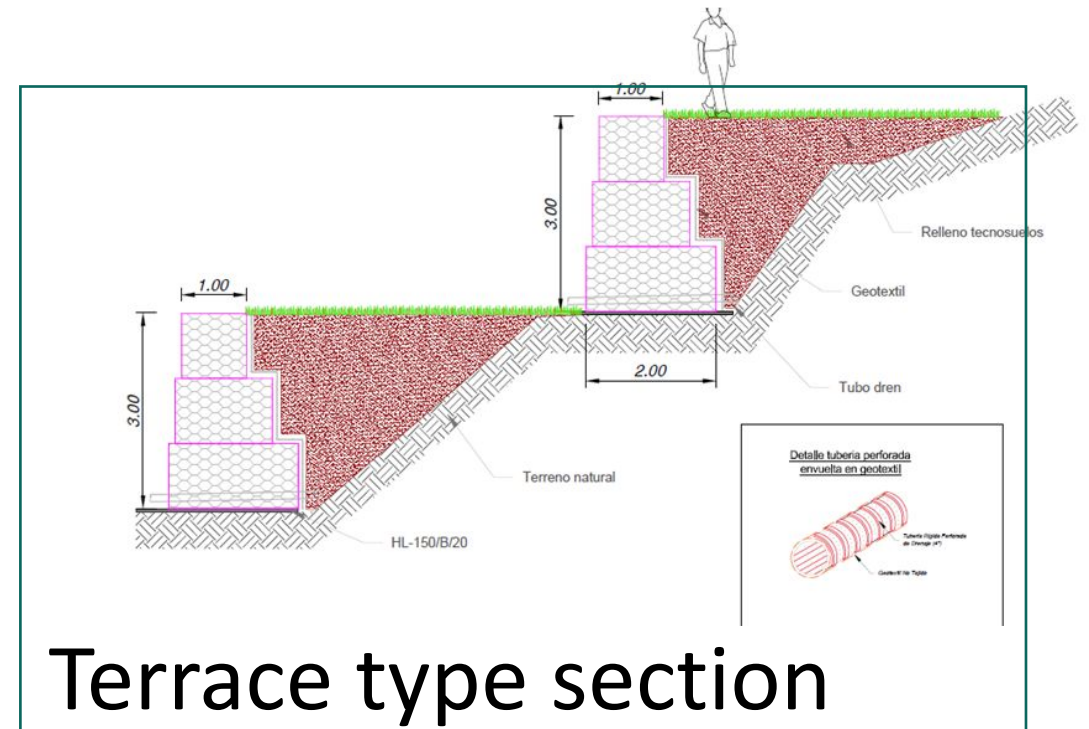
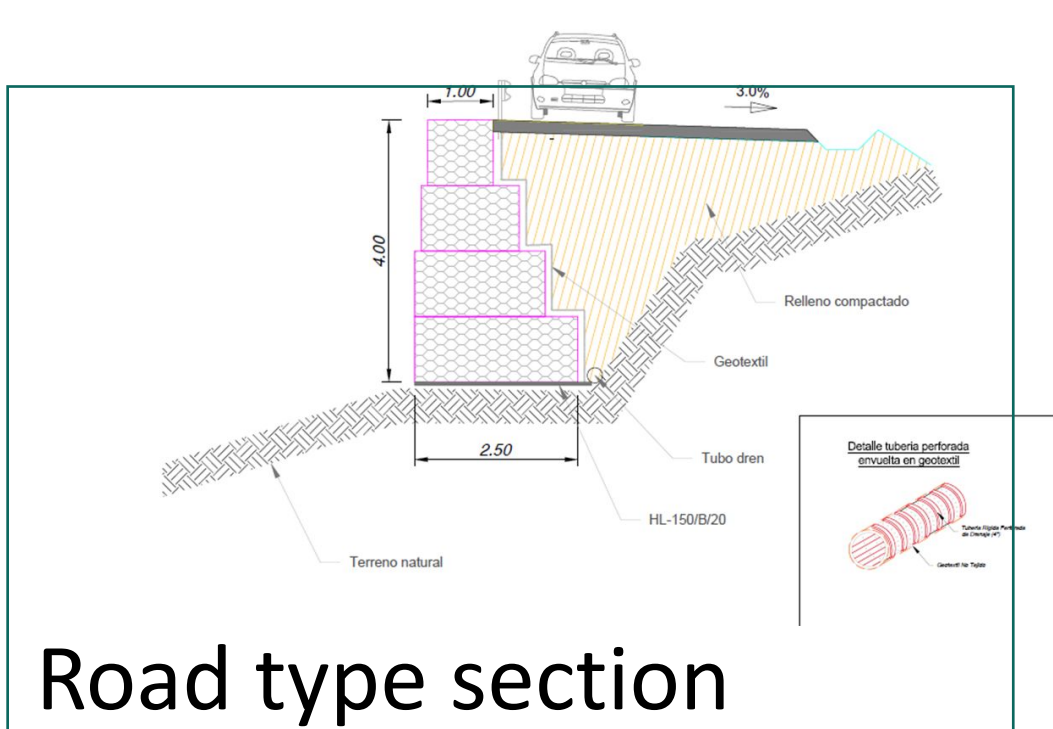
ADVANTAGES

