Prepared for:

DGEC

Direction générale de l'énergie et du climat

AO9 Bidder Presentation

12th December 2024

Brittany – AO5

GEOQUIPMARINE

SAFELY DELIVERING RELIABLE DATA

Introduction

Torran Purchase
Snr. Project Manager

Jordan Millman
Snr. Project Engineer

Oliver Sirett
Geotechnical Engineer

GEOQUIPMARINE

Project Team

Torran Purchase
Snr. Project Manager

Chris Brandish-Lowe
Head of Engineering

Jordan Millman
Snr. Project Engineer

Daniel Smith
Laboratory Manager

Phil Crawford	*Project Manager*
Nico Meijering	*Head of Marine*
David Oman	*Head of QHSE*
Paul Thornton	*Rig Manager – MV Investigator*
Darren Murphy	*Rig Manager – MV Geoquip Seehorn*
Yann Chevalier	*CPT Superintendent*
Steve Horsewell	*Logistics & Procurement Manager*

Oliver Sirett
Geotechnical Engineer

Roderick Horne
Geotechnical Engineer

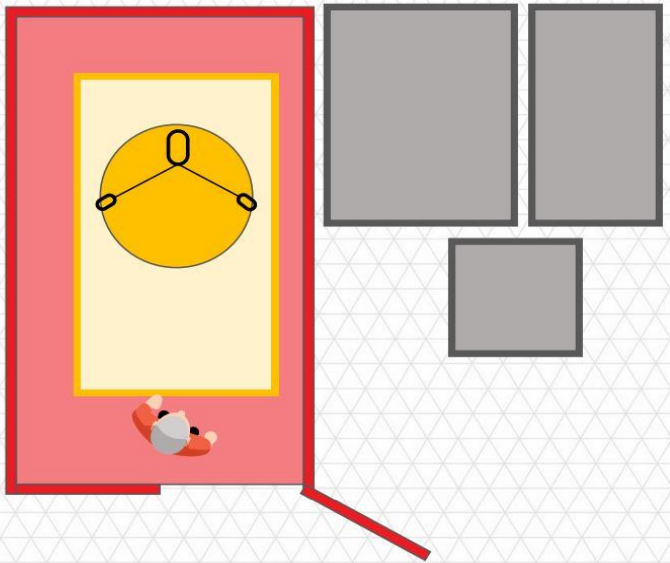
Uzair Mazhar
Assistant Laboratory Manager

GEOQUIPMARINE

Safety Moment

The Lift

- The deck crew were tasked with lifting the compactor from the 16^{ft} container.
- The right hand door was opened to attach the load to the crane and provide line of sight for the banksman.
- Once the crane hook was connected, the load handler retreated to this position.



SAFETY MOMENT

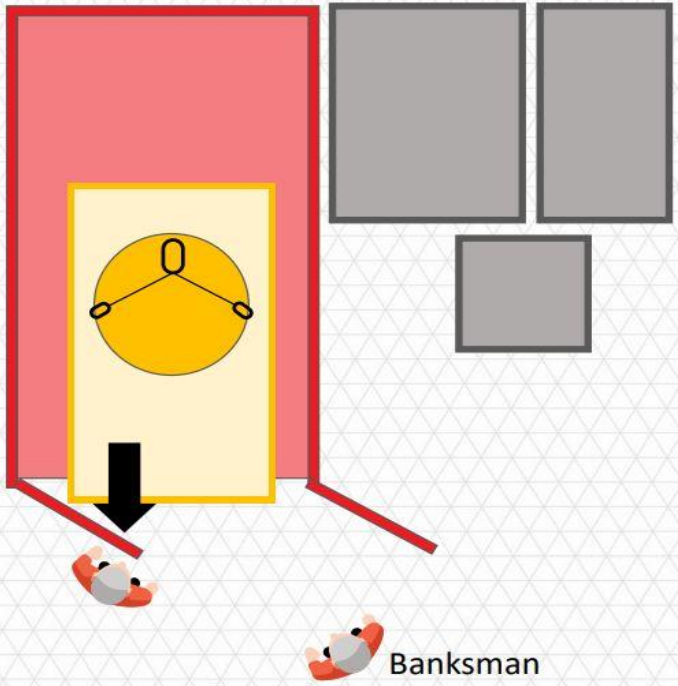
Safe Mechanical Lifting & the Prevention of Falling Objects

STEP CHANGE IN SAFETY

Safety Moment | **Safe Mechanical Lifting**

The Incident

- As the Load Handler unlatched the door, the load skewed left and forward as it centred beneath the crane hook, striking the left door.
- The door struck the Load Handler, throwing them backwards & injuring them.

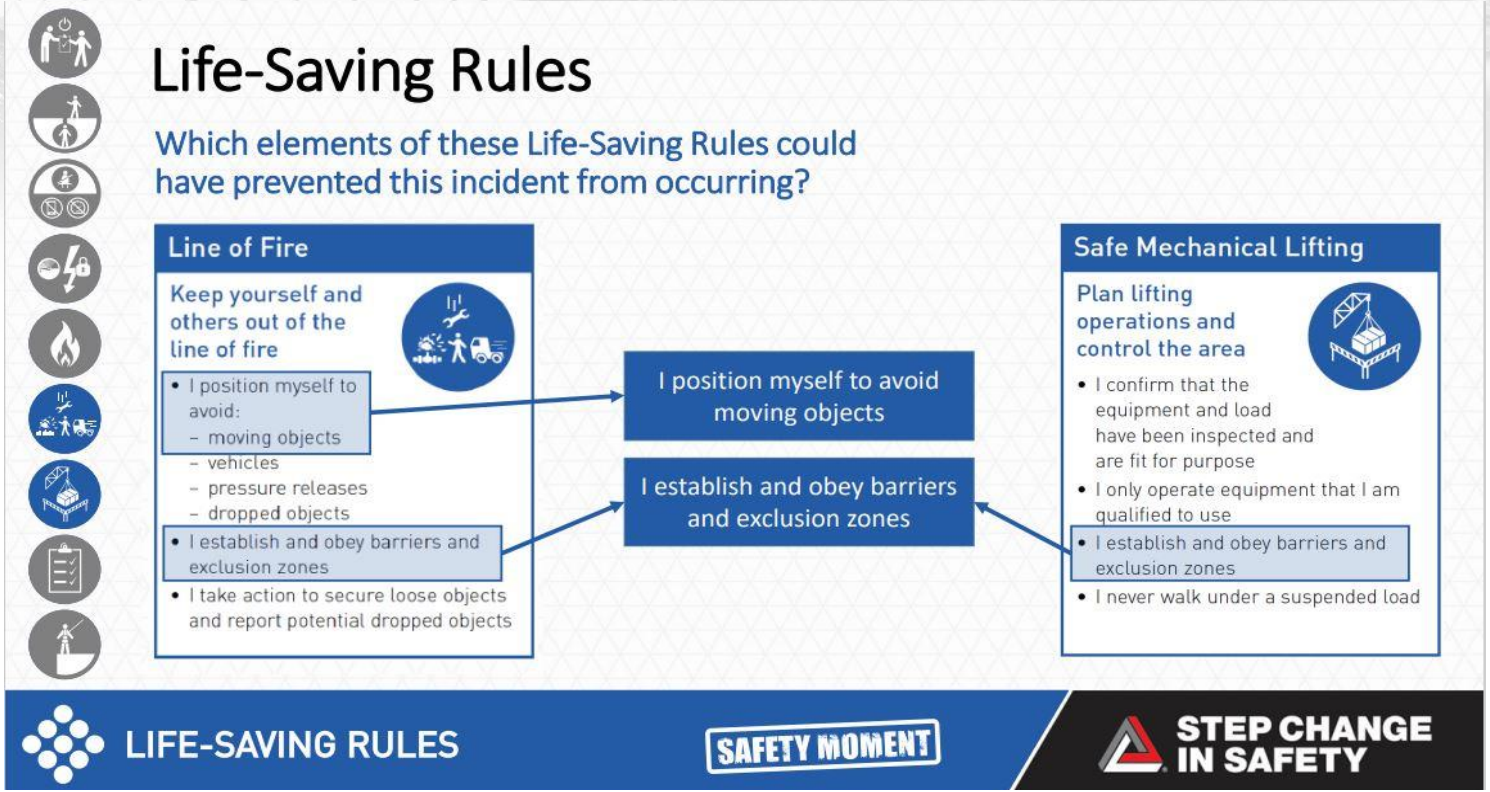


SAFETY MOMENT

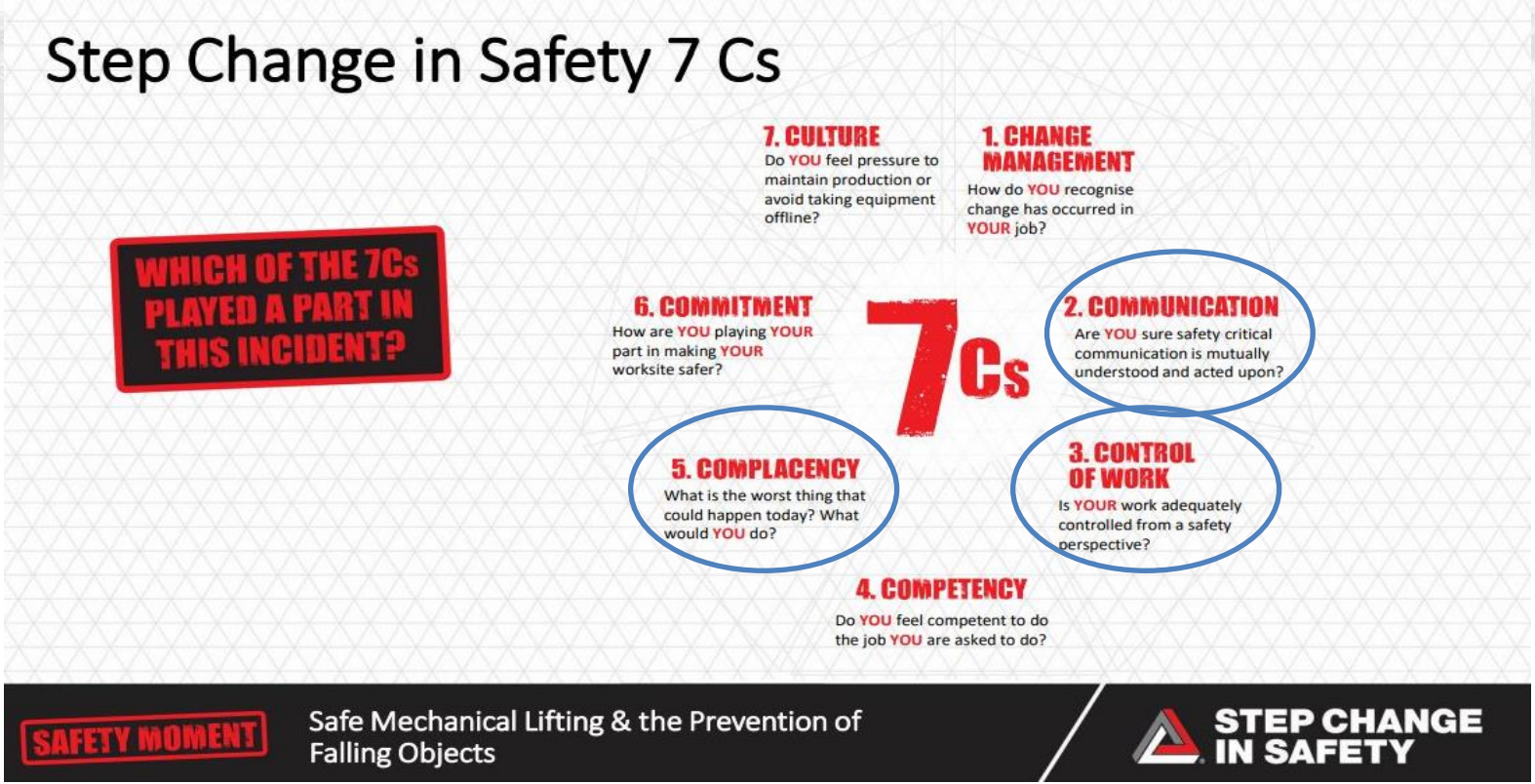
Safe Mechanical Lifting & the Prevention of Falling Objects

STEP CHANGE IN SAFETY

Safety Moment | **Safe Mechanical Lifting**



Safety Moment | **Safe Mechanical Lifting**



Safety Moment | **Geoquip S.T.A.R.**

S.T.A.R. Lifesaving Rules:

- These subject have been highlighted to cover the most critical safety hazards in our operations.
- The rules remind everyone of the key Geoquip Marine requirements intended to keep people safe at our sites, both onshore and offshore.
- The rules are about reinforcing best practice, educating our staff, taking care of each other and being accountable for our actions.







TABLE OF CONTENTS

1. Geoquip Marine

Geoquip Marine

Geoquip Marine provides offshore geotechnical solutions worldwide to the renewable and energy industries, infrastructure developers, and government and research organisations.

We safely obtain data from the seabed and sub-strata, interpret that data and provide engineering and scientific recommendations in reports to our clients.

Our Mission

- To pioneer **environmentally sound** geotechnical data acquisition practices.
- To be one of the world's **leading deep water** geotechnical data acquisition companies.
- To be the industry's **most customer centric** provider, adopting technical solutions that provide the best, most accurate data.

GEOQUIPMARINE

Our Fleet

Geoquip Seehorn

Dina Polaris

Geoquip Elena

Expansion via additional vessels, equipment and other capabilities is planned within 2025 & 2026

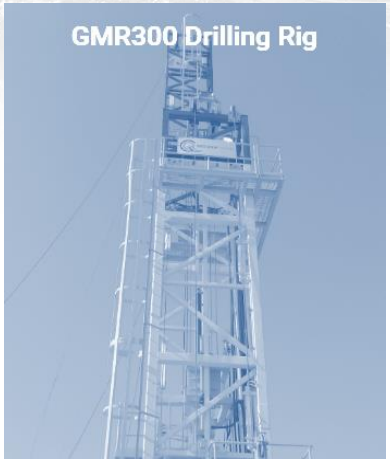
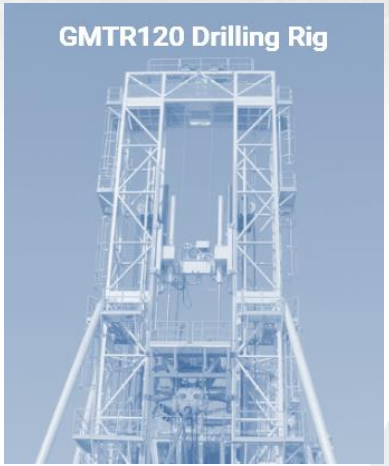
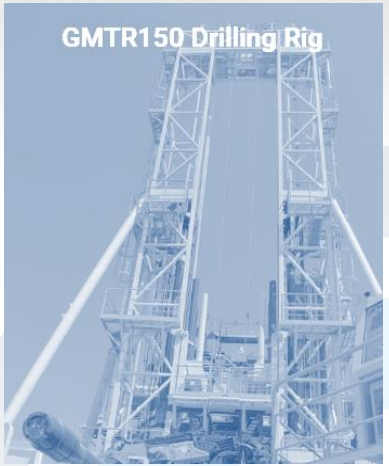
Geoquip Saentis

Geoquip Speer

Investigator

Our Drilling Rigs

Engineered by Geoquip Marine for optimal geotechnical drilling performance.

Shallow Water	Midwater	Deep Water	Ultra Deep Water
			
Water plus borehole depth up to 350m with 4m of heave compensation	Water plus borehole depth up to 600m with 4m of heave compensation	Water plus borehole depth up to 2500m with 4.5m of heave compensation	Water plus borehole depth up to 3500m with 6m of heave compensation

Variations of the GMR300 and GMR600 series are also deployed across the fleet

Our Onshore Soils & Rock Testing Laboratory

Geoquip Marine can now offer both standard and advanced geotechnical laboratory testing services, in addition to its offshore surveys.

Utilising cutting edge technology in conjunction with decades of geotechnical experience, this new facility can meet today's testing requirements, including ISO, ASTM and BS standards

Classification Testing
Water Content
Atterberg Limits
PSD (inc. Hydrometer)
Particle Density
Min-Max Density

Permeability and Consolidation Testing
Constant Rate of Strain
Incrementation Loading
Constant Head Permeability

Index Strength Testing
Torvane & Pocket Penetrometer
Fall Cone
Miniature Vane

Triaxial Testing
UU Triaxial
CIU (with or without bender element)
CID Triaxial
Thermal and Electrical Property
Thermal Conductivity
Electrical Resistivity

Cyclic Testing
Cyclic Triaxial
Cyclic Direct Simple Shear
Resonant Column

Shear Testing
Direct Shear
Ring Shear

GEOQUIPMARINE

Our Data Interpretation and Geospatial Team

Ground modelling

- Data management and integration
- Geospatial dataset management across largescale sites
- Data in 2D and 3D images / models
- Group data based on identified stratigraphy, to further understand spatial differences
- Can be outputted into other GIS platforms for extended data integration

Data interpretation

- Specialist soil experience like Glauconite & Chalk

GEOQUIPMARINE

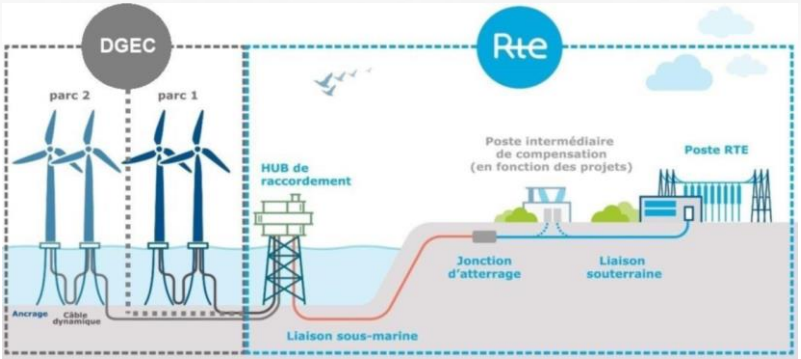
Our Clients

Geoquip Marine operate with both private and public sectors clients, including offshore renewable energy companies, scientific organizations, global energy majors and governments.

2. Project Overview

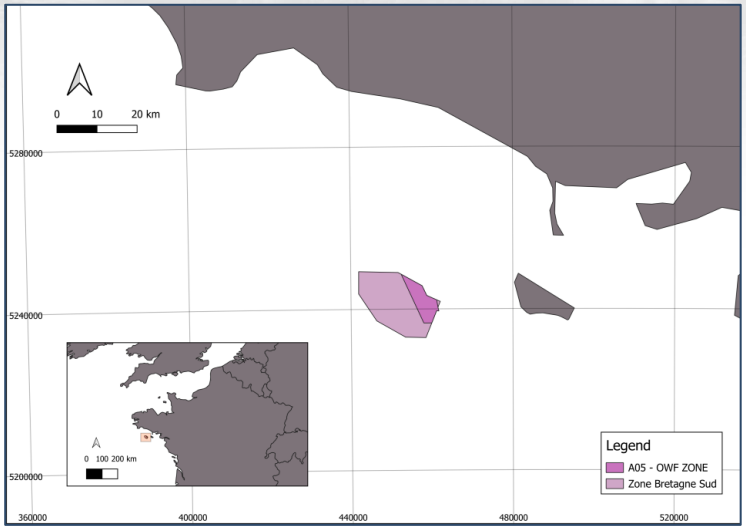
Appointment

- During Q3 2021, Geoquip Marine Operations AG was appointed the AO4(8)/AO5 project in consortium with Tecnoambiente S.L.U.
- Geoquip Marine and Tecnoambiente contracted to undertake geotechnical and geophysical surveys respectively for both DGEC's offshore windfarm area, and RTE's offshore substation and cable route.
- The purpose of these investigation were to understand the main characteristics of the sites to enable tender candidates and RTE to estimate project costs.