- Cost-efficient system
- Appropriate in areas with limited work surface or for a quick execution
- Flexible technique: topographic adaptability, absorption of foundation settlement.

DISADVANTAGES

- Execution: choice of filling material, and compaction.
- Reinforcement protection against corrosion.







BUDGET

PENDING TECNOSOILS

SCHEDULE

- 18 months.
- Accesses: 5.5 months
- Terraces: 4.5 months



TECHNOSOILS

- PROMOTE THE WATER RESERVE
- IMPROVE THE AGROLOGICAL CONDITIONS, THINNER AT THE BASE TO FAVOUR THE INCREASE OF THE CAPILLARITY IN THE ROCK
- REGULATE THE POLLUTANT LOAD
- RECREATE A BACTERIAL AND FUNGAL CONSORTIUM IN THE SOIL AND IN THE VADOSE ZONE

VEGETATION

- COVER TO AVOID EROSION
- DEEP ROOTS TO REACH THE VADOSE ZONE
- ABILITY TO RETAIN AND/OR DEGRADE POLLUTANTS



UNIQUE STRATEGIC PROJECTS IN THE SITES AFFECTED BY HCH IN ARAGON



DISMANTLING AND DEMOLITION OF THE OLD INQUINOSA FACTORY

BACKGROUND



ACTIVITY (1975-1992)

- MANUFACTURE AND GENERATION OF WASTE DERIVED FROM LINDANE PESTICIDE (1989-1992 only commercial formulation not production)

SOILS DECLARED CONTAMINATED

- RESOLUTIONS 2012 and 2020 GENERAL DIRECTORATE OF ENVIRONMENTAL QUALITY

SOURCE OF POLLUTION

ABANDONMENT AND DETERIORATION OF FACILITIES

- INDUSTRIAL RUIN

DISMANTLING AND DEMOLITION OF THE OLD INQUINOSA FACTORY

CHARACTERIZATION OF THE CONTAMINATION



LAYER 1: $h < 1$ m

MAXIMUMS

94,86 HCH mg/Kg dry weight
55,62 HCH mg/Kg dry weight



LAYER 2: $1\text{m} \leq h < 2\text{m}$

MAXIMUMS

74.730 HCH mg/Kg dry weight
27.268 HCH mg/Kg dry weight



LAYER 3: $2\text{m} \leq h < 5\text{m}$

MAXIMUS

397,9 HCH mg/Kg dry weight

HCH in GROUNDWATER

- is **EXCEEDED** by several orders of magnitude

HCH gas in AIR

- are **not exceeded**

Particulate HCH AIR

- are **not exceeded**

DISMANTLING AND DEMOLITION OF THE OLD INQUINOSA FACTORY

CHARACTERIZATION OF THE CONTAMINATION (walls)