Final Scope of Works | **DGEC**

AO5		
Borehole Type	**Borehole Depth**	**Quantity**
Continuous PCPT	20	1
Continuous Sampling	20	12
Composite (Sampling + PCPT)	20	5



GEOQUIPMARINE

3. Equipment & Methodology

3.1 Geotechnical Drilling Vessels

- MV Investigator
- MV Geoquip Seehorn

MV Investigator & GMR300

4-Point Anchoring
Positioning System

300 m
Water + borehole depth

4.0 m
Heave compensation

2.0 m
Max Wave height

25.0 kt
Max Windspeed

GEOQUIPMARINE

MV Geoquip Seehorn & GMR602

DP2 System
Positioning System

600 m
Water + borehole depth

4.0 m
Heave compensation

2.5 m
Max Wave height

30.0 kt
Max Windspeed

GEOQUIPMARINE

3. Equipment & Methodology

3.2 Sampling & Cone Penetrometer Testing (PCPT/CPTu)

Downhole Wireline Sampling

- Push and Piston samplers
- Thin, Medium and Thick wall Shelby tubes
- 70mm Inner Diameter
- 1.00m Stroke Length
- 100kN Thrust

Downhole Wireline Coring

- In-house Developed Leading Shoe Design
- 70mm Core Diameter
- 1.50m Stroke Length

Downhole PCPT Tools

- 1.60m and 3.00m Tools
- 5cm^2 and 10cm^2 Cone Tip Area
- Real time measurements of:
  - » Tip Resistance
  - » Sleeve Friction
  - » Pore Water Pressure
- Derived Parameters:
  - » Friction Ration
  - » Pore Pressure Ratio
  - » Undrained Shear Strength (Clays)
  - » Relative Density (Sands)

GEOQUIPMARINE

Offshore Soils & Rock Laboratory

- Offshore soil classification and strength parameter determination
- Sample Photography
- Triaxial Test Apparatus
- Miniature Laboratory Vane
- Torvanes
- Pocket Penetrometers
- Soil drying ovens
- Point Load Machine

GEOQUIPMARINE

3. Equipment & Methodology

3.3 Onshore Laboratory Testing & Reporting

Laboratory Testing Strategy & Specification

A Lab Testing Strategy document was produced, in agreement with the client, to demonstrate GEOQUIP's understanding of:

- The proposed onshore laboratory testing requirements.
- The laboratory that will be performing the works.
- Characterising the communication lines and responsibilities, identify methodologies that will enable an appropriate duration of the programme to be met.
- Specific processes and methods for performing each of the proposed tests.


GEOQUIPMARINE

SAFELY DELIVERING RELIABLE DATA.

LAB TESTING STRATEGY METHODOLOGIES

Bretagne Preliminary Site Investigation

Prepared for: RTE & DGEC

MINISTÈRE
DE LA TRANSITION
ÉCOLOGIQUE

Geoquip Marine Ref: GMOP21-G-019-LTS-01
Revision: B2
Date: 24 November 2022

Offshore Geotechnical Site Investigations

Reporting & Deliverables

In addition to standard pre-mobilisation documentation to define and agree the execution and safety management of this project, the following reports were produced for each stage:

- AO5 – Field & Factual Report
  (Factual reported as 2 phases)

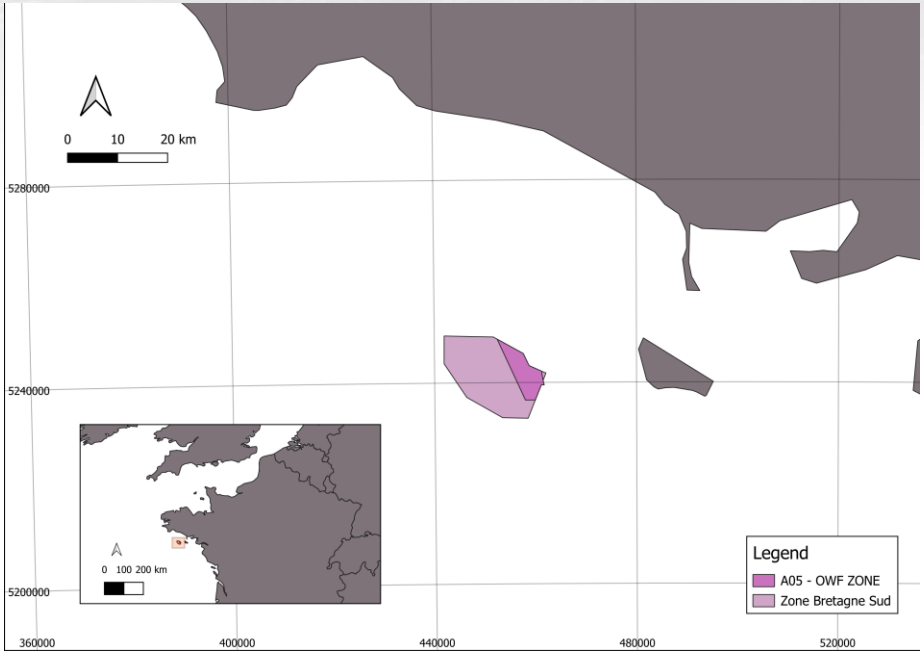
Volume I – Field Report
Field operations and preliminary results
Cover Page
Revision status and QA/QC
Executive summary, including an overview map of investigated points
Table of contents
List of symbols and terms used
Chapter 1: Scope of field operations with description of the soil investigation platform (vessel/rig), overview over investigated points, with maps and coordinates, HSE, and organisation of work.
Chapter 2: Log of drilling operations
Chapter 3: Sampling operations, procedures, and preliminary results, including inventory of recovered samples
Chapter 4: In situ testing operations, procedures, and preliminary results
Chapter 5: Field laboratory operations, procedures, and test results
Chapter 6: Preliminary geotechnical borehole logs
Chapter 7: Log of daily field operations
Chapter 8: Positioning and survey. including water depth and tidal measurements
References
Appendix A-F

Volume II – Factual Report
Measured and derived geotechnical parameters and final results
Cover Page
Revision status and QA/QC
Summary of main report modifications from previous revision
Executive summary, including an overview map of investigated points
Table of contents
List of symbols and terms used
Chapter 1: Scope of field operations with description of the soil investigation platform (vessel/rig)
Chapter 2: Final geotechnical borehole logs and soil profiles, with proposed stratigraphic schematization
Chapter 3: Final in situ test results, including discussion on validity of results
Chapter 4: Sampling procedures and final results
Chapter 5: Laboratory test procedures and final results
Chapter 6: References
Appendices

4. AO5 Project - Brittany

Project Overview | **AO5**

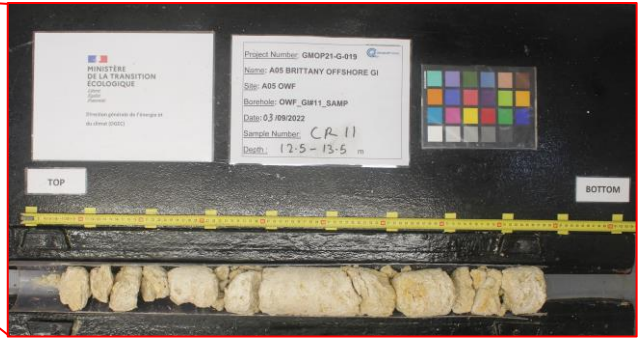
AO5		
Borehole Type	**Borehole Depth**	**Quantity**
Continuous PCPT	20	1
Continuous Sampling	20	12
Composite (Sampling + PCPT)	20	5



Ground Conditions | **AO5**

Client: RTE_DGEC
Project Name: A05 Bretagne Offshore GI
Project No.: GMOP21-G-019
Location: A05 OWF

DEPTH (m)	SAMPLE	IN SITU TEST	LEGEND	STRATA DESCRIPTION
				00.00m Dense to very dense greenish grey (GLEY 1 10Y 5/1) highly calcareous slightly gravelly uniformly graded fine to medium SAND (grf-m)Sa) with frequent shell fragments (1mm-10mm)
				03.05m - thin bed of medium dense sandy silt
				04.10m Medium strong greyish orange (10 YR 7/4) highly calcareous slightly sandy DOLOMITE with frequent voids (1mm-2mm) and shell fragments (1mm-5mm). Discontinuities are very closely spaced dippings (5-15°) stepped to undulating rough open to moderate
				07.75m - medium bed of silty slightly weathered sandstone
				08.50m Weak very high density moderate yellow (5Y 7/6) very highly calcareous highly weathered SHELLY LIMESTONE with frequent shell fragments (2mm-5mm) and rare fossils (2mm). Discontinuities are very close to closely spaced sub horizontal dipping (0-20°) planar rough surface with voids (5mm).
				11.50m Medium strong high density yellow (5Y 7/6) very highly calcareous highly weathered SHELLY LIMESTONE with occasional shell fragments (2mm-8mm) and fossils (3mm-5mm). Discontinuities are closely spaced sub horizontal dipping (0-20°) undulating rough open to moderately wide clean with occasional voids (3mm-5mm).
				14.50m - becoming white (N9)
				15.50m Moderately weak greyish green (10GY 4/2) highly calcareous silty fine GLAUCONITE DOLOMITE. Discontinuities are medium spaced dipping (0-5°) stepped to undulating rough open with silty sand infill and rare orange staining
				16.50m - discontinuities becoming very closely to closely spaced



GEOQUIPMARINE

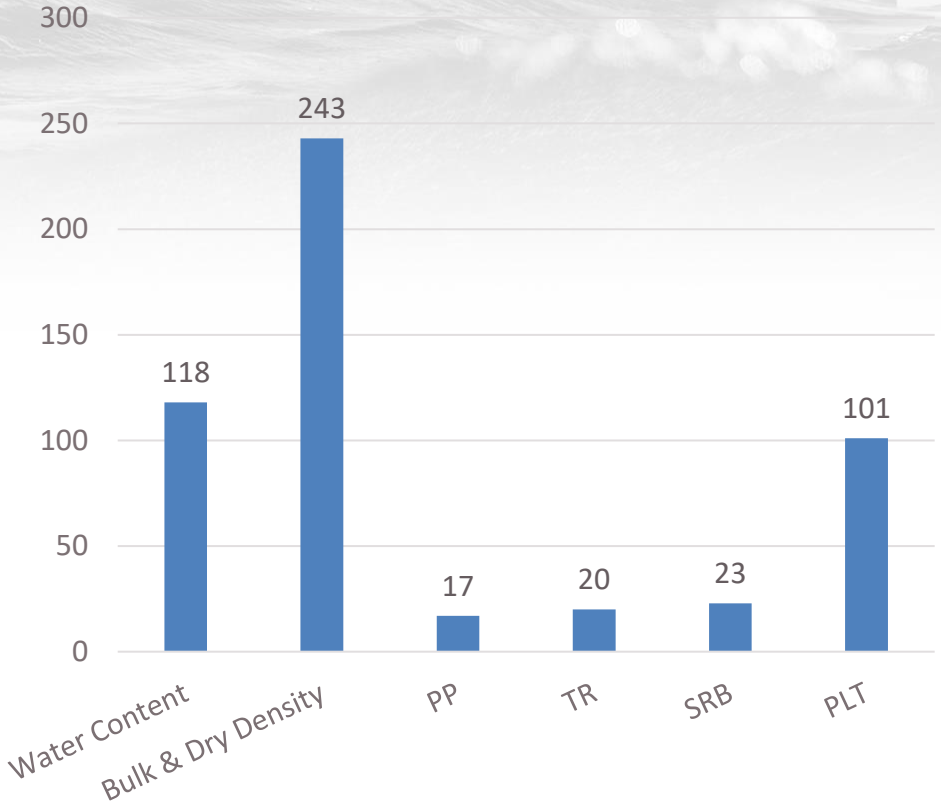
Ground Conditions – Cohesive Layers

- Rare across site
- Very high to extremely high strength CLAY
- Thin Layers

GEOQUIPMARINE

Offshore Lab Testing

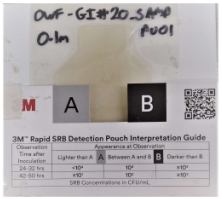
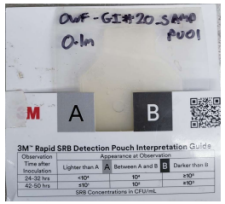
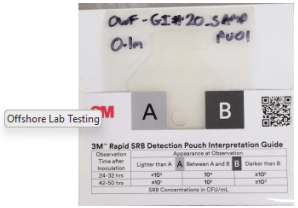
Test Category	Test Type	Test Standard
Classification	Water Content	ISO 17892-1
	Bulk & Dry Density	ISO 17892-2
Strength	Pocket Penetrometer	GM-MSP-OI-5-3-3
Chemical & Physical Properties	Thermal Resistivity	ASTM D5334
	Sulphate Reducing Bacteria	GM-MSP-OI-5-3-3
Rock	Point Load Test	ISRM Suggested Method



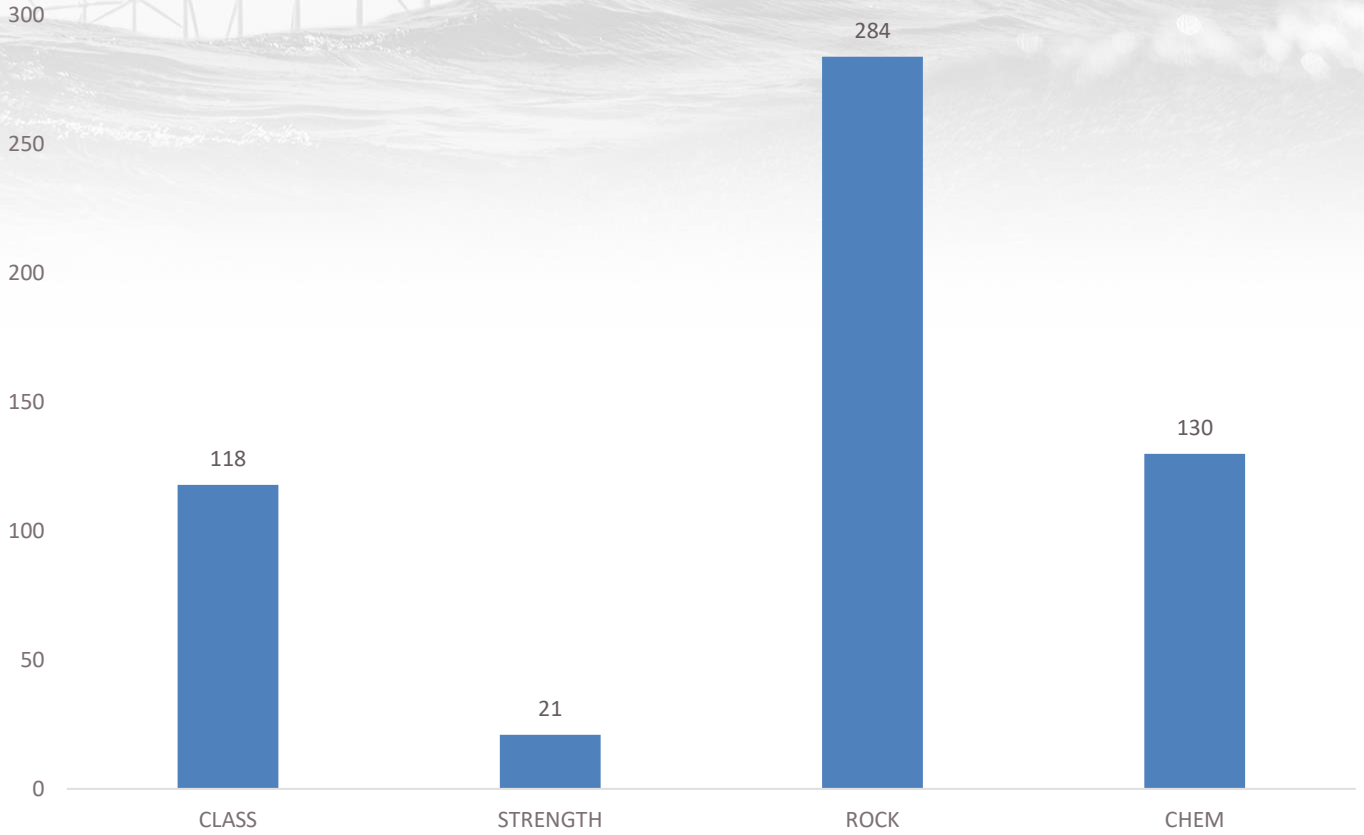
GEOQUIPMARINE

Sulphate Reducing Bacteria

Client: DGEC Project Name: A05 BRETAGNE OFFSHORE GI Project Number: GMOP21-G-019	Location: A05 OWF Borehole No.: OWF_GI#20_SAMP	GEOQUIPMARINE

Day 0 (0 hrs)	Day 1 (24-32 hrs)	Day 2 (43-50 hrs)
		
SRB/mL: $<10^4$	SRB/mL: $<10^4$	SRB/mL: $\leq 10^1$
Sample Number: PU01	Depth: 0.1m	
SRB PHOTO LOG Ref.: GMOP21-G-0129-FLD		

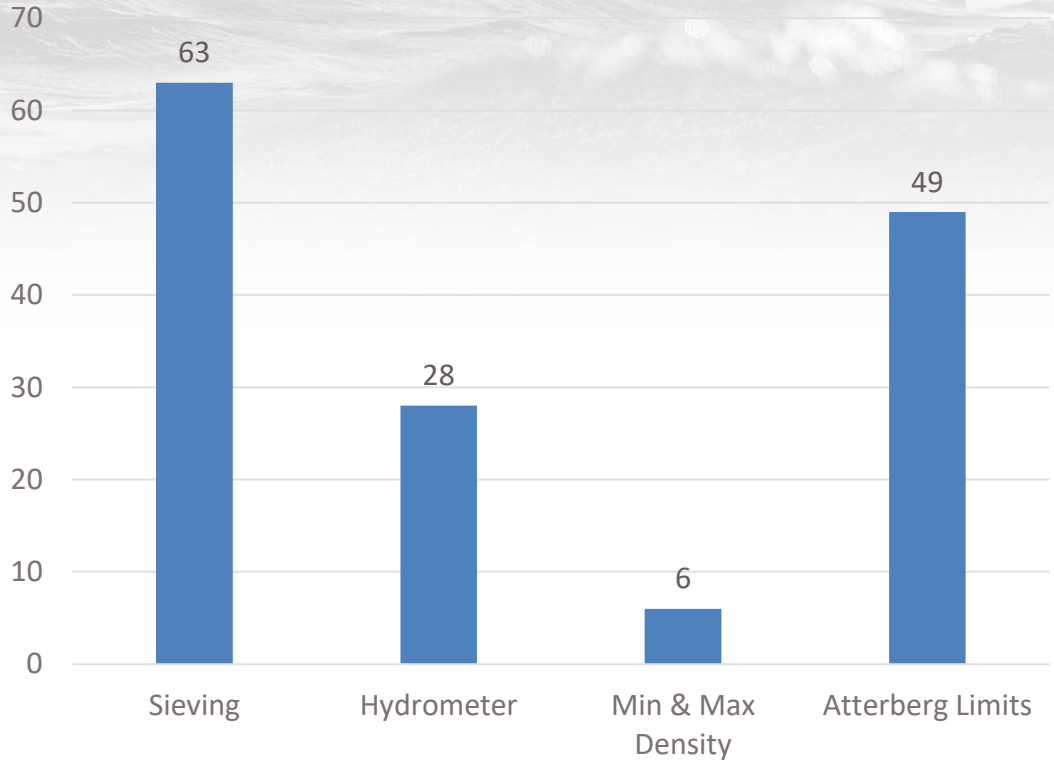
Lab Testing



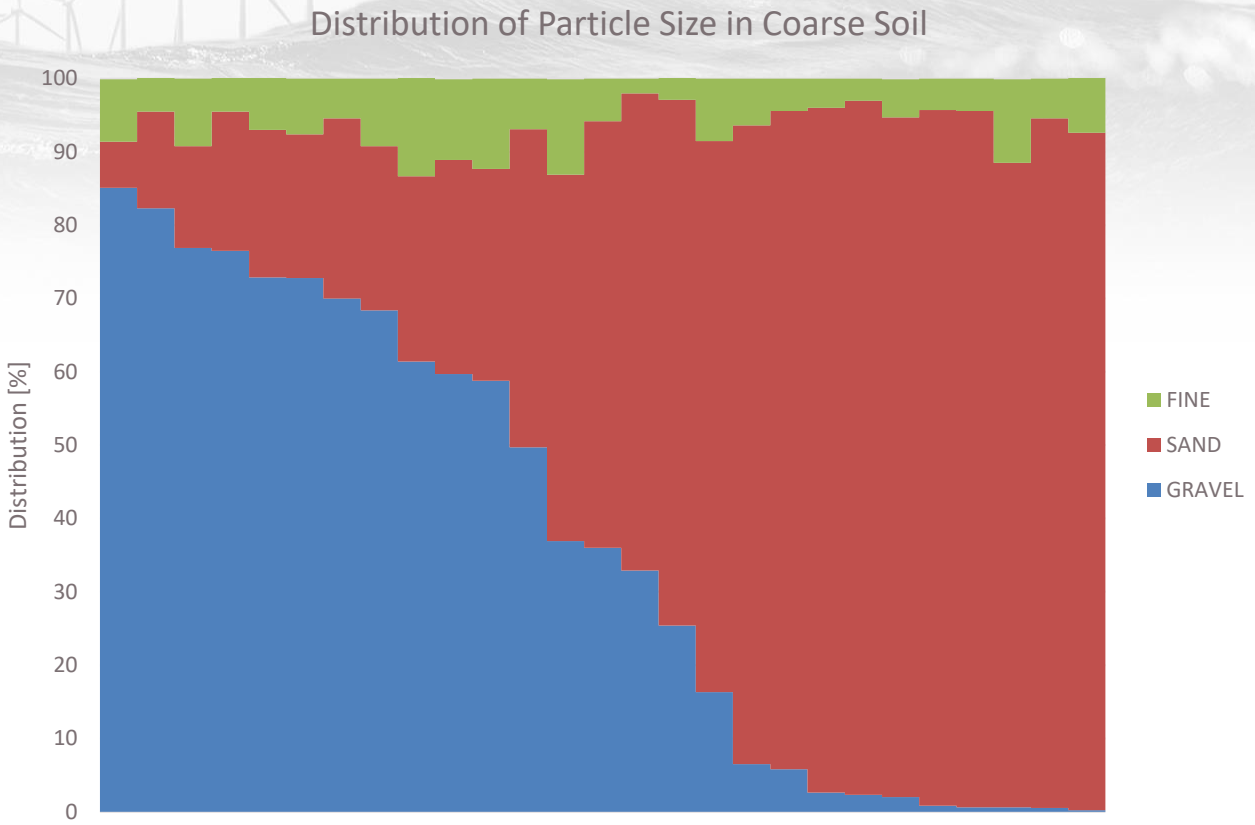
GEOQUIPMARINE

Onshore Lab Testing - Class

Test Type	Test Standard
Sieving	ISO 17892-4
Hydrometer	ISO 17892-4
Min & Max Density	NGI Geolabs Method
Atterberg Limits	ISO 17892-12

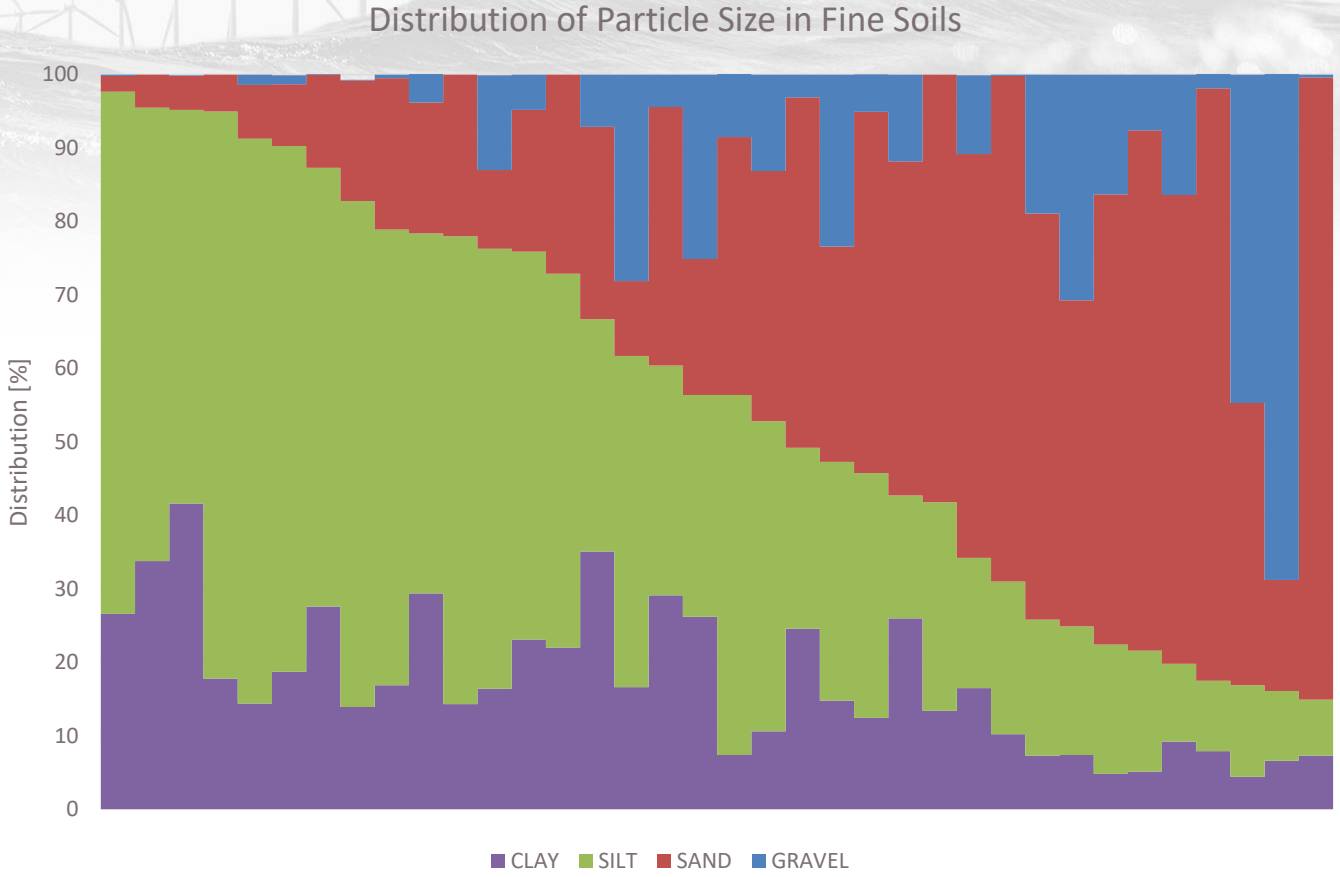


Particle Size Distribution – Non-Cohesive (Sieve)



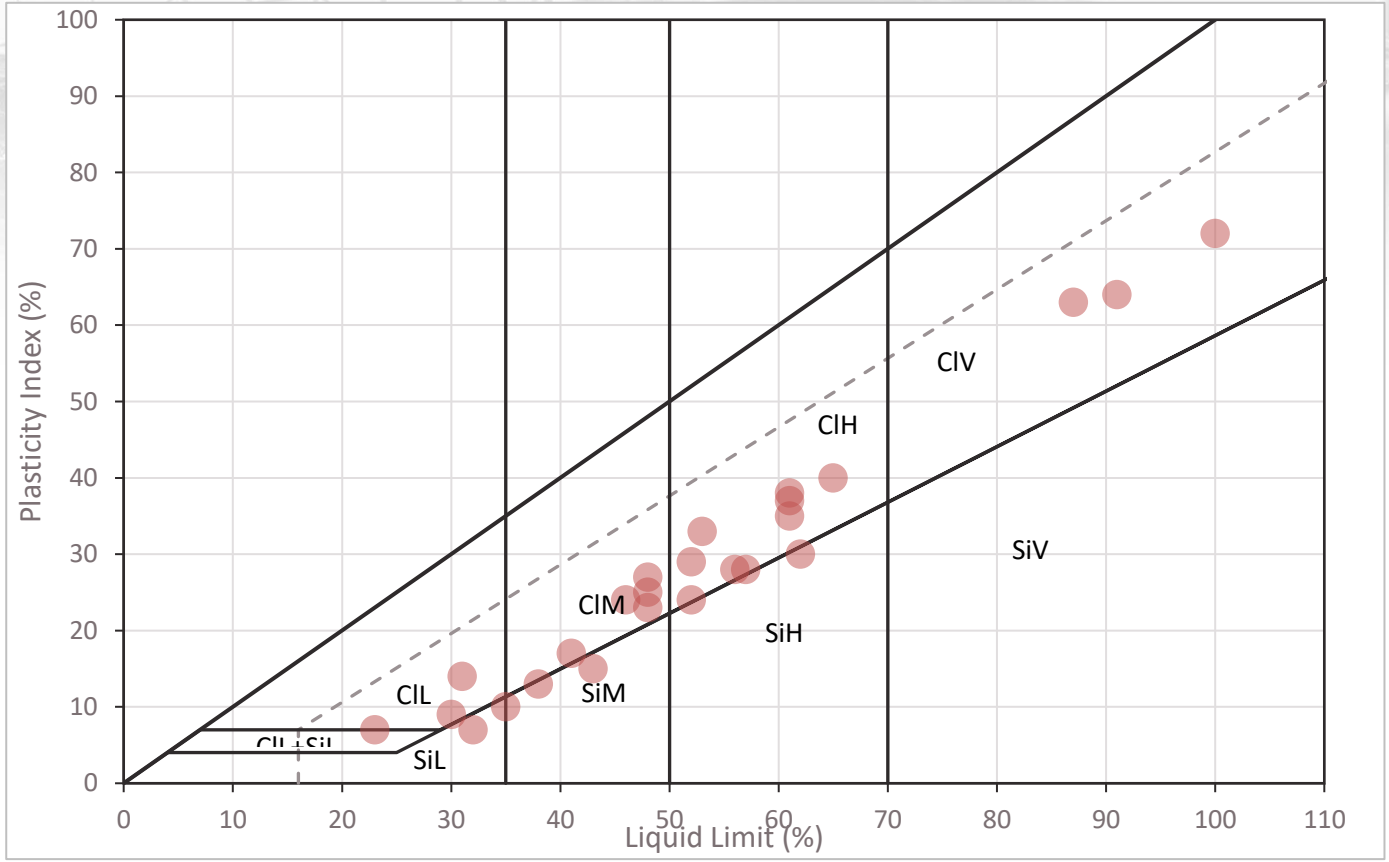
GEOQUIPMARINE

Particle Size Distribution – Cohesive (Hydrometer & Sieve)



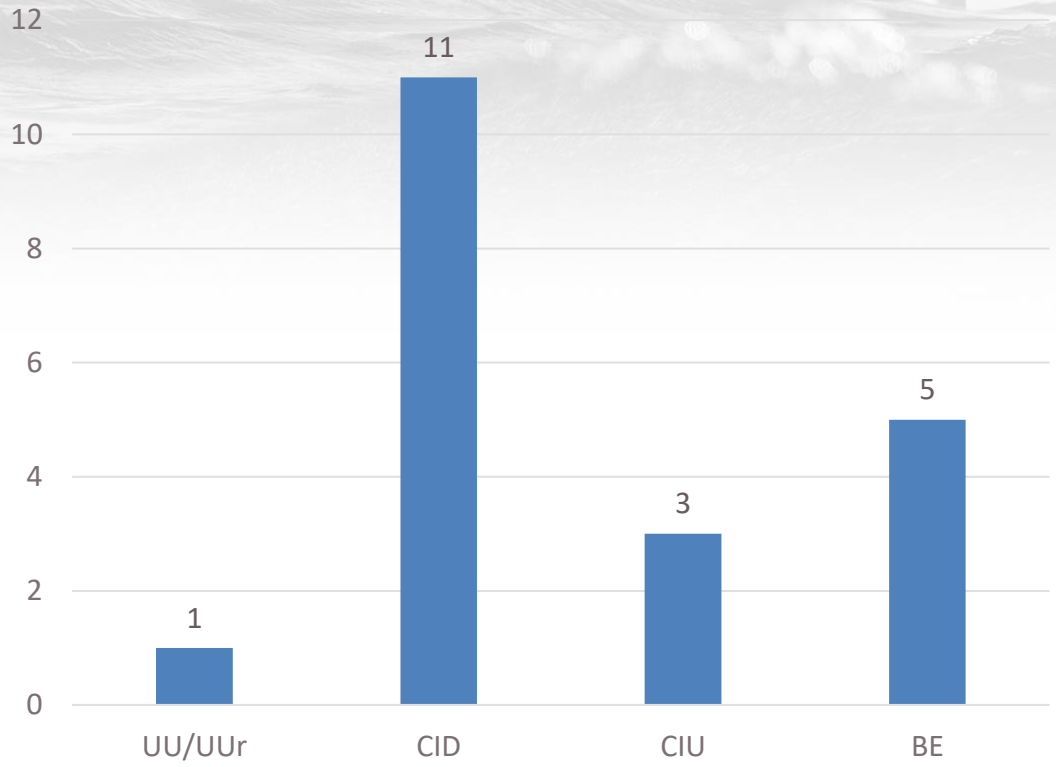
GEOQUIPMARINE

Atterberg Limits



Lab Testing - Strength

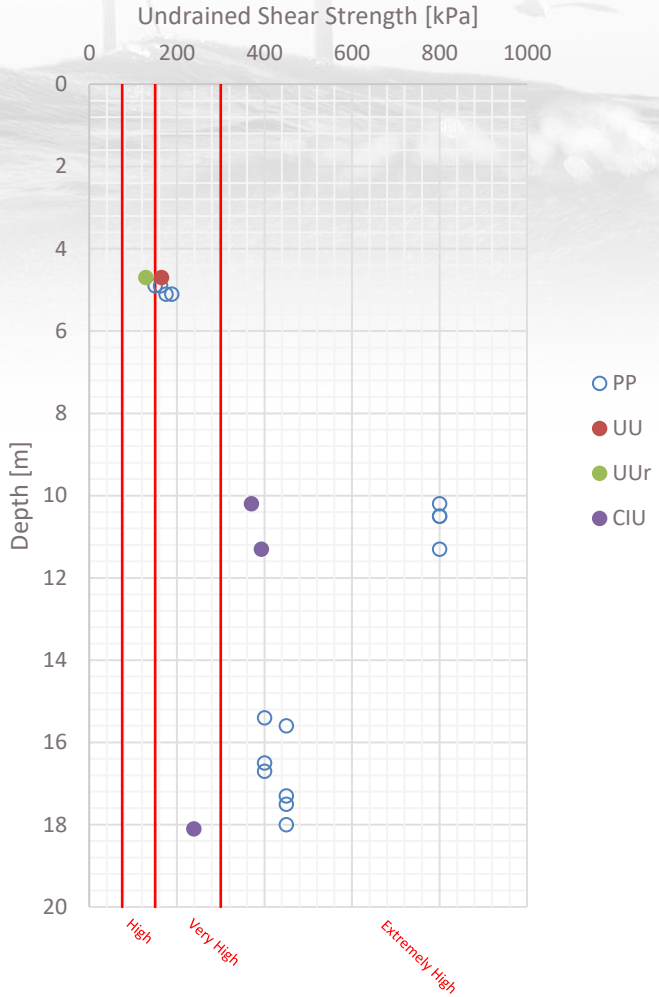
Test Type	Test Standard
UU/UUr	ISO 17892-8
CID	ISO 17892-9
CIU	ISO 17892-9
BE	ASTM D8295



GEOQUIPMARINE

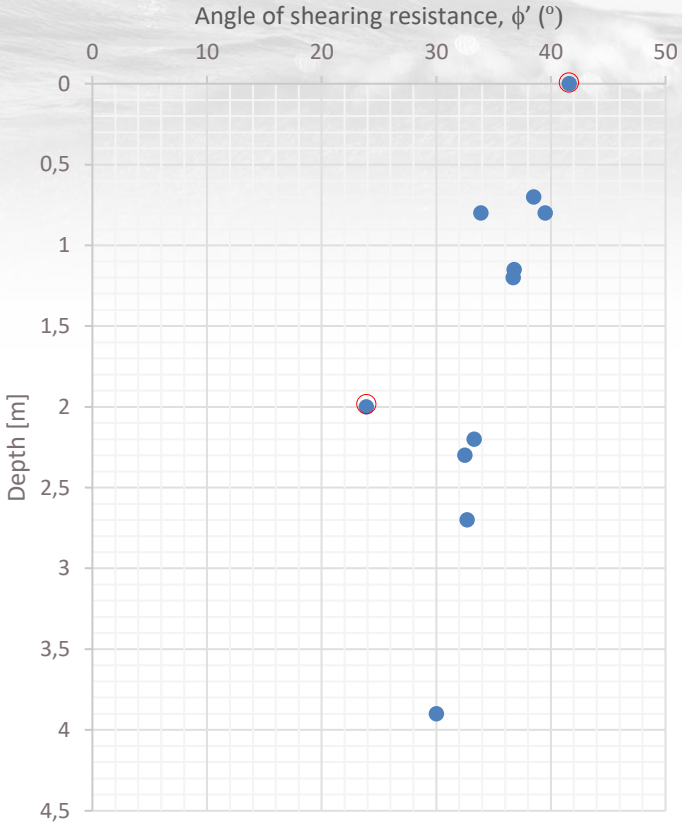
Cohesive Strength Testing

- Su increasing with depth
- Good correlation between PP & UU at lower depths
- Correlation harder to maintain in deeper more competent material



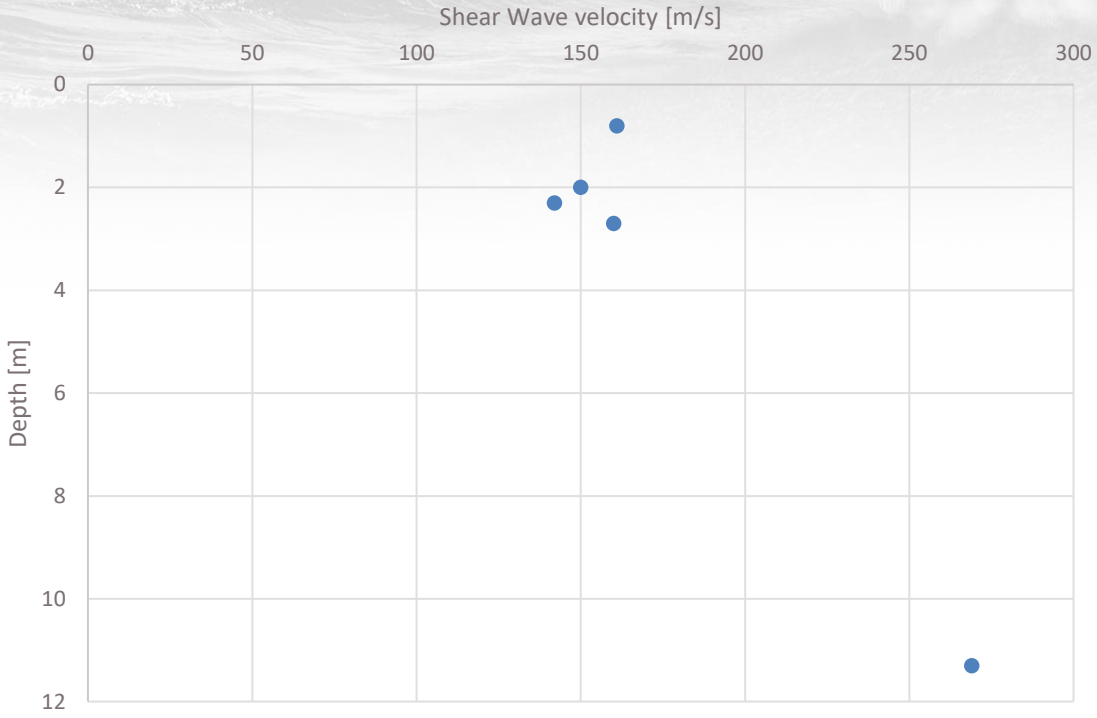
Non-Cohesive Strength Testing

- Majority of results between 32 and 39
- Low angle corresponds with high cohesion, silty sample
- High angle sample contains shell fragments