Year 2018: 56 core drills interns

180 m3 of paint and
plaster

- 46 kg of HCH

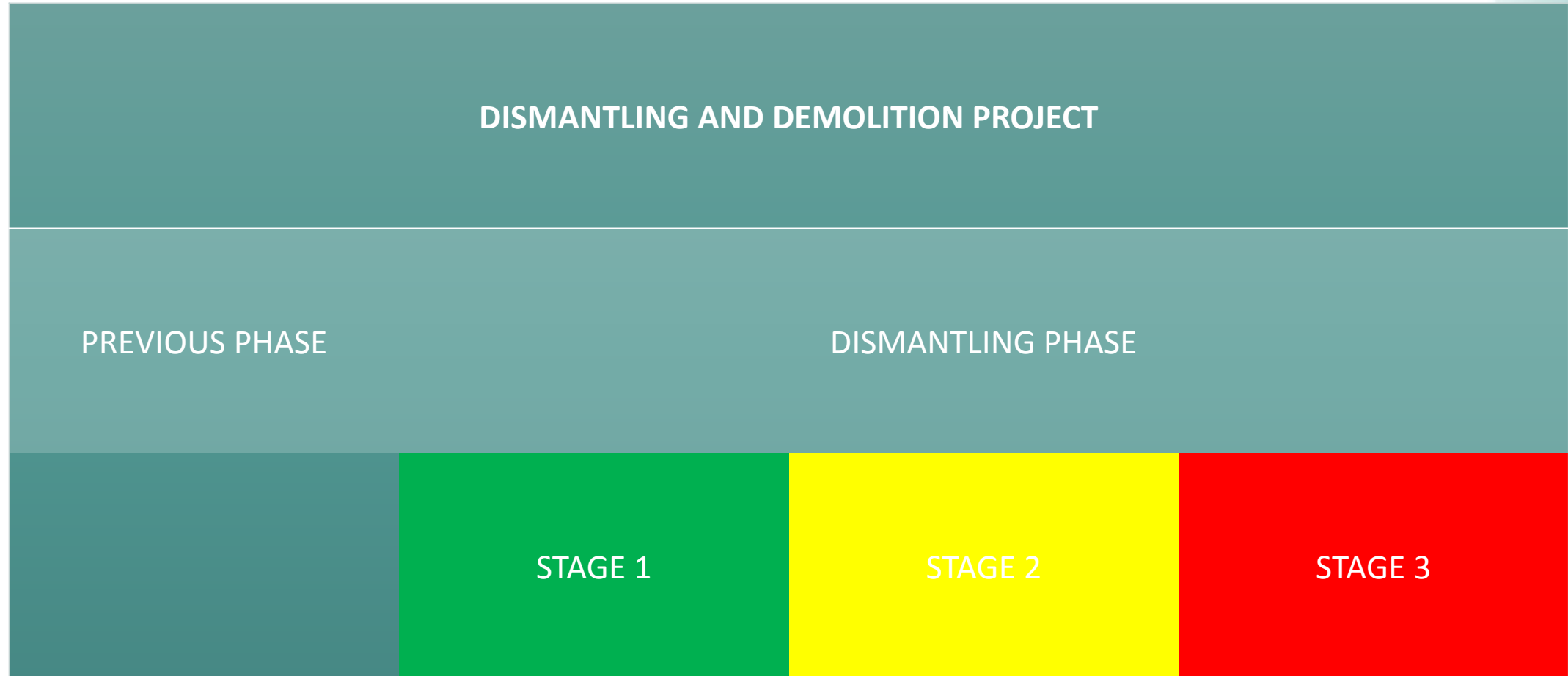
1,020 m3 of bare block

- 10 Kgr of HCH

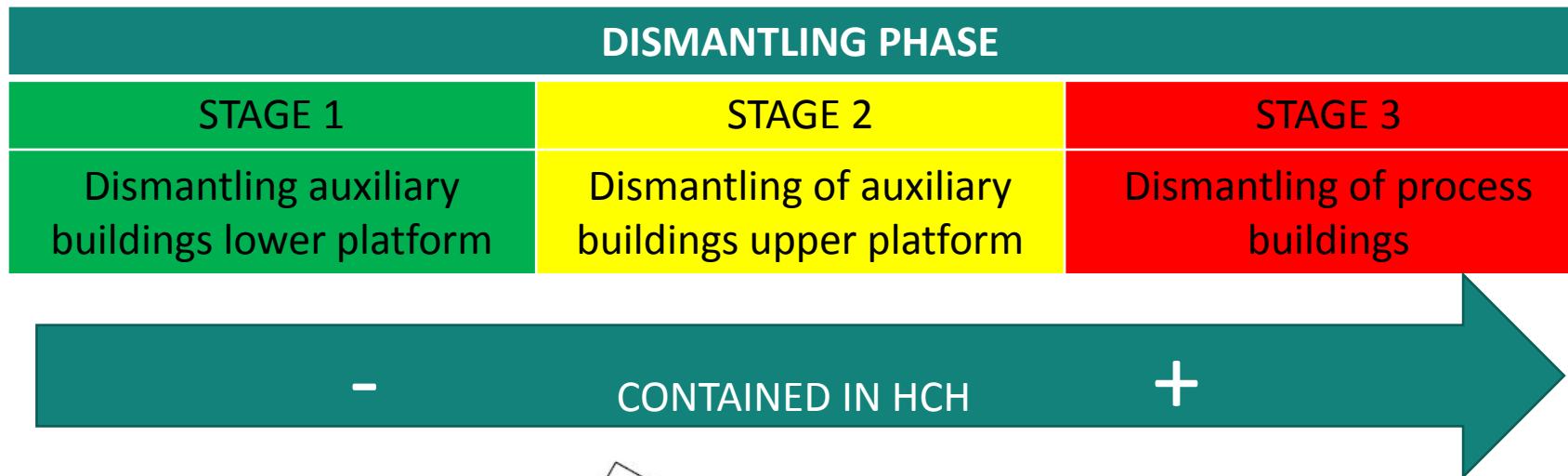
| Edificio | Fachada | Capas | m2 | Pintura exterior | Pintura interior | Enfoscado exterior | Enfoscado interior | Bloque |
|---------------------------|---------|-------|---------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Nave norte | N | 5 | 222,28 | | | | | |
| | S | 5 | 282,81 | | | | | |
| | E | 2 | 146,33 | | | | | |
| | W | 2 | 155,08 | | | | | |
| Nave sur | N | 4 | 479,85 | | | | | |
| | S | 5 | 434 | | | | | |
| | E | 3 | 227,82 | | | | | |
| | W | 3 | 185,1 | | | | | |
| Almacén oeste | N | 2 | 85,43 | | | | | |
| | S | 2 | 133,58 | | | | | |
| | E | 1 | 106,86 | | | | | |
| | W | 2 | 127,26 | | | | | |
| Almacén este | N | 1 | 58,32 | | | | | |
| | S | 1 | 58,31 | | | | | |
| | E | 2 | 61,7 | | | | | |
| | W | 1 | 85,09 | | | | | |
| Nave envasado | N | 1 | 80,17 | | | | | |
| | S | 1 | 42,82 | | | | | |
| | E | 1 | 63,34 | | | | | |
| | W | 1 | 58,06 | | | | | |
| CTE | N | 0 | 48,88 | | | | | |
| | S | 0 | 17,89 | | | | | |
| | E | 0 | 17,89 | | | | | |
| | W | 1 | 17,6 | | | | | |
| EFIG | N | 1 | 30,46 | | | | | |
| | S | 1 | 25,72 | | | | | |
| | E | 1 | 18,01 | | | | | |
| | W | 1 | 17,23 | | | | | |
| ECB | N | 0 | 8,28 | | | | | |
| | S | 1 | 6,75 | | | | | |
| | E | 0 | 6,28 | | | | | |
| | W | 0 | 6,07 | | | | | |
| EOLAB | N | 1 | 53,2 | | | | | |
| | S | 2 | 44,73 | | | | | |
| | E | 0 | 88,38 | | | | | |
| | W | 1 | 93,24 | | | | | |
| ECALD | N | 2 | 76,82 | | | | | |
| | S | 0 | 95,41 | | | | | |