GEOQUIPMARINE

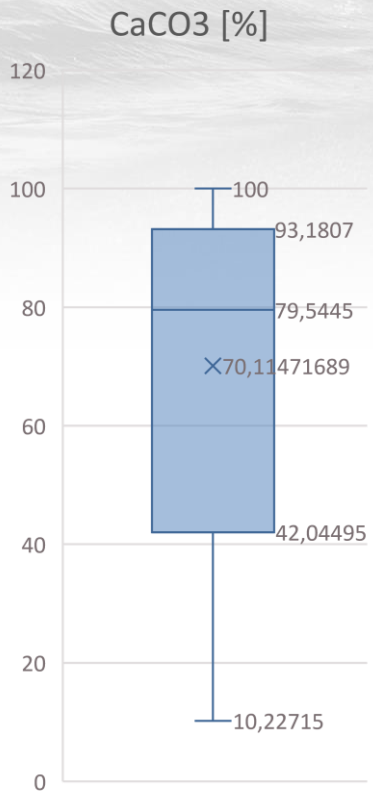
Dynamic Testing

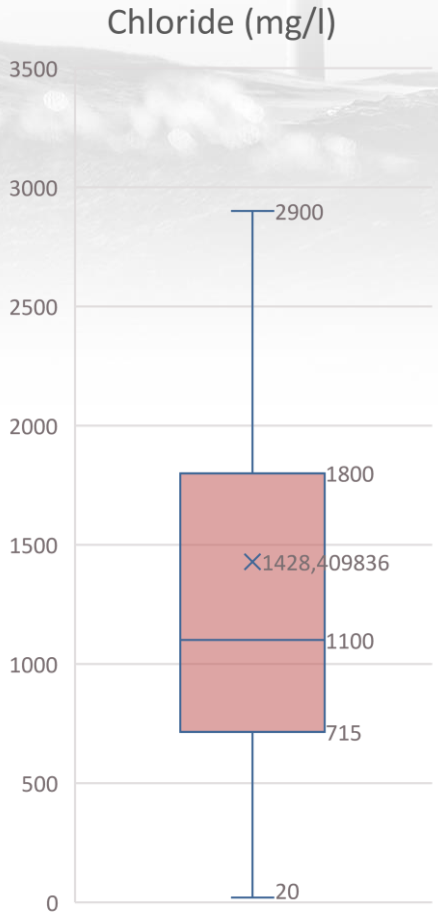


GEOQUIPMARINE

Lab Testing – Chemical

Test Type	Test Standard
Carbonate Content	BS1377-3
Chloride Content	BS1377-3

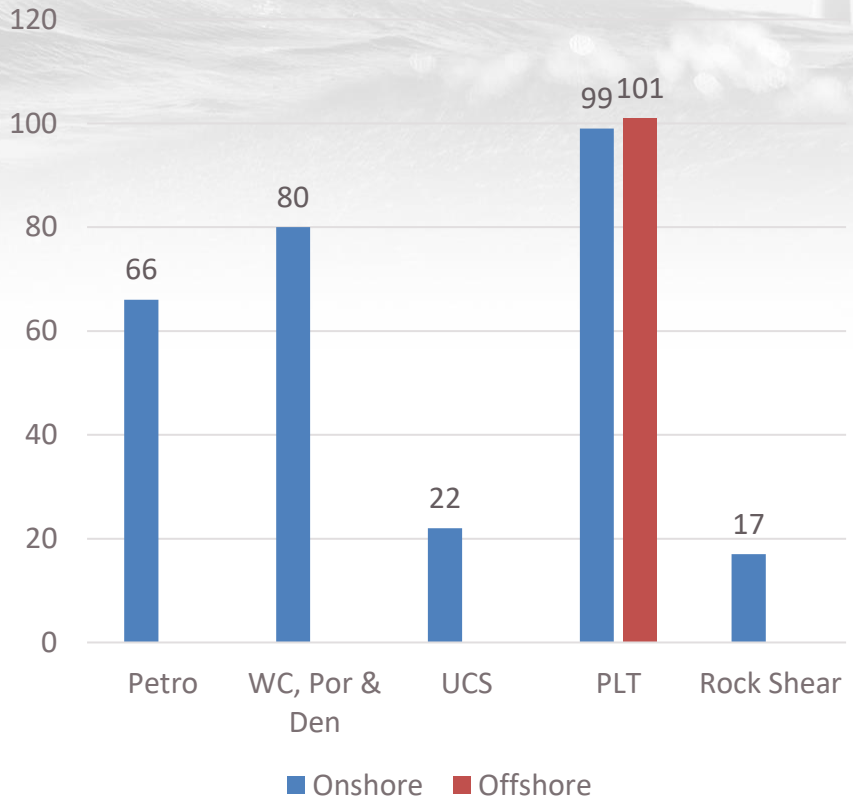




GEOQUIPMARINE

Lab Testing - Rock

Test Type	Test Standard
Petrographic Analysis	Geolabs In-House Method (based on ISRM Suggested Methd)
ISRM WC, Porosity & Density	ISRM Suggested Method
UCS	ISRM Suggested Method
Point Load Test	ISRM Suggested Method
Rock Shear Test	ISRM Suggested Method



GEOQUIPMARINE

Petrographic Analysis - Dolomite

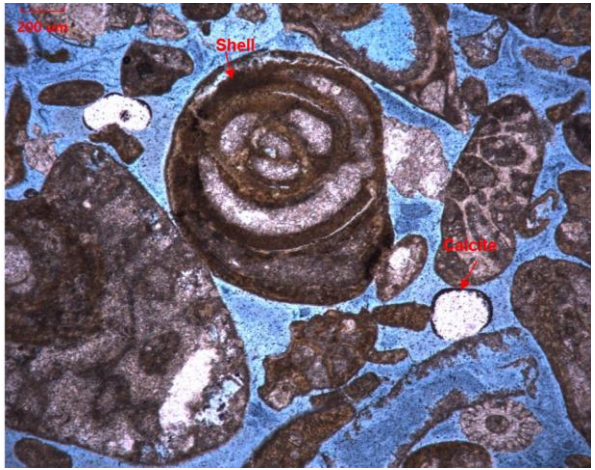
- Found across site
- Very shallow
- Consists of carbonate materials, clay and opaque materials

- Fossiliferous Dolomite *(left)*
- Glauconite Dolomite *(right)*

GEOQUIPMARINE

Petrographic Analysis - Limestone

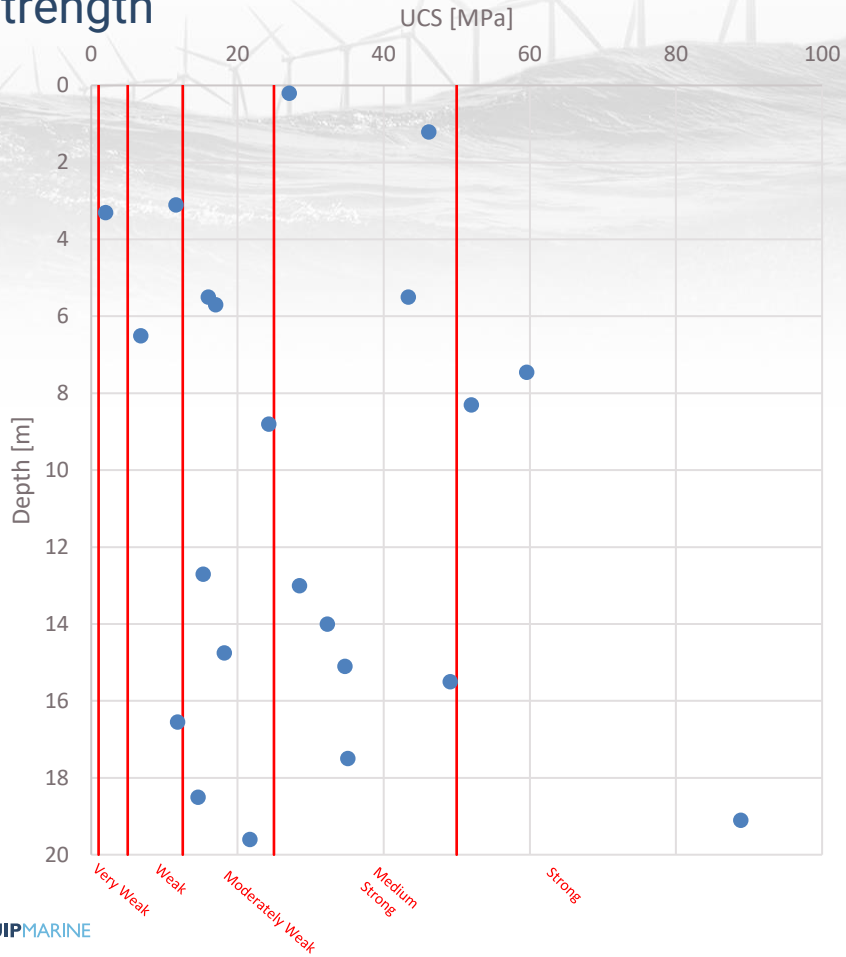
- Found across site
- Very shallow
- Consists of carbonate materials, clay and opaque materials

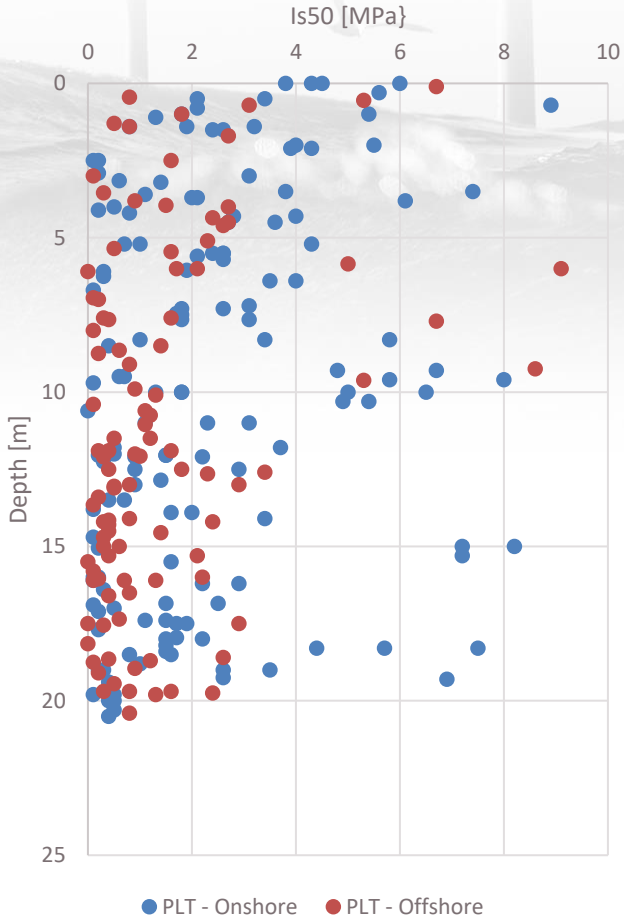


- Fossiliferous Glauconite Limestone *(left)*
- 50x Photomicrograph of shelly Limestone *(right)*

GEOQUIPMARINE

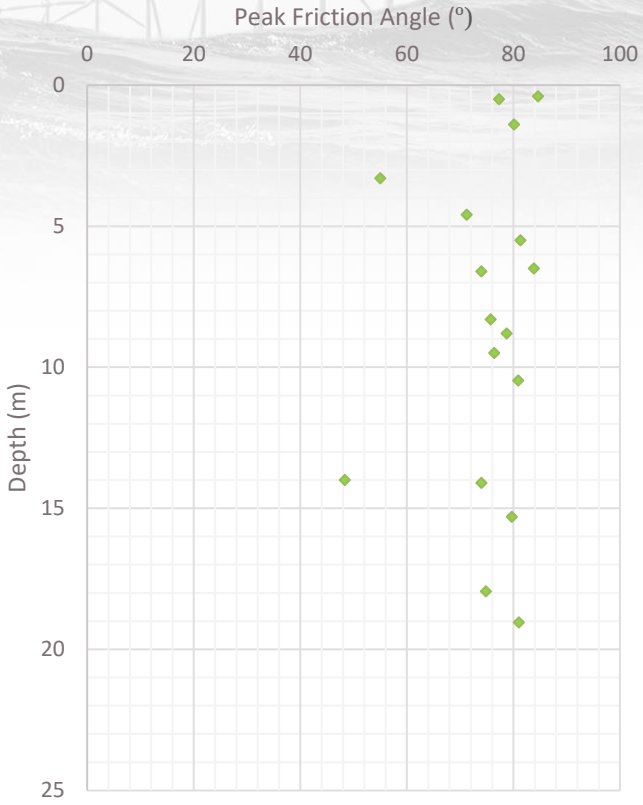
Rock Strength

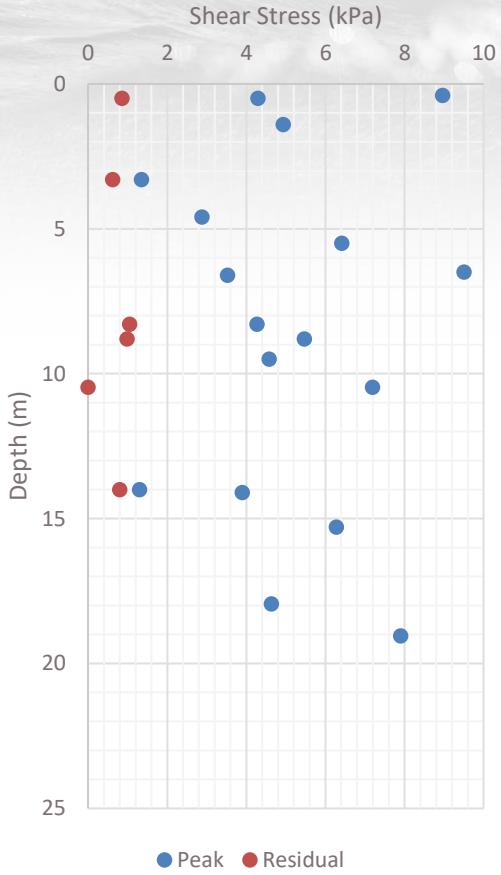




GEOQUIPMARINE

Rock Strength – Rock Shear





Non-Conformance Reports

- 65 NCFs
- Insufficient Material
- Nature of Material

Any Questions?

Thank you

Torran Purchase
Senior Project Manager
torran.purchase@geoquip-marine.com

Jordan Millman
Senior Project Engineer
jordan.millman@Geoquip-marine.com

A09 Offshore Wind Farm Geotechnical data

12 December 2024

Providing integrated environmental, survey and inspection solutions

Globally. Offshore & Nearshore. On shore. In our own Labs.

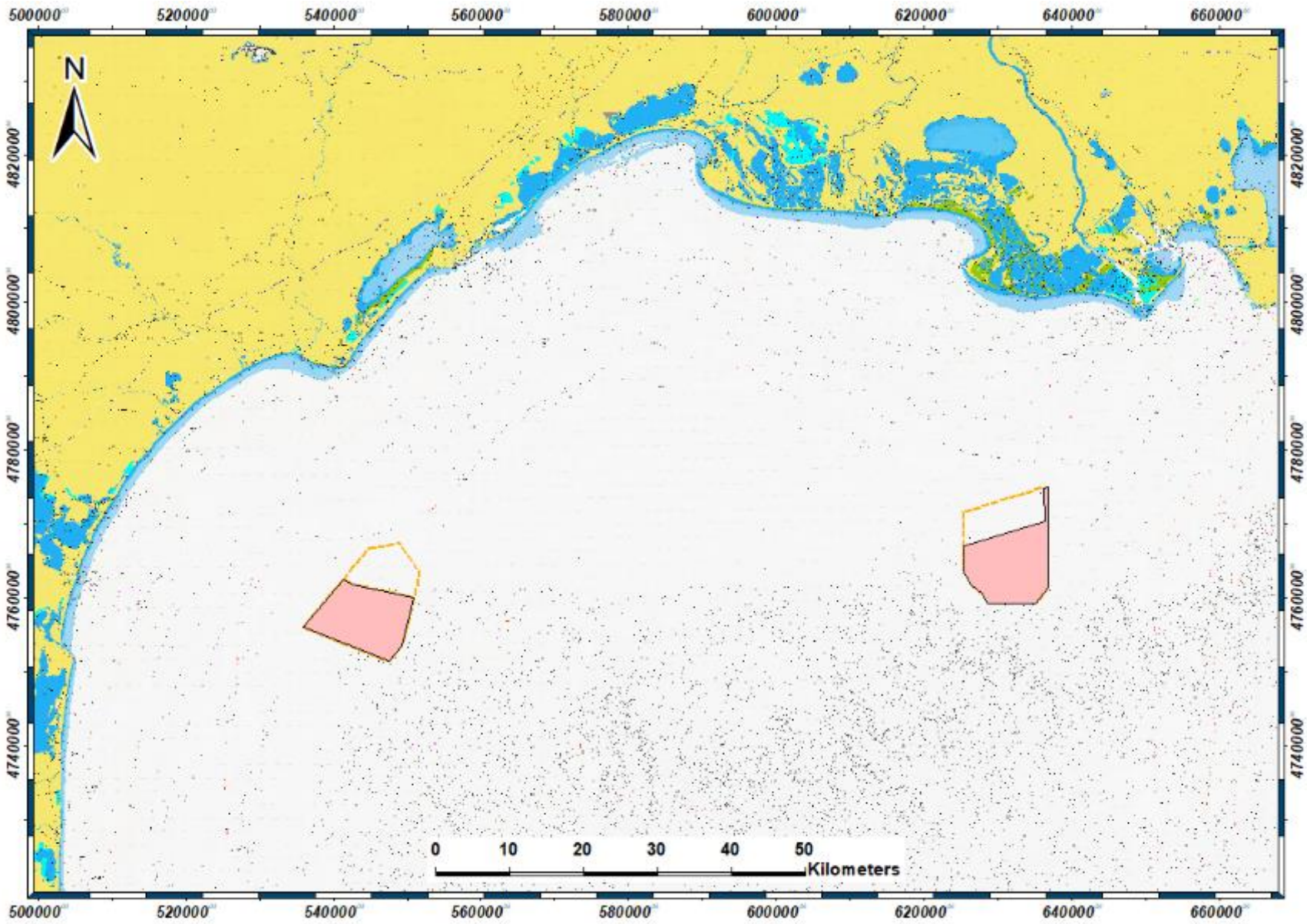
TECNOAMBIENTE

A TRADEBE COMPANY

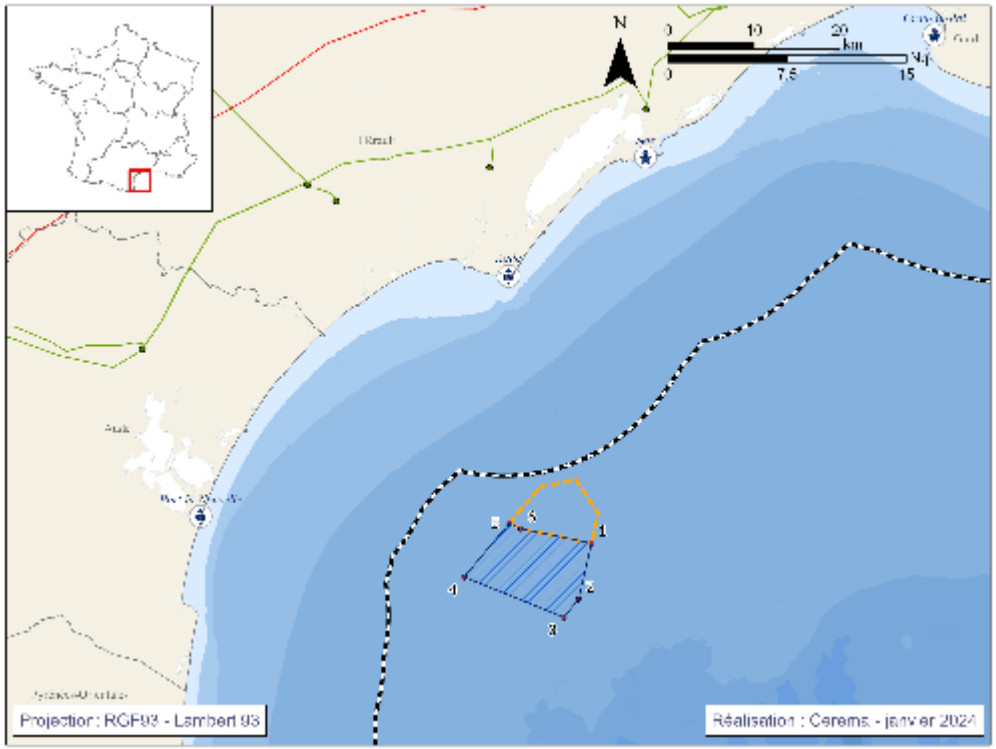
Enabling sustainable progress

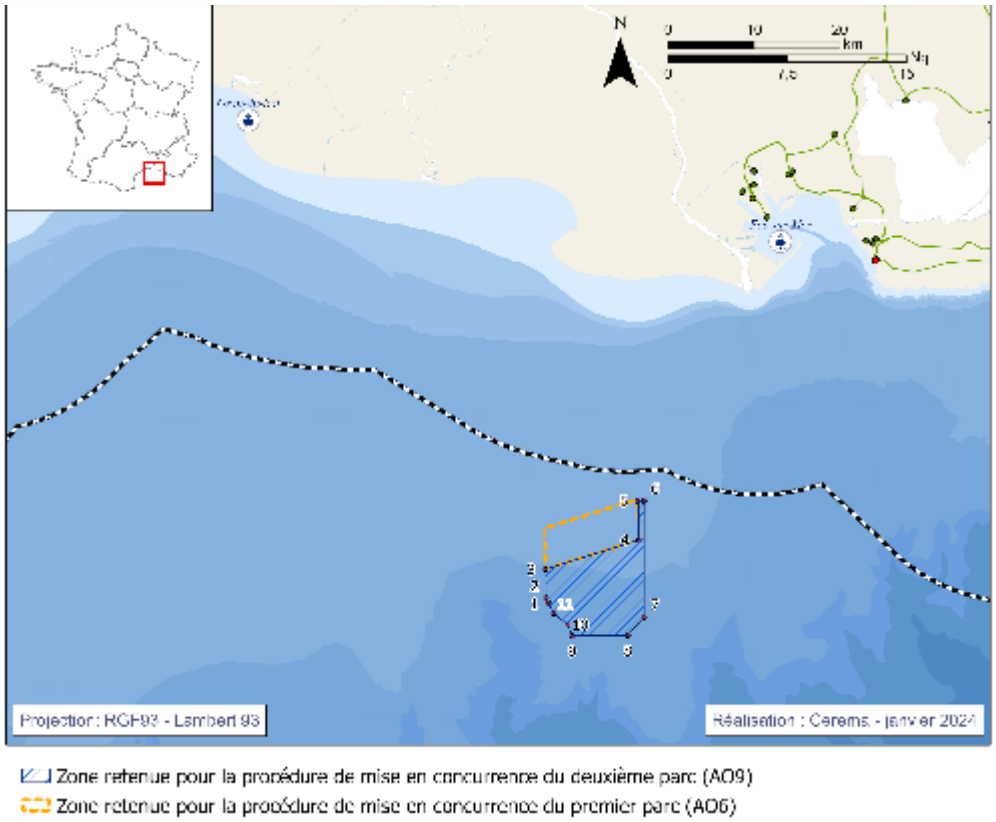
- Overview of the AO6/O9 areas
- Surveys performed by TA
- Geotechnical Acquisition
- Methodologies Offshore
- Onshore Lab tests and data processing
- Geotechnical Results Occitanie Project 2
- Geotechnical Results Paca Project 3

Q/A session after


500000
520000
540000
560000
580000
600000
620000
640000
660000
4820000
4800000
4780000
4760000
4740000
N
0
10
20
30
40
50
Kilometers

AO6/O9 – Zones





Windfarm area (OWF) Occitanie project 2 (Occ2)

Bathymetric range: -68 m to -104 m *(Vertical reference Bathyelli v2 ZH)*

Windfarm area (OWF) Paca project 3 (Paca3)

Bathymetric range: -71 m to -128 m *(Vertical reference Bathyelli v2 ZH)*

TECNOAMBIENTE ACQUISITION for AO6/O9

TECNOAMBIENTE
A TRADEBE COMPANY

Geophysical surveys

UXO boxes for ALARP

UHRS

(SHOM provided MBES/SSS/SBP)

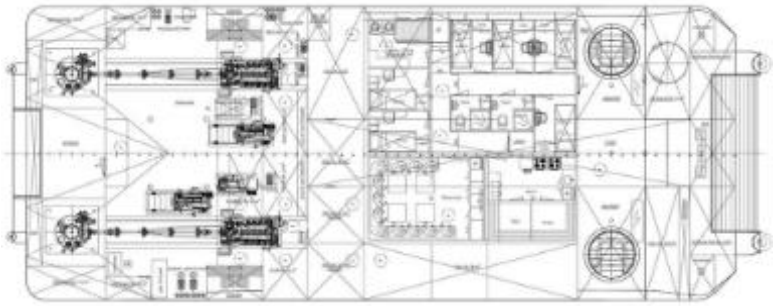
Geotechnical

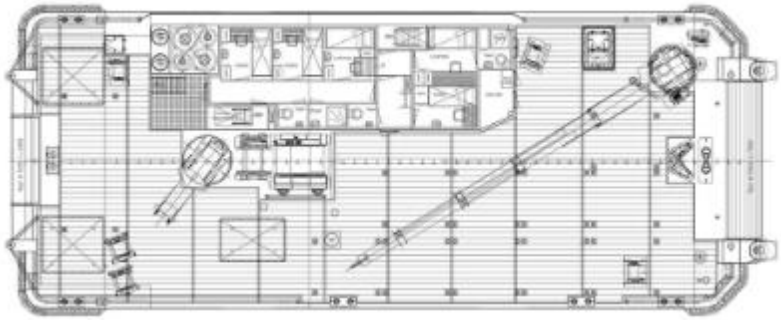
Sabed CPT to 30m

VC and PC to 9m

(Fugro provided BH for 2 OSS to 80m)

ROXANE Z





TYPE: Multipurpose Vessel
MODEL: Eurocarrier 3413
OWNER: JIFMAR Offshore Services
FLAG: French
BUILT IN / ON DUTY: 2015
IMO: 9751456

A06-09 – Geotechnical SI

Geomil equipment

carma® quality coring

GEO

Offshore testing

TECNOAMBIENTE
A TRADEBE COMPANY

ONSHORE LABORATORY TESTING A06

TECNOAMBIENTE
A TRADEBE COMPANY

Type	Test	Nº of tests planned	Nº of tests deleted	Nº of Results Z1	Nº of Results Z2	Lab. standard
Classification	EN-ISO soil description with PP and TV in cohesive material plus photograph	100	0	4xPC 2xVC	4xPC 6xVC	EN-ISO

Type	Test	Nº of tests planned	Nº of tests deleted	Nº of Results Z1	Nº of Results Z2	Lab. standard
	Water content	97	0	59	38	ISO 17892-1:2014
	Particle density	4	0	3	1	ISO 17892-2:2014 - Method 5.1
	Min. & Max. Density	21	3	2	16	ASTM D4254-16 - Method A
	Submerged Unit weight	97	1	58	38	ISO 17892-2:2014 - Method 5.1
	Atterberg limits	26	0	10	16	ISO 17892-12:2018
	PSD wet sieve (sedimentation if fines are more than 15%)	92	0	29	59	ISO 17892-4:2016
	Sedimentation	92	0	33	59	ISO 17892-4:2016

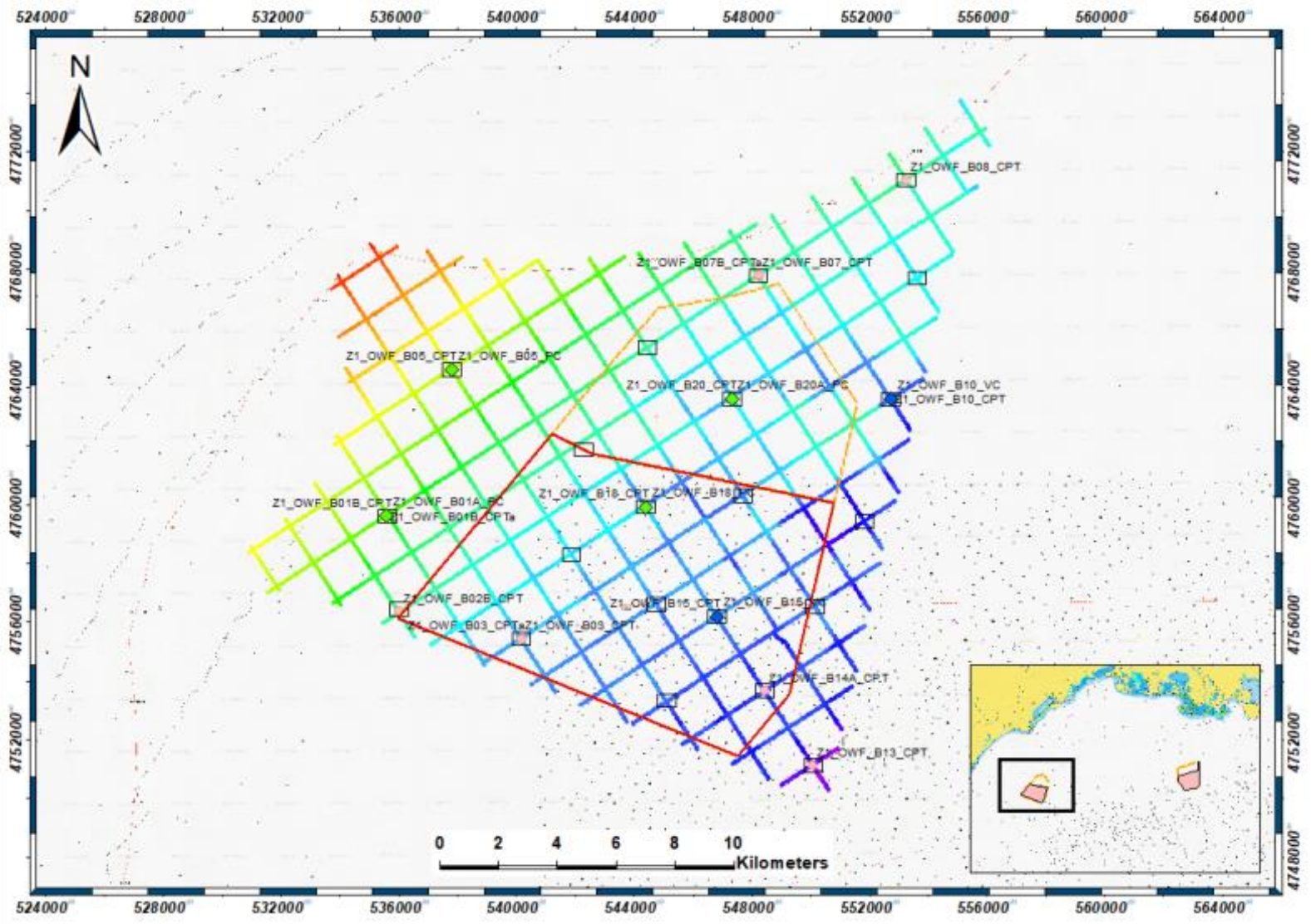
ONSHORE LABORATORY TESTING A06

Type	Test	Nº of tests planned	Nº of tests deleted	Nº of Results Z1	Nº of Results Z2	Lab. standard
Strength	UUr (Undrained Triaxial Remoulded)	9	0	4	5	ISO 17892-8:2018
	CIUc (Isotropically Consolidated Undrained Triaxial Compression (Ciu))	8	2	3	3	ISO 17892-9:2018
	DS (Direct Shear at (20, 40 and 80 kPa)	21	1	4	16	ISO 17892-10:2018
	CIDc (Isotropically Consolidated Drained Triaxial Compression)	10	2	1	7	ISO 17892-9:2018
	DSS (Direct Simple Shear)	10	2	6	2	ASTM D6528-17
	THIXO (Thixotropy)	9	1	3	5	ISO 19901-8:2014 - ISO 17892-6:2017
	Oedometer CRS	7	0	3	4	ASTM D4186 / D4186M-20
Chemical and thermal	$CaCO_3$	17	0	5	12	ISO 10693-14
	ORG	3	0	2	1	ASTM D2974-20 - Method C
	Thermal Conductivity	12	1	4	7	ASTM D 5334-22

A09- Occitanie Project 2

.

**** AO9 in red***



Legend

CHART BOXES

ALARP

GEOTECHNICAL LOCATIONS

CPT

PC

VC

BATHYMETRY (m ZH)

High : -68,4725

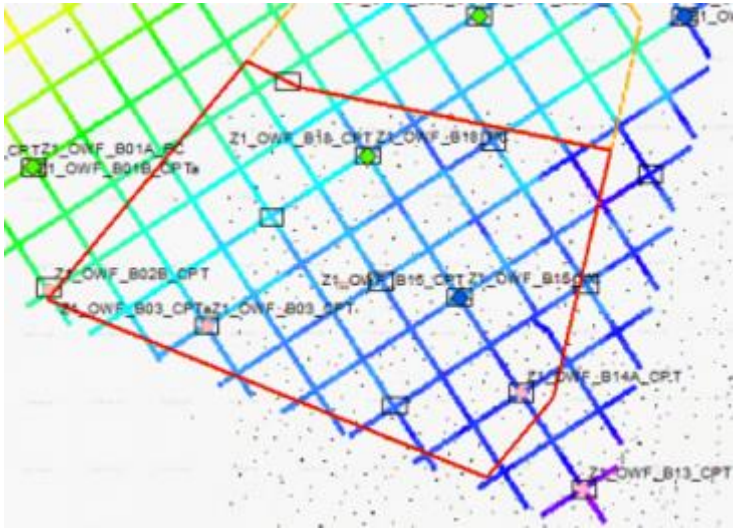
Low : -103,857

A09- Occitanie Project 2 – 5 CPT (1 retest)

TECNOAMBIENTE
A TRADEBE COMPANY

Point ID	Type	Water Depth_ZH - MBES (m)	Penetration (m)
Z1_OWF_B01B_CPT	CPT	-85.11	26.55
Z1_OWF_B01B_CPTa	CPT	-85.01	20.73
Z1_OWF_B02B_CPT	CPT	-88.90	28.29
Z1_OWF_B03_CPT	CPT	-93.90	24.24
Z1_OWF_B03_CPTa	CPT	-93.96	19.98
Z1_OWF_B05_CPT	CPT	-82.35	25.71
Z1_OWF_B07_CPT	CPT	-89.34	18.26
Z1_OWF_B07B_CPTa	CPT	-89.37	19.48
Z1_OWF_B08_CPT	CPT	-88.86	23.79
Z1_OWF_B10_CPT	CPT	-95.47	30.64
Z1_OWF_B13_CPT	CPT	-99.94	30.1
Z1_OWF_B14A_CPT	CPT	-96.38	28.93
Z1_OWF_B15_CPT	CPT	-94.30	27.96
Z1_OWF_B18_CPT	CPT	-94.02	30.54
Z1_OWF_B20_CPT	CPT	-93.54	30.87

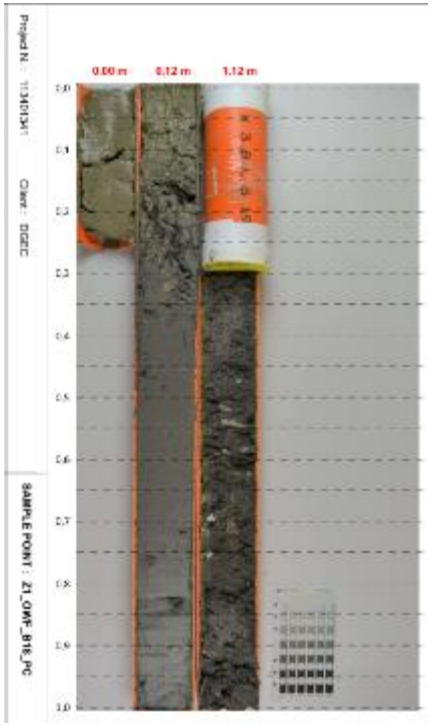
**** AO9 in red***

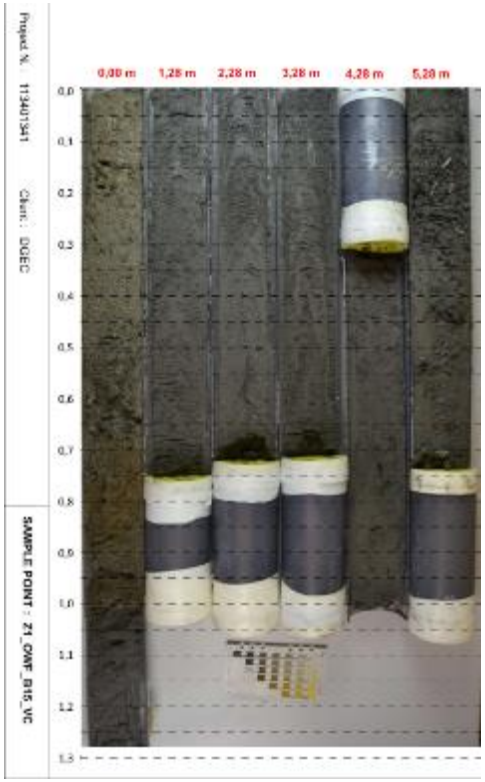


A09- Occitanie Project 2 – 1 PC 1 VC

Point ID	Type	Water Depth_ZH - MBES (m)	Penetration (m)	Recovery (m)	Recovery (%)
Z1_OWF_B01A_PC	PC	-85.09	5.4	4.9	91%
Z1_OWF_B05_PC	PC	-82.39	7.8	5.95	76%
Z1_OWF_B18_PC	PC	-93.86	3.05	2.12	70%
Z1_OWF_B20A_PC	PC	-93.55	4.7	4.05	86%
Z1_OWF_B10_VC	VC	-95.45	5.8	7.16	123%
Z1_OWF_B15_VC	VC	-94.29	9	8.28	92%