| | E | 0 | 80,12 | | | | | |
| | W | 0 | 76,54 | | | | | |
| EBI | N | 0 | 21,8 | | | | | |
| | S | 0 | 22,71 | | | | | |
| | E | 1 | 47,27 | | | | | |
| | W | 1 | 45,66 | | | | | |
| ETMAM | N | 0 | 41,04 | | | | | |
| | S | 1 | 28,52 | | | | | |
| | E | 2 | 86,24 | | | | | |
| | W | 1 | 87,53 | | | | | |
| ESWC | N | 0 | 7 | | | | | |
| | S | 0 | 5,7 | | | | | |
| | E | 0 | 11,75 | | | | | |
| | W | 1 | 18,04 | | | | | |
| CB2 | N | 0 | 6,51 | | | | | |
| | S | 1 | 7,27 | | | | | |
| | E | 0 | 5,86 | | | | | |
| | W | 0 | 6,08 | | | | | |
| CB3 | N | 1 | 6,51 | | | | | |
| | S | 0 | 7,27 | | | | | |
| | E | 0 | 5,86 | | | | | |
| | W | 0 | 6,08 | | | | | |
| EDIP2 | N | 0 | 11,28 | | | | | |
| | S | 0 | 12,51 | | | | | |
| | E | 0 | 22,58 | | | | | |
| | W | 1 | 22,42 | | | | | |
| EDIP3 | N | 0 | 11,2 | | | | | |
| | S | 1 | 7,28 | | | | | |
| | E | 0 | 24,61 | | | | | |
| | W | 0 | 24,8 | | | | | |
| M ² | | | 4.638 | 4.638 | 4.638 | 4.638 | 4.638 | 4.638 |
| M ³ | | | 1029,57 | 4,6 | 4,6 | 46,4 | 46,4 | 927,5 |
| Masa estimada de HCH (Kg) | | | 55,55 | 5,4 | 12,7 | 6 | 21,3 | 10,2 |
| Retirada mediante | | | | Pulido y aspirado | Pulido y aspirado | Pulido y aspirado | Pulido y aspirado | Pulido y aspirado |
| Tratamiento 1H | | | | Integrado en condiciones estancas | Integrado en condiciones estancas | Integrado en condiciones estancas | Integrado en condiciones estancas | Integrado en condiciones estancas |
| Tratamiento 2H | | | | Oxidación | Oxidación | Oxidación | Oxidación | Oxidación |
| Tratamiento 3H | | | | bioremediación | bioremediación | bioremediación | bioremediación | bioremediación |

DISMANTLING AND DEMOLITION OF THE OLD INQUINOSA FACTORY

CONCEPT



DISMANTLING AND DEMOLITION OF THE OLD INQUINOSA FACTORY



DISMANTLING AND DEMOLITION OF THE OLD INQUINOSA FACTORY



SURFACE TO DEMOLISH:
3,337.82 m²

MAXIMUM HEIGHT:
20.25 m

VOLUME OF DEBRIS
GENERATED: 1,217 m³

ESTIMATED VOLUME OF
NON-HAZARDOUS : 1,020 m³

**Old BAILIN
LANDFILL:
541,66 Tn/day**

ESTIMATED VOLUME OF
HAZARDOUS PER HCH: 180 m³

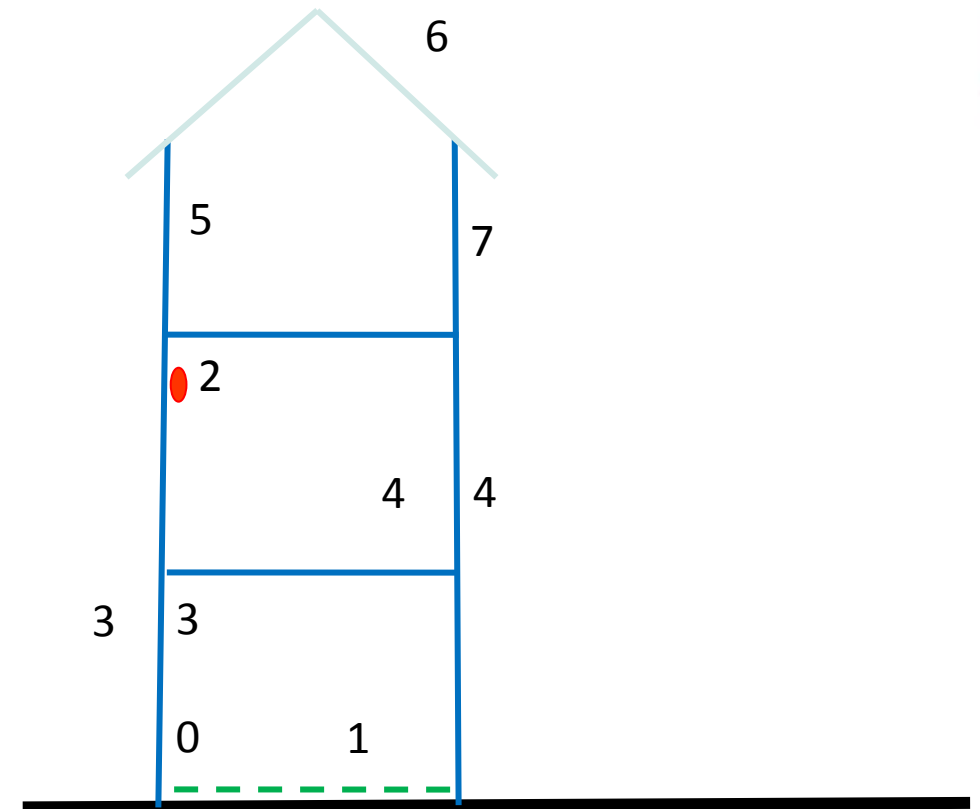
ESTIMATED VOLUME OF
ASBESTOS HAZARDS: 17 m³