**** AO9 in red***

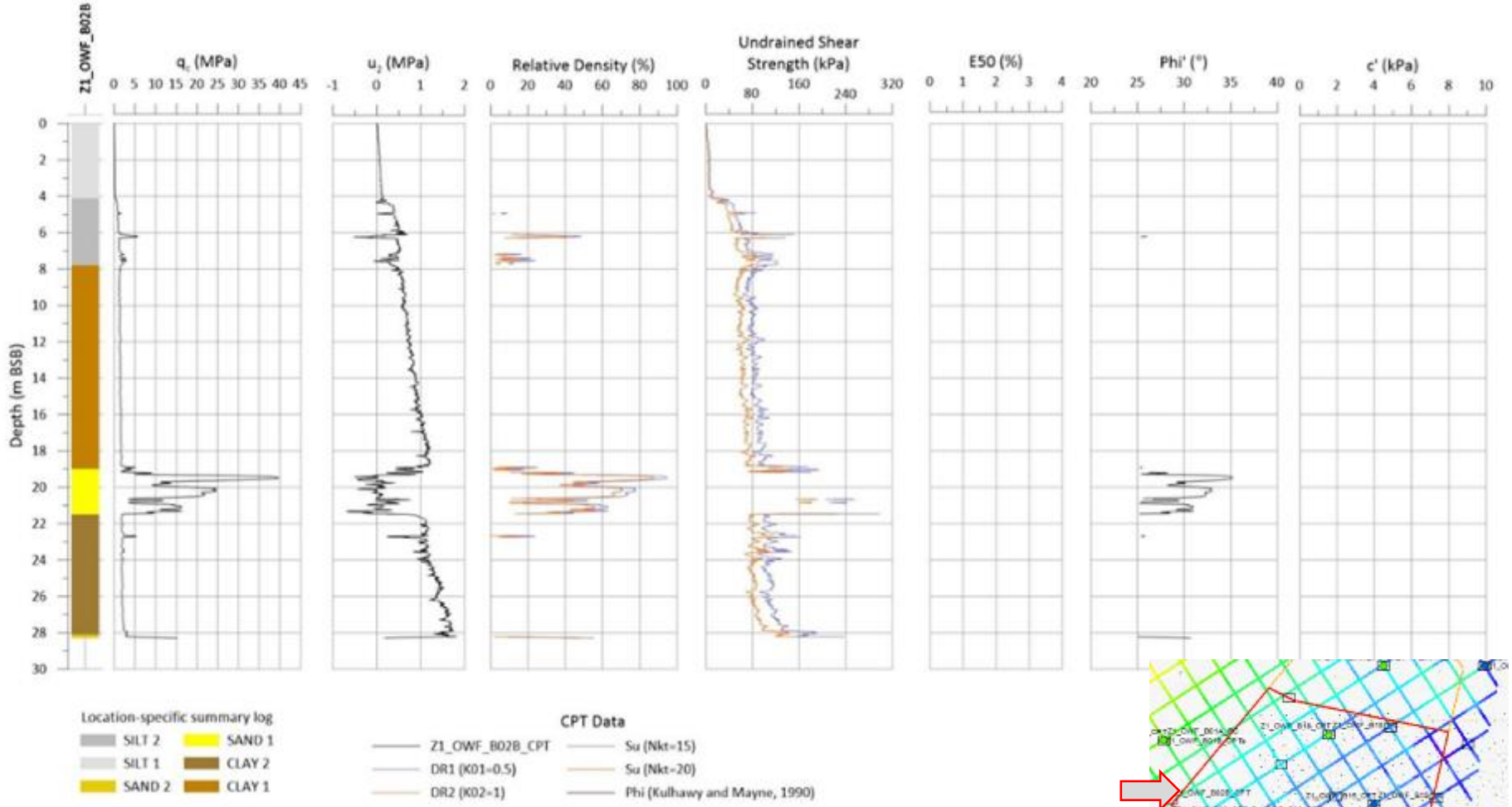




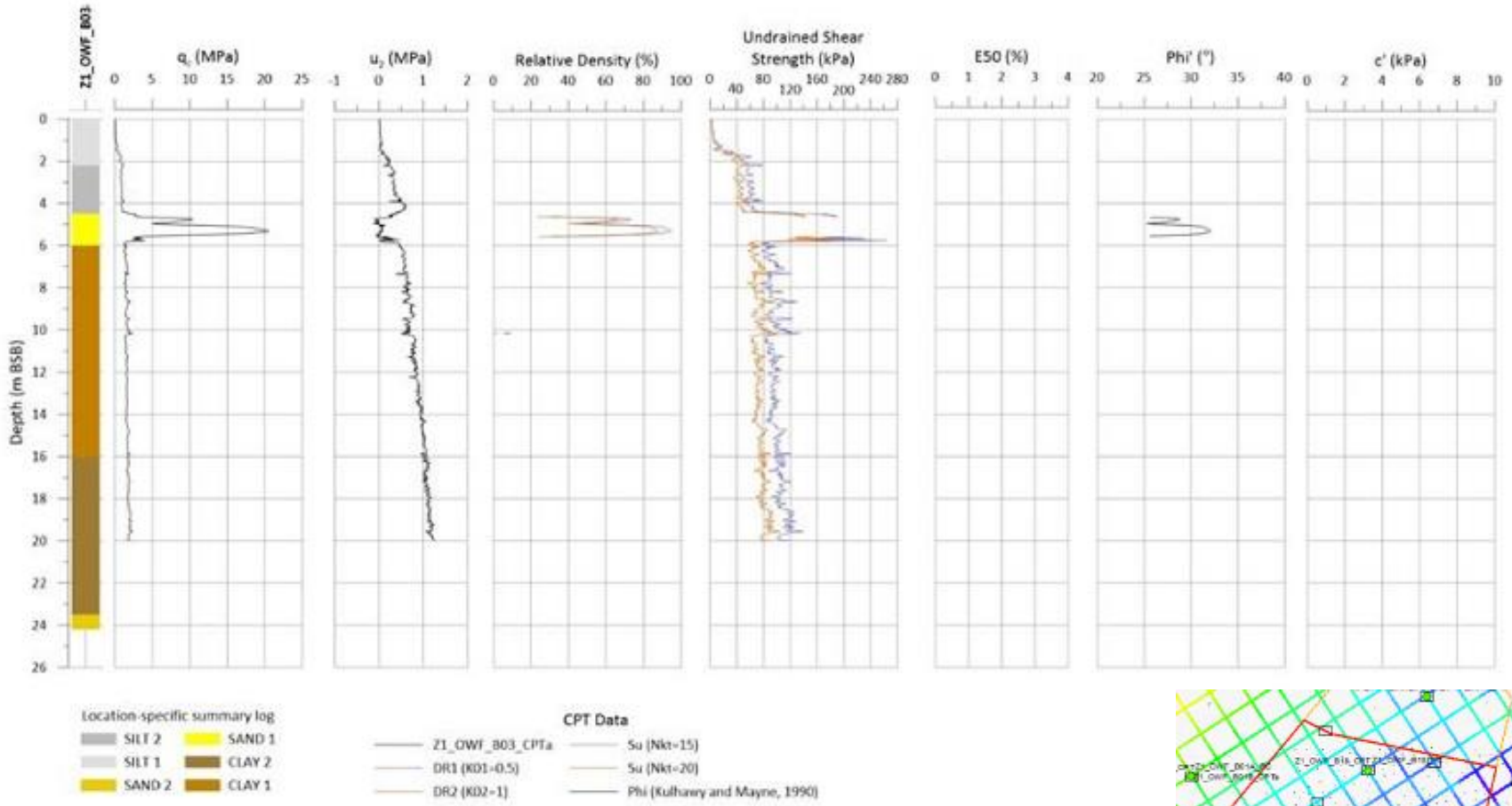
Geotechnical Units

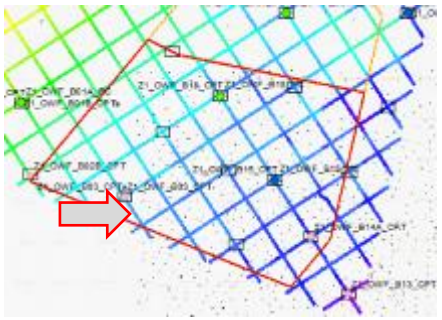
Soil behav-iour	Geotech-nical unit	Description	Sample Photo
Undrained or cohesive	**SILT1**	Extremely low to low shear strength clayey SILT	
Transitional or partially drained	**SILT2**	Low to high shear strength sandy/clayey SILT	
Drained or granular	**SAND1**	Medium dense to dense silty SAND with interbedded sandy clay.	
Drained or granular	**SAND2**	Dense to very dense silty SAND	
Undrained or cohesive	**CLAY1**	Medium to high shear strength sandy CLAY	Not intercepted by VC or PC
Undrained or cohesive	**CLAY2**	High to very high shear strength sandy CLAY	Not intercepted by VC or PC