DISMANTLING AND DEMOLITION OF THE OLD INQUINOSA FACTORY

MAIN ACTIVITIES



- 0 Horizontal shot blasting of floor - vacuum - waste packaging
- 1 Sealing of the floor with non-slip waterproofing paint
- 2 Dismantling facilities and connections- Asbestos removal
- 3 Painting of interior and exterior coatings with titanium oxide
- 4 Shot blasting interior and exterior walls - Aspiration - Waste packaging
- 5 Block removal, section by section using a grid of approximately 40 cm x 40 cm
- 6 Asbestos removal
- 7 Disassembly of structure



DISMANTLING AND DEMOLITION OF THE OLD INQUINOSA FACTORY

PREVENTIVE AND CORRECTIVE MEASURES



REDUCE CONTAMINATION IN CONSTRUCTION ELEMENTS AND AMOUNT OF DANGEROUS WASTE

- Oxidative treatment through **painting** on vertical walls
- **Shot blasting** of altered surfaces, with the aim of separating contaminated materials from non-contaminated ones.

AVOID THE DISPERSION OF DUST

- **Covering** Canvases and panels of the openings
- Employment **Nebulizers** with microdrop in cort bloq and mach
- **Shot blasting**, vacuuming, filtering and sealed packaging of contaminated areas of walls and screeds
- Protection and **sealing waterproofing paint** on screeds
- **Crushing** of the block at Bailín facilities
- Predictive **model** of atmospheric dispersion

AVOID DISCHARGES OF RUN WATER

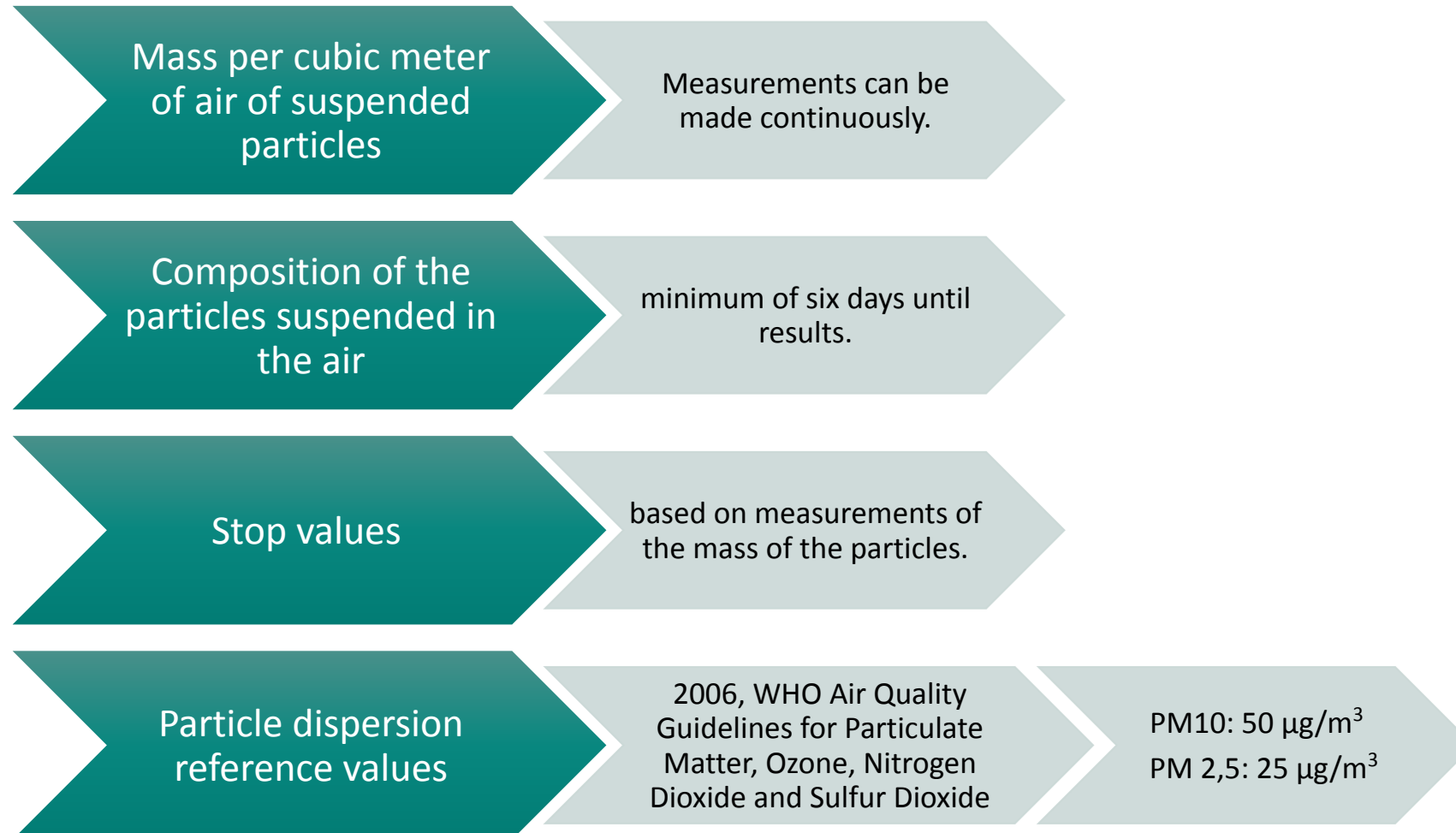
- **water treatment system** installation
- **Drainage network** to minimize the entry of water into the work area.
- **Minimize** the use of water inside the facilities

HEALTH & SAFETY

- Hygienic and decontamination facilities (**Black & White**)
- Application of normative in asbestos removal

DISMANTLING AND DEMOLITION OF THE OLD INQUINOSA FACTORY

CONDITIONS FOR DETERMINATION OF STOP VALUES BY ATMOSPHERIC DISPERSION



DISMANTLING AND DEMOLITION OF THE OLD INQUINOSA FACTORY

STOP THRESHOLDS



Background value around Sabiñánigo

11 $\mu\text{g}/\text{m}^3$ for
PM10
concentration
(mass)

$1.5 \times 10^{-5} \mu\text{g}/\text{m}^3$
for total HCH
concentration.

stop level

40 $\mu\text{g}/\text{m}^3$ mass of
PM 10.

$5.6 \times 10^{-5} \mu\text{g}/\text{m}^3$
mass of HCH in
air.

REFERENCE THRESHOLDS

EPA (CalEPA12)

- 0.3 $\mu\text{g}/\text{m}^3$ (**5,300 times higher**)

NATICH13, OSHA14 and Ontario Air Quality Guidance¹⁵, Canada

- 5 $\mu\text{g}/\text{m}^3$ (**89,000 times higher**).

DISMANTLING AND DEMOLITION OF THE OLD INQUINOSA FACTORY

BUDGET AND SCHEDULE



BUDGET

**PENDING
ENVIRONMENTAL
AGENCY REPORT**

SCHEDULE

• 17 MONTHS

UNIQUE STRATEGIC PROJECTS IN THE SITES AFFECTED BY HCH IN ARAGON



| SECURITY CELL | CORHIBA | THE OLD INQUINOSA FACTORY |
|------------------|------------------|---------------------------------|
| • 2,706,684.10 € | • 1,155,007.56 € | • 4,288,835.31 € |

UNIQUE STRATEGIC PROJECTS IN THE SITES AFFECTED BY HCH IN ARAGON



8,150,526.97 €



SPECIAL THANKS

LAURA MONGE

ADRIAN VISANZAY

THE WHOLE TEAM OF SARGA





THANK YOU FOR YOUR ATTENTION

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<https://descontaminacionlindano.aragon.es>