Occitanie Project 2 - B02B

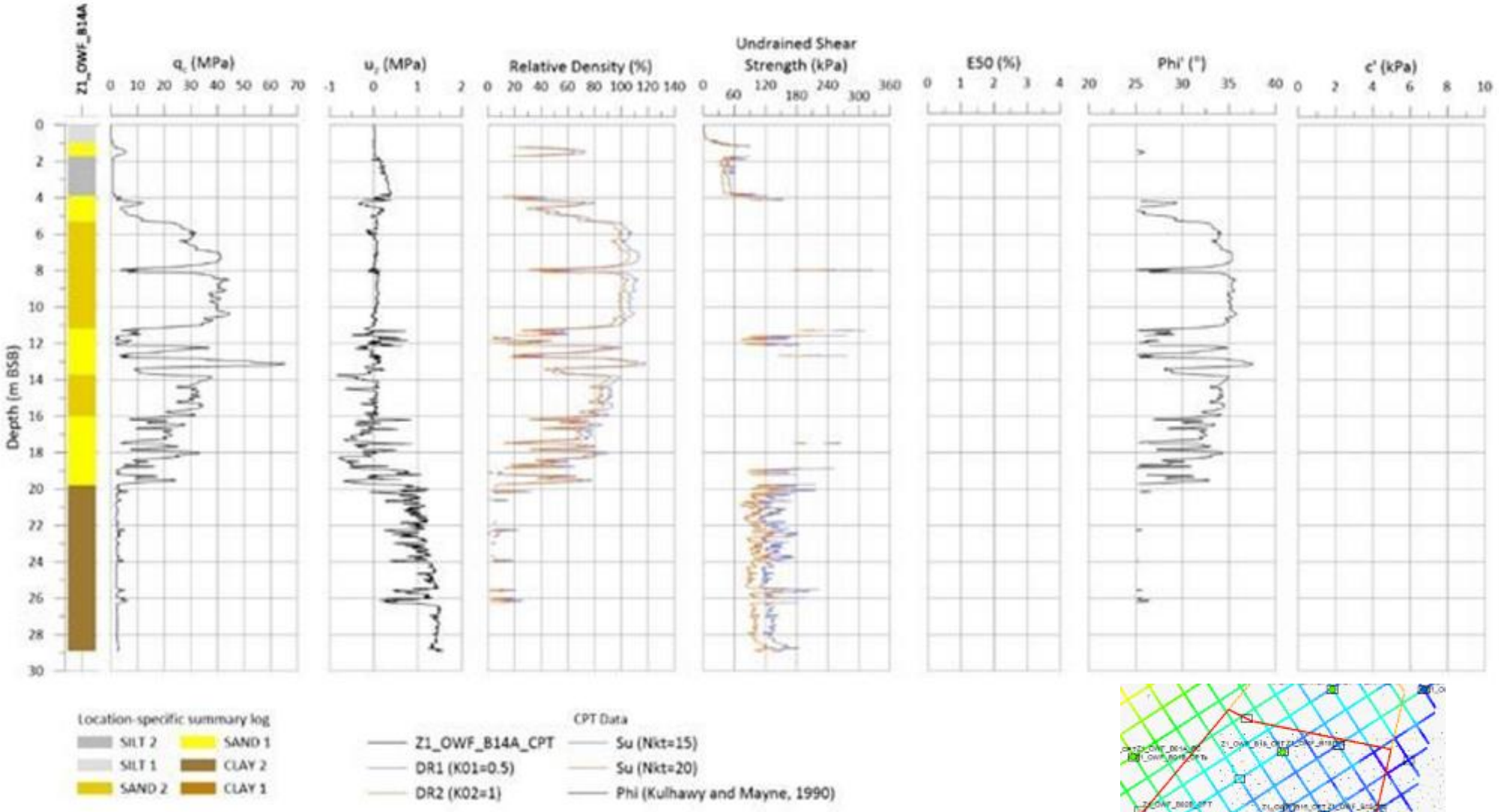


Occitanie Project 2 -B03 and B03a

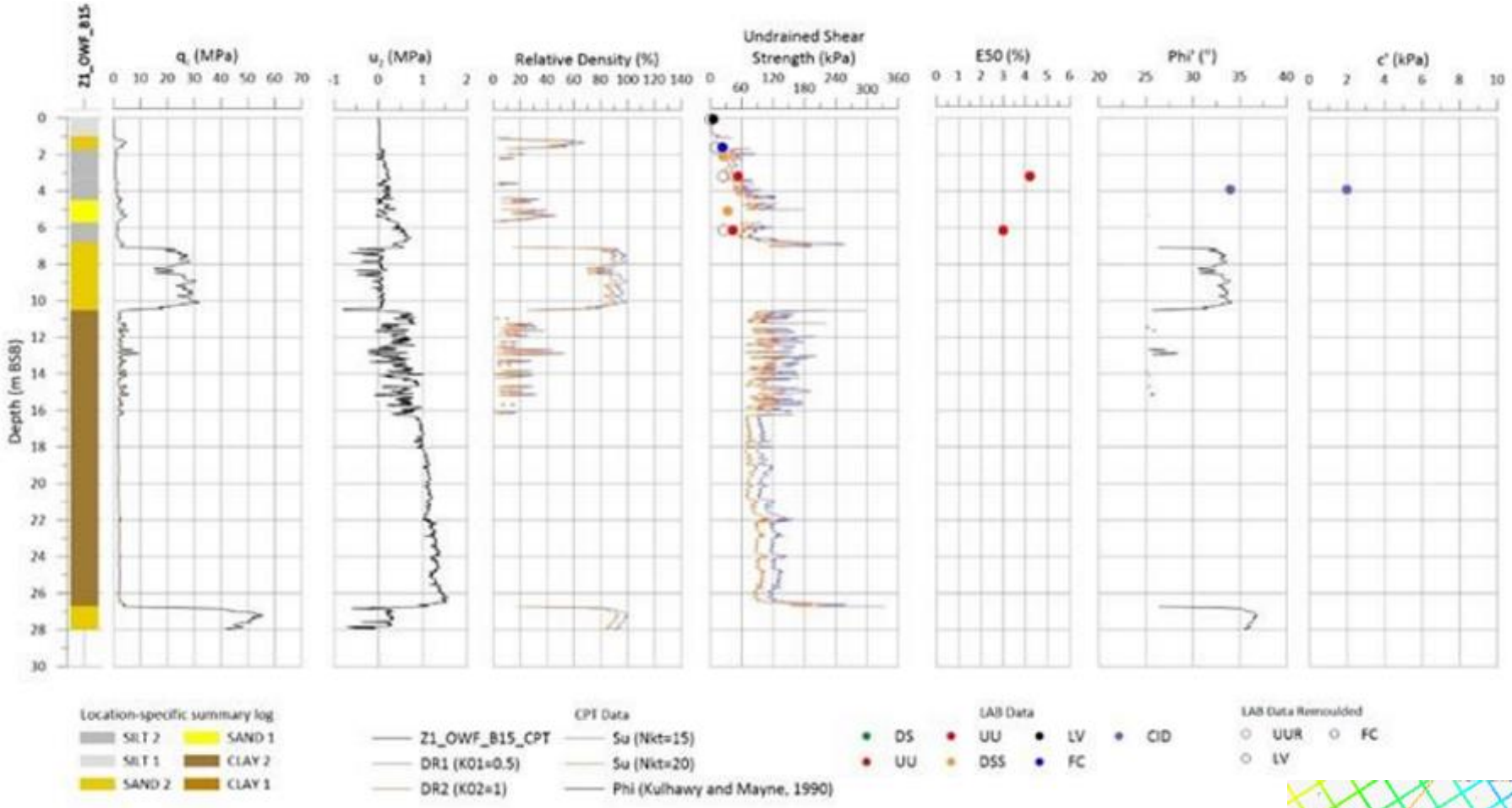


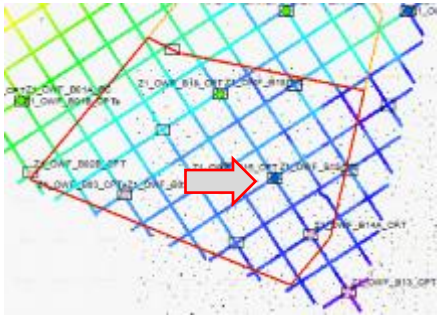


Occitanie Project 2 - B14A

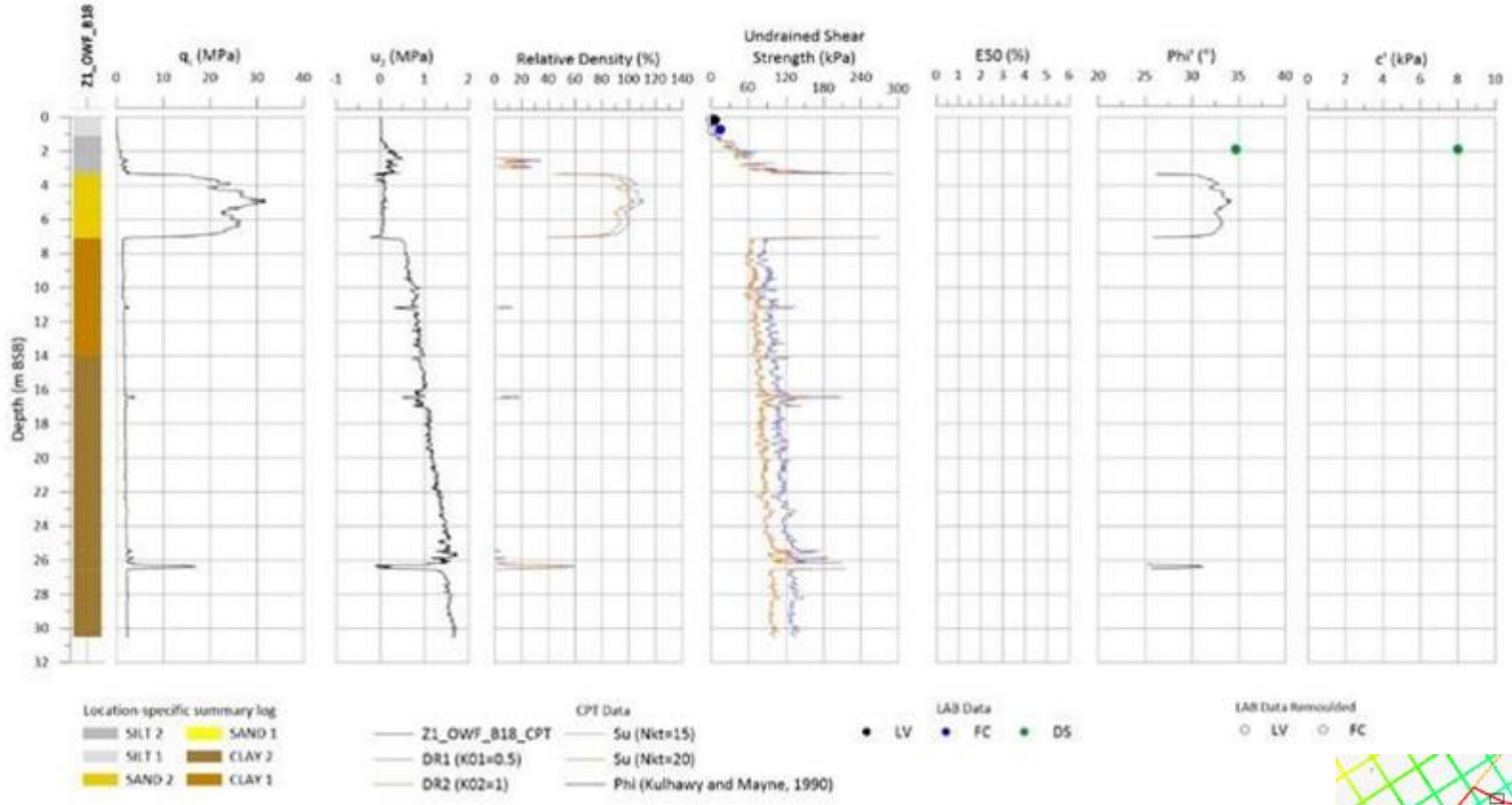


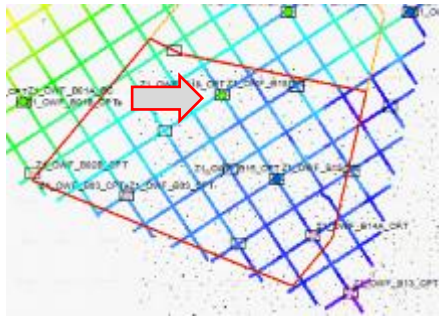
Occitanie Project 2 - B15



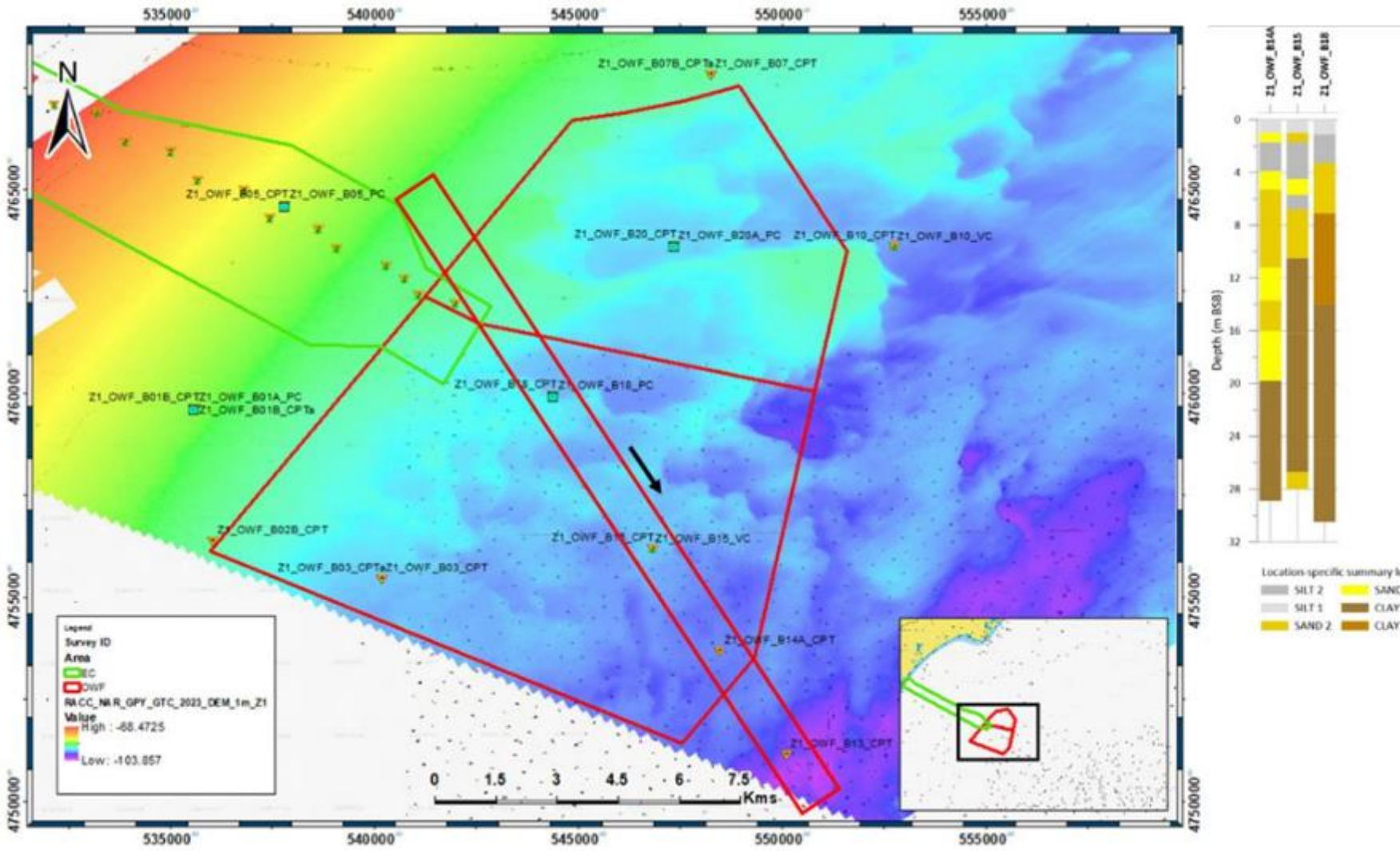


Occitanie Project 2 - B18





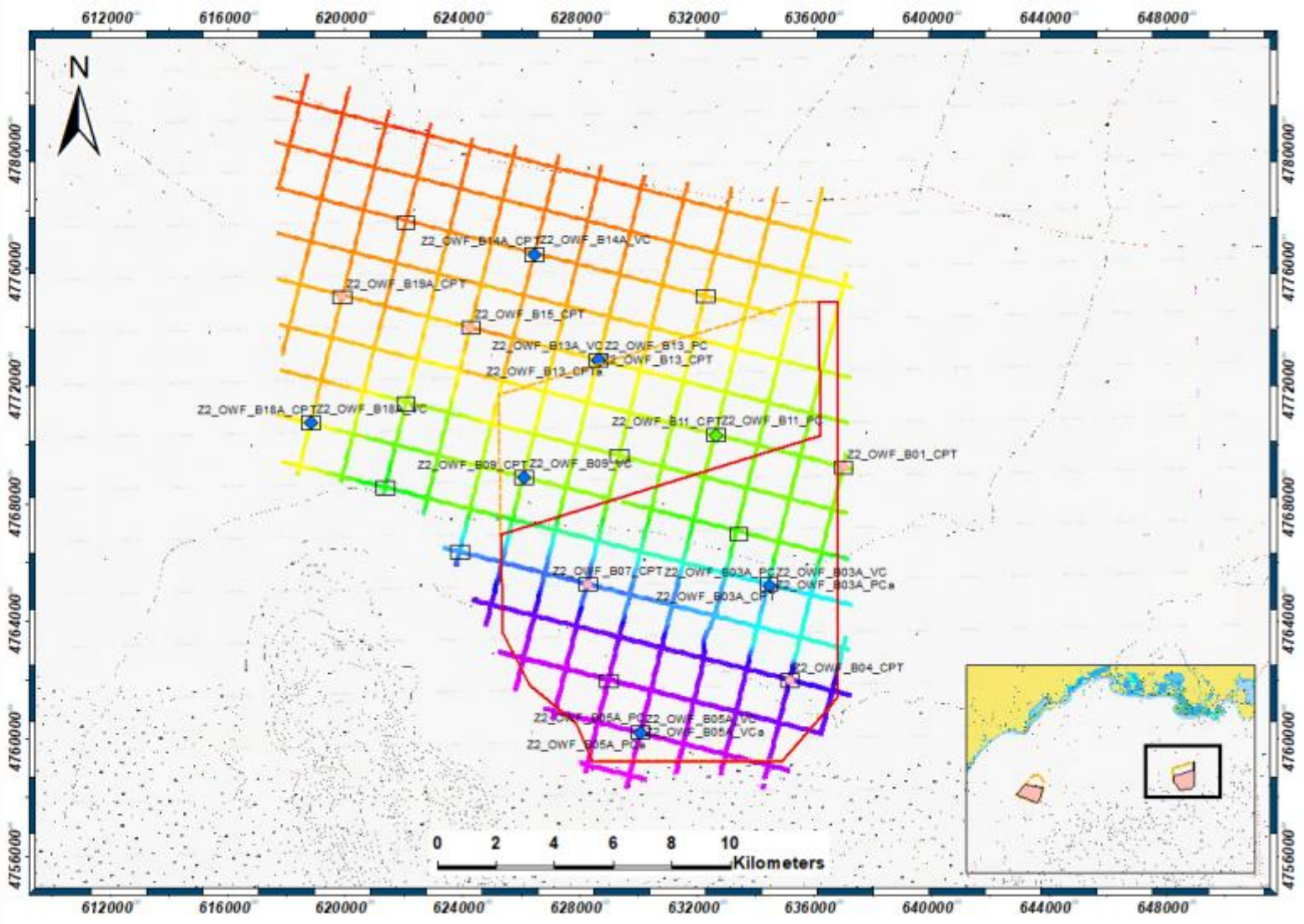
Occitanie Project 2 – Section



Paca project 3

.

**** AO9 in red***



Legend

CHART BOXES

ALARP

GEOTECHNICAL LOCATIONS

CPT

PC

VC

BATHYMETRY (m ZH)

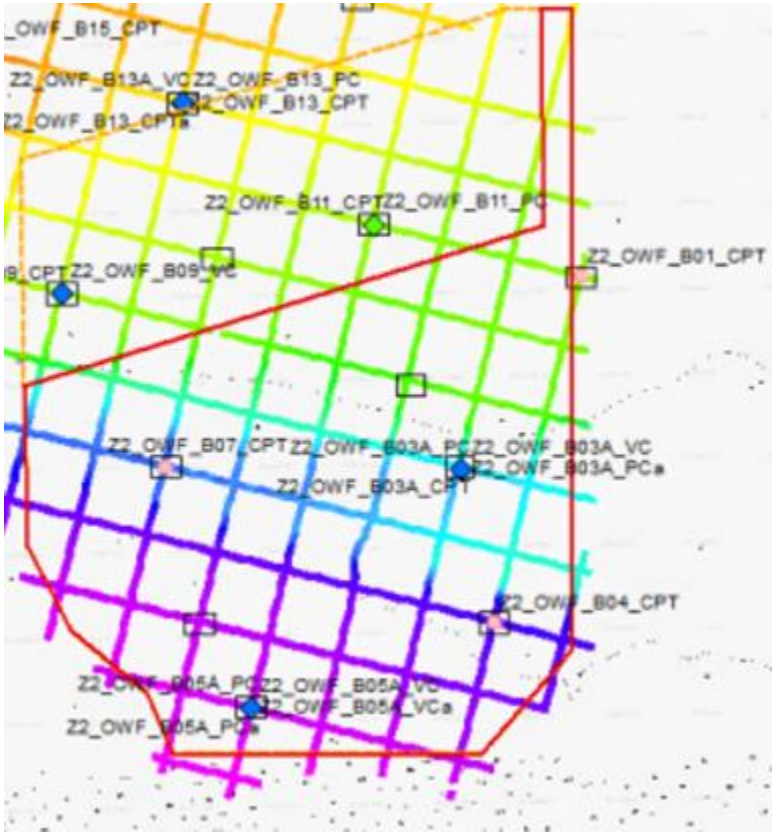
High : -71,1155

Low : -127,621

Paca project 3 – 5 CPT

Point ID	Type	Water Depth_ZH – MBES (m)	Penetration (m)
Z2_OWF_B01_CPT	CPT	-95.10	29.94
Z2_OWF_B03A_CPT	CPT	-108.99	29.62
Z2_OWF_B04_CPT	CPT	-119.80	30
Z2_OWF_B05A_CPT	CPT	-125.57	29.83
Z2_OWF_B07_CPT	CPT	-114.24	29.84
Z2_OWF_B09_CPT	CPT	-94.14	29.8
Z2_OWF_B11_CPT	CPT	-94.42	29.76
Z2_OWF_B13_CPT	CPT	-88.05	2.56
Z2_OWF_B13_CPTa	CPT	-88.04	29.79
Z2_OWF_B14A_CPT	CPT	-80.82	29.67
Z2_OWF_B15_CPT	CPT	-83.46	27.32
Z2_OWF_B18A_CPT	CPT	-89.37	29.83
Z2_OWF_B19A_CPT	CPT	-83.40	29.87

**** AO9 in red***



Paca project 3 – 2 PC(2 retest)/2 VC(1 retest)

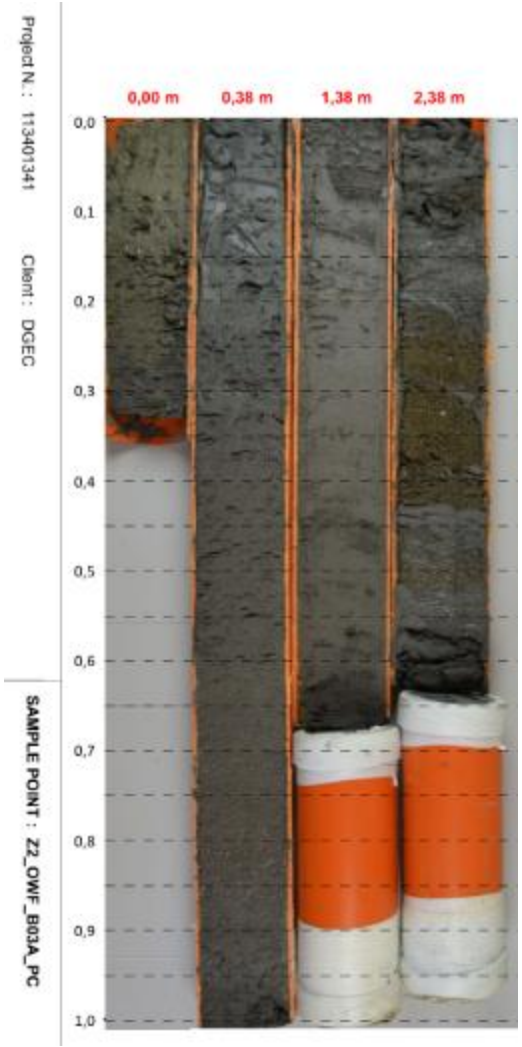
TECNOAMBIENTE
A TRADEBE COMPANY

Point ID	Type	Water Depth_ZH – MBES (m)	Actual Penetration (m)	Recovery (m)	Recovery (%)
Z2_OWF_B03A_PC	PC	-109.29	4.95	3.38	68%
Z2_OWF_B03A_PCa	PC	-108.89	5	3.23	65%
Z2_OWF_B05A_PC	PC	-125.56	2.8	2.73	98%
Z2_OWF_B05A_PCa	PC	-125.58	3.5	2.86	82%
Z2_OWF_B11_PC	PC	-94.41	5	4.1	82%
Z2_OWF_B13_PC	PC	-88.01	4.85	3	62%
Z2_OWF_B03A_VC	VC	-109.02	9	8.58	95%
Z2_OWF_B05A_VC	VC	-125.57	3.97	5	126%
Z2_OWF_B05A_VCa	VC	-125.58	6.3	8.2	130%
Z2_OWF_B09_VC	VC	-94.11	9	7.66	85%
Z2_OWF_B13A_VC	VC	-88.03	9	7.4	82%
Z2_OWF_B14A_VC	VC	-80.81	7.5	7.56	101%
Z2_OWF_B18A_VC	VC	-89.39	8.05	8.42	105%

** AO9 in red*

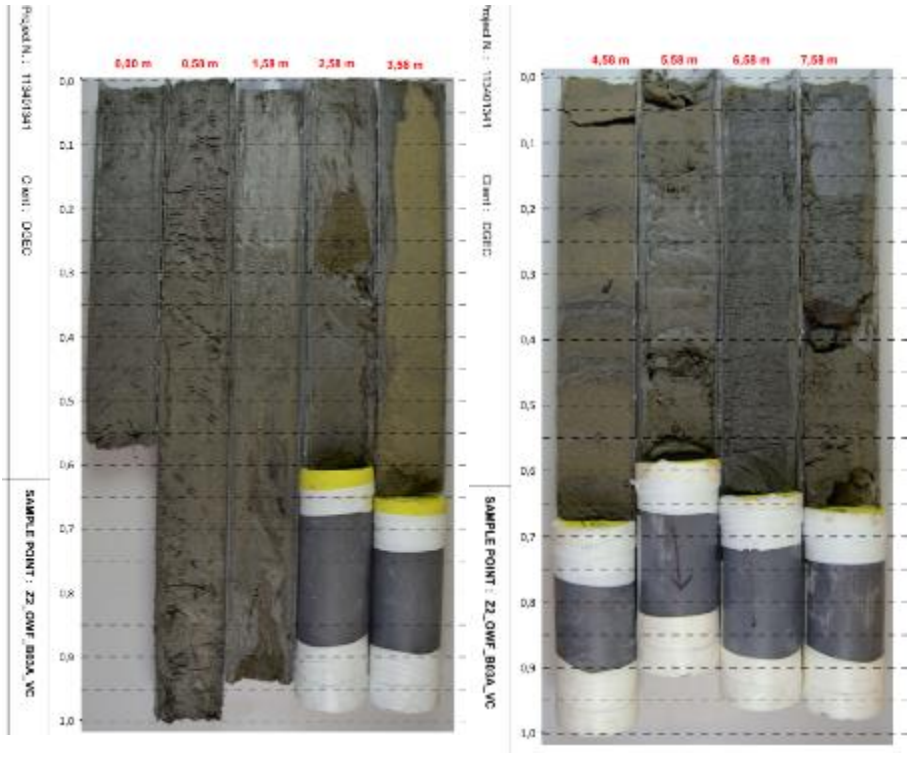
Paca project 3 - PC

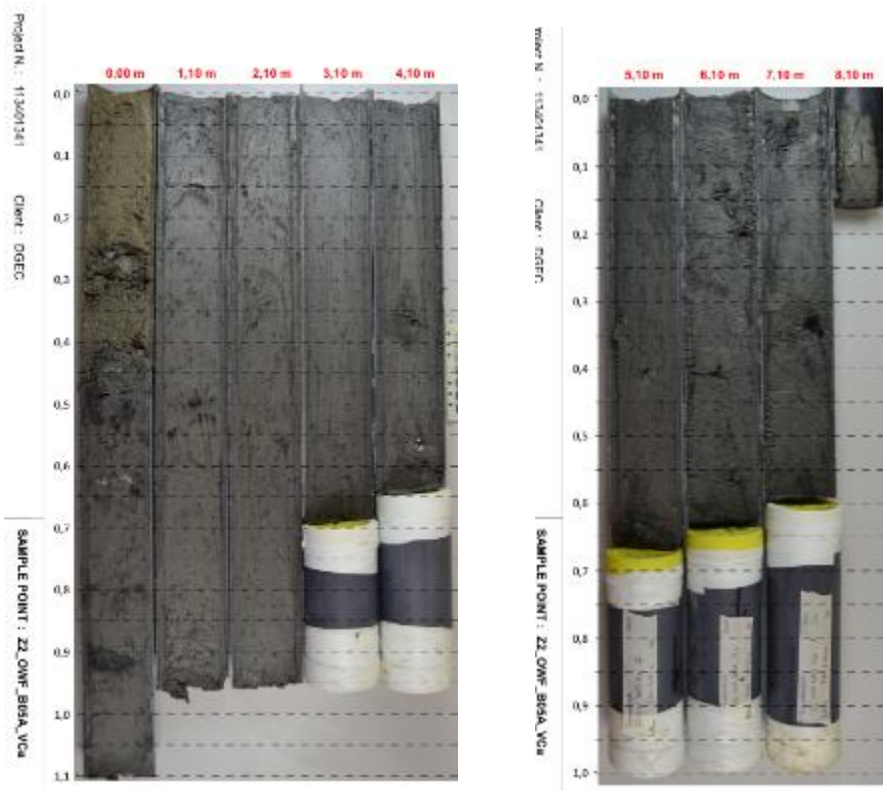
B03A and B05A



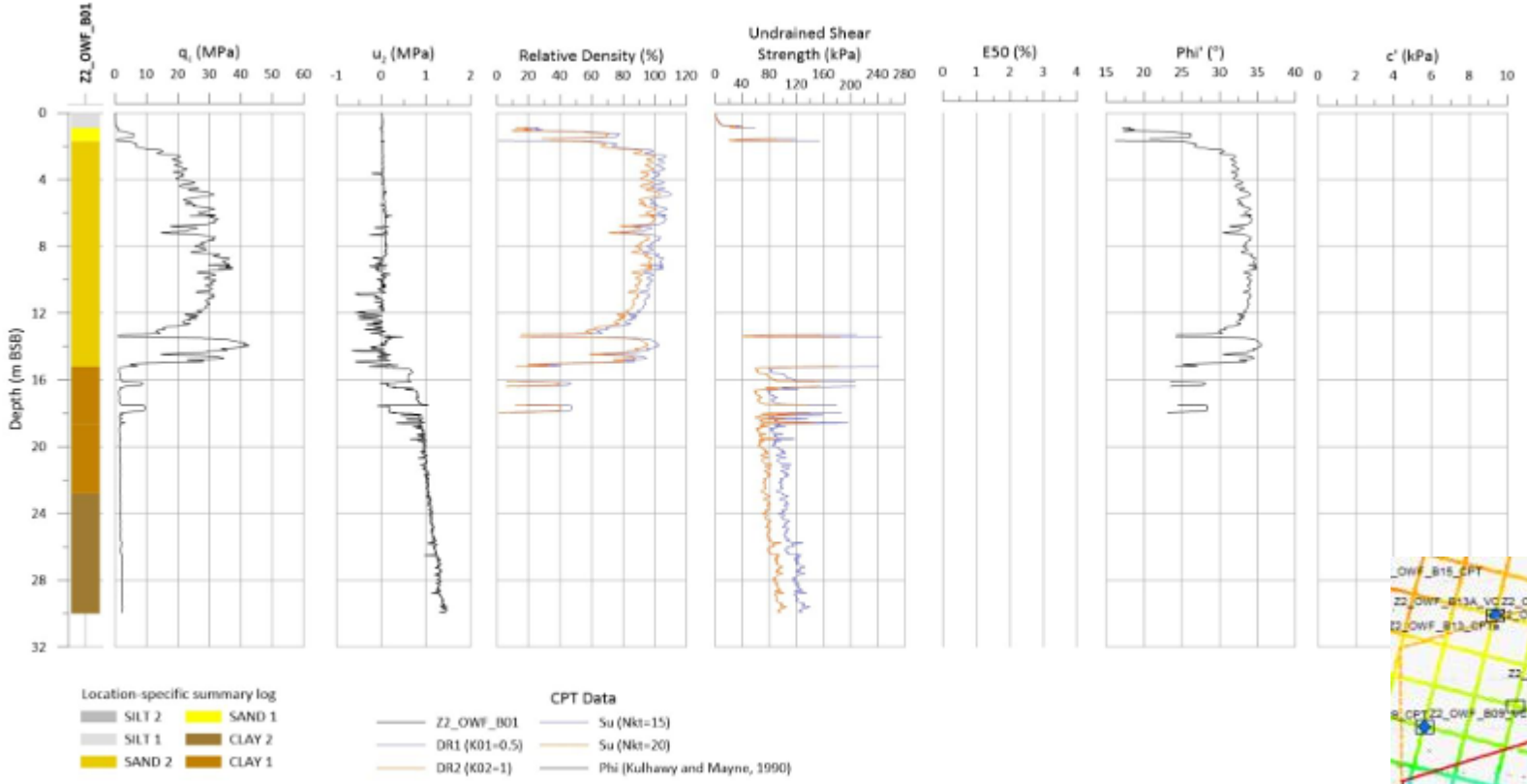
Paca project 3 - VC

B03A and B05A

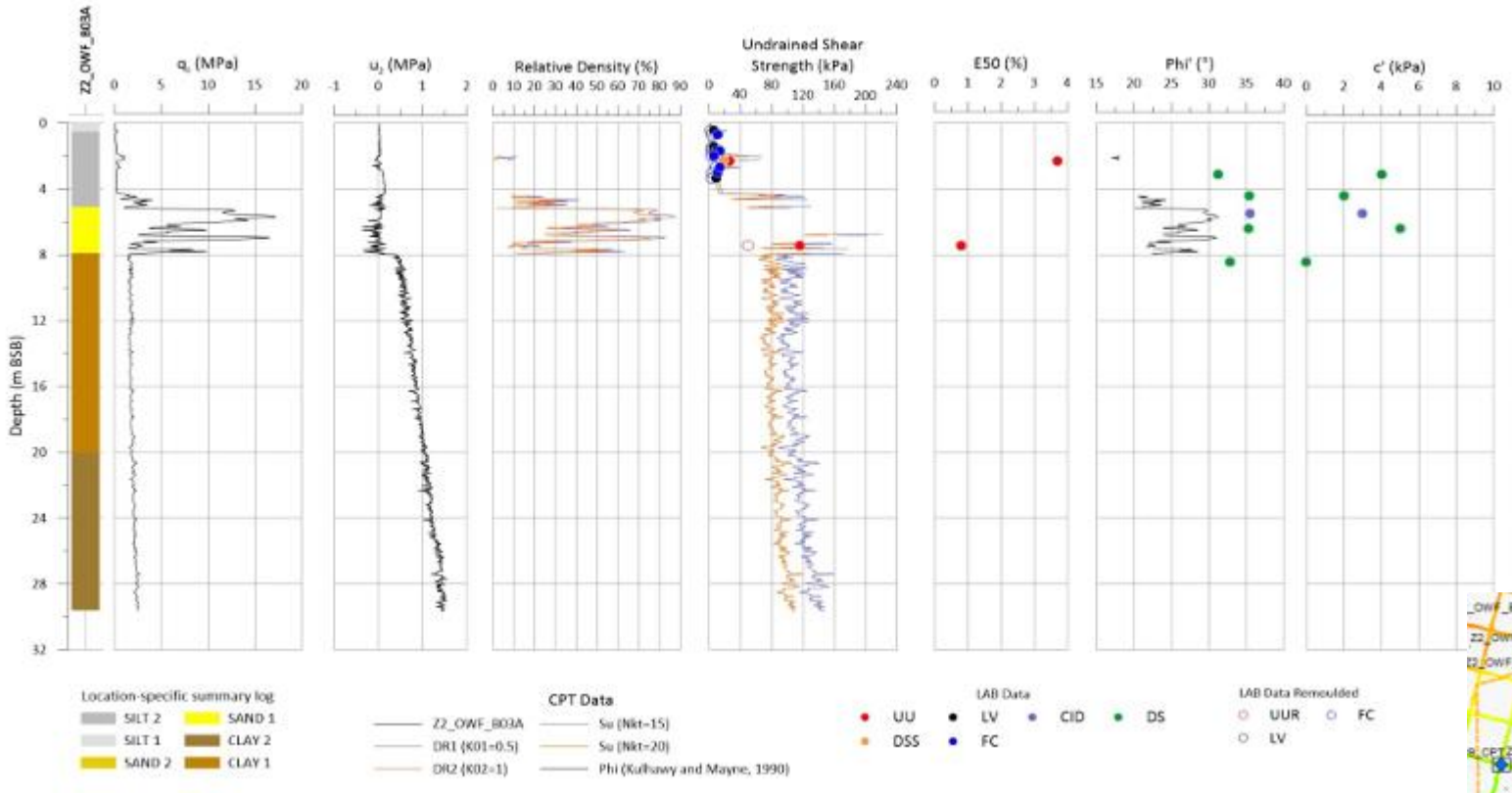




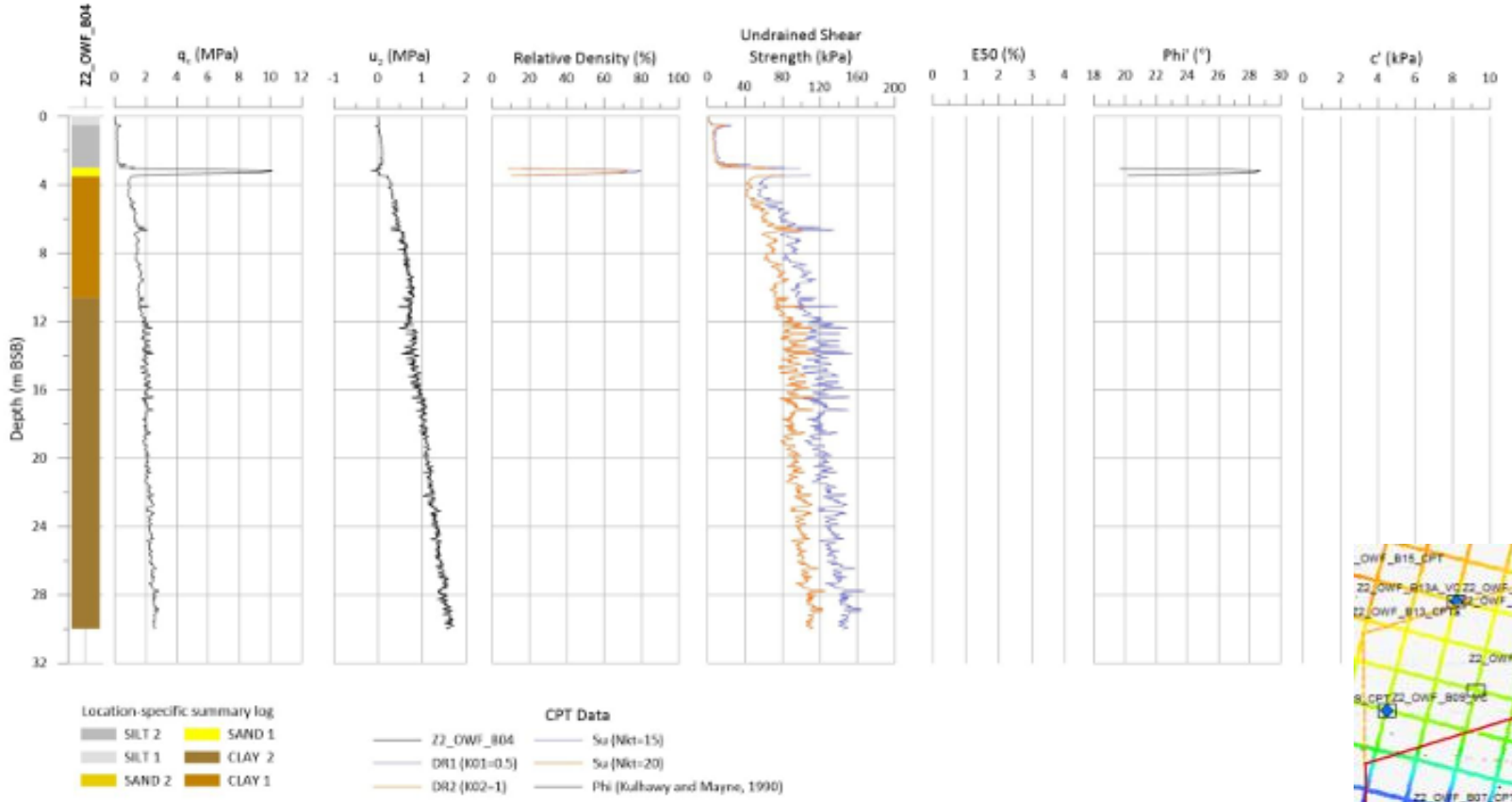
Paca project 3 - B01



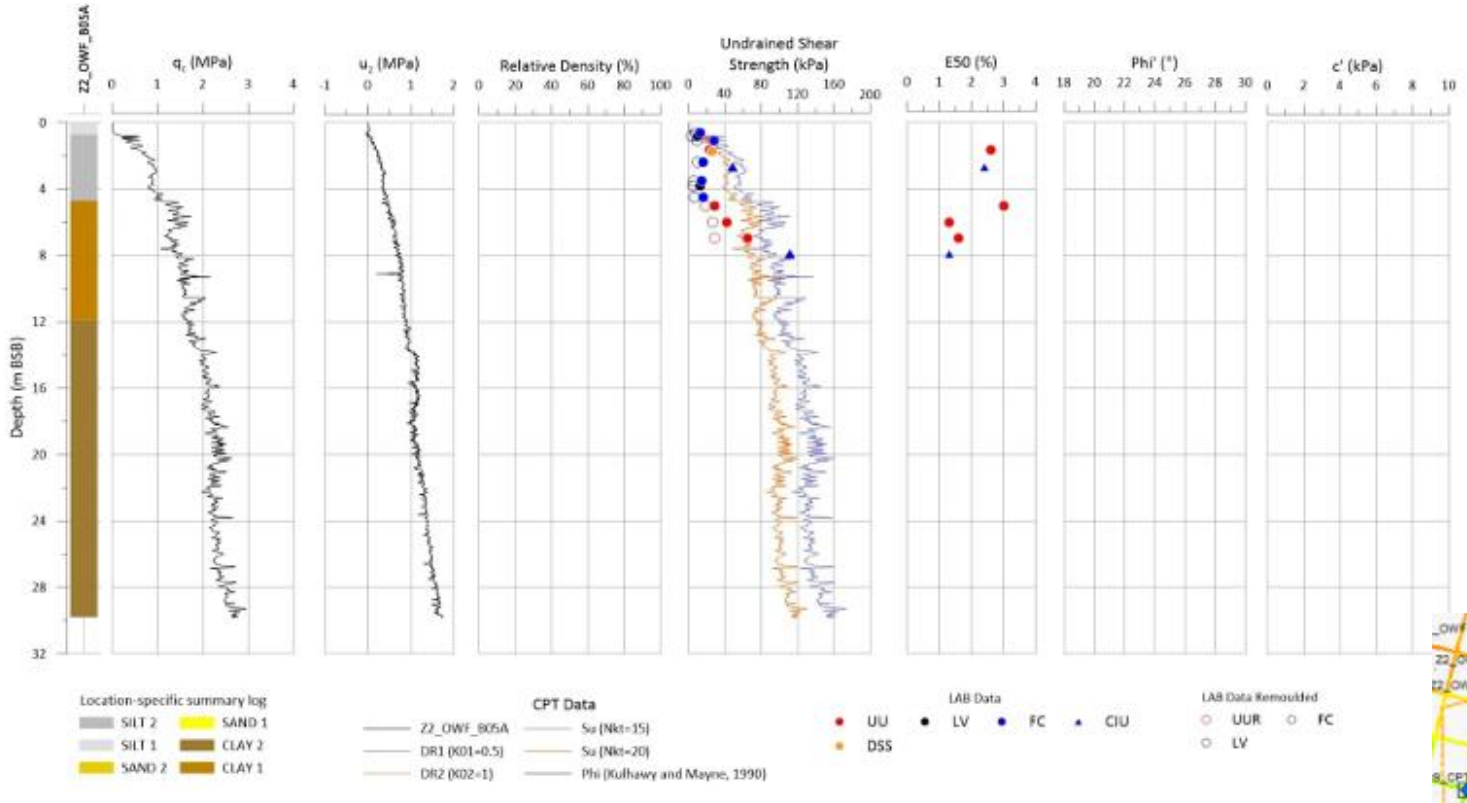
Paca project 3 - B03A



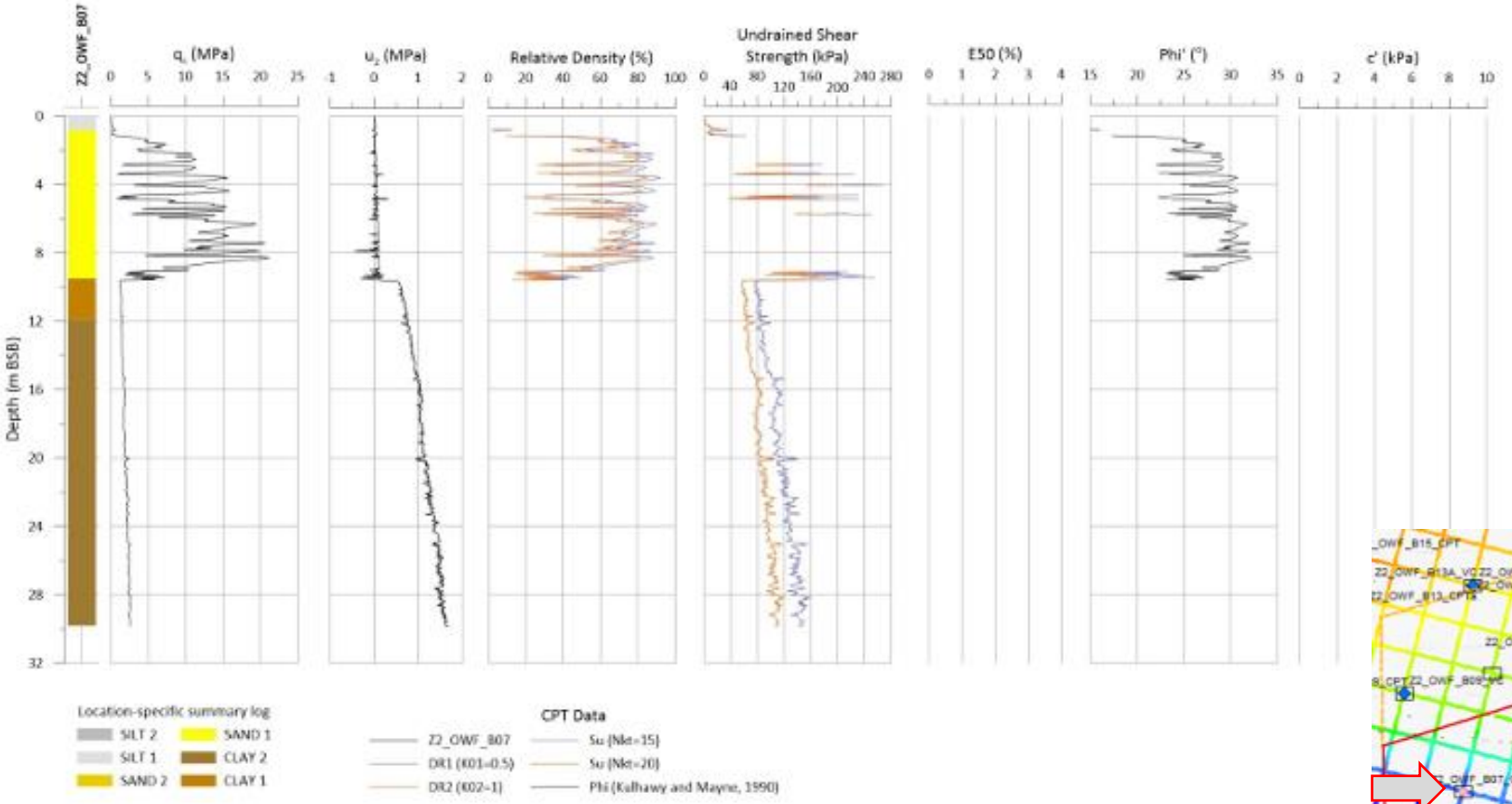
Paca project 3 - B04



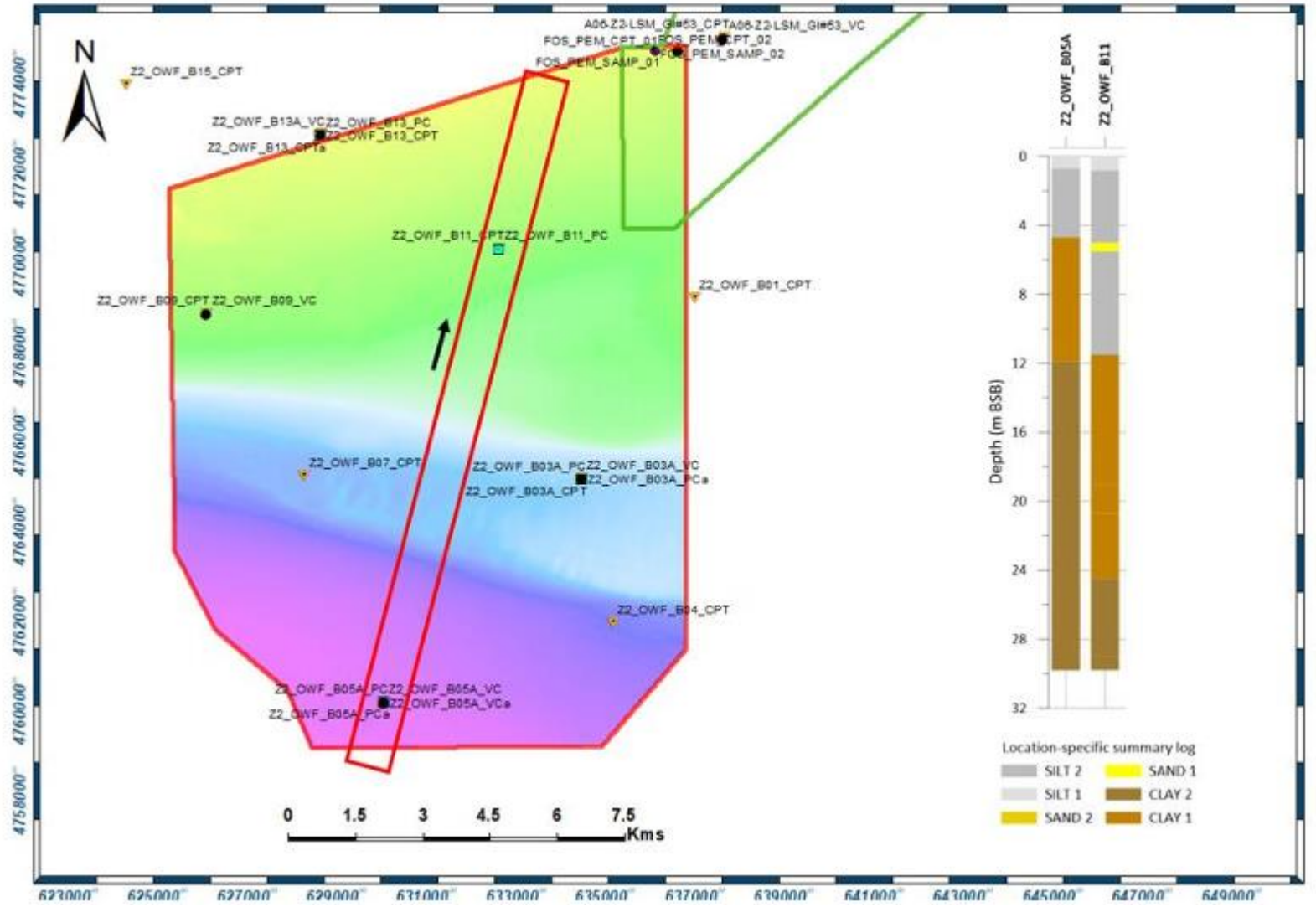
Paca project 3 - B05A



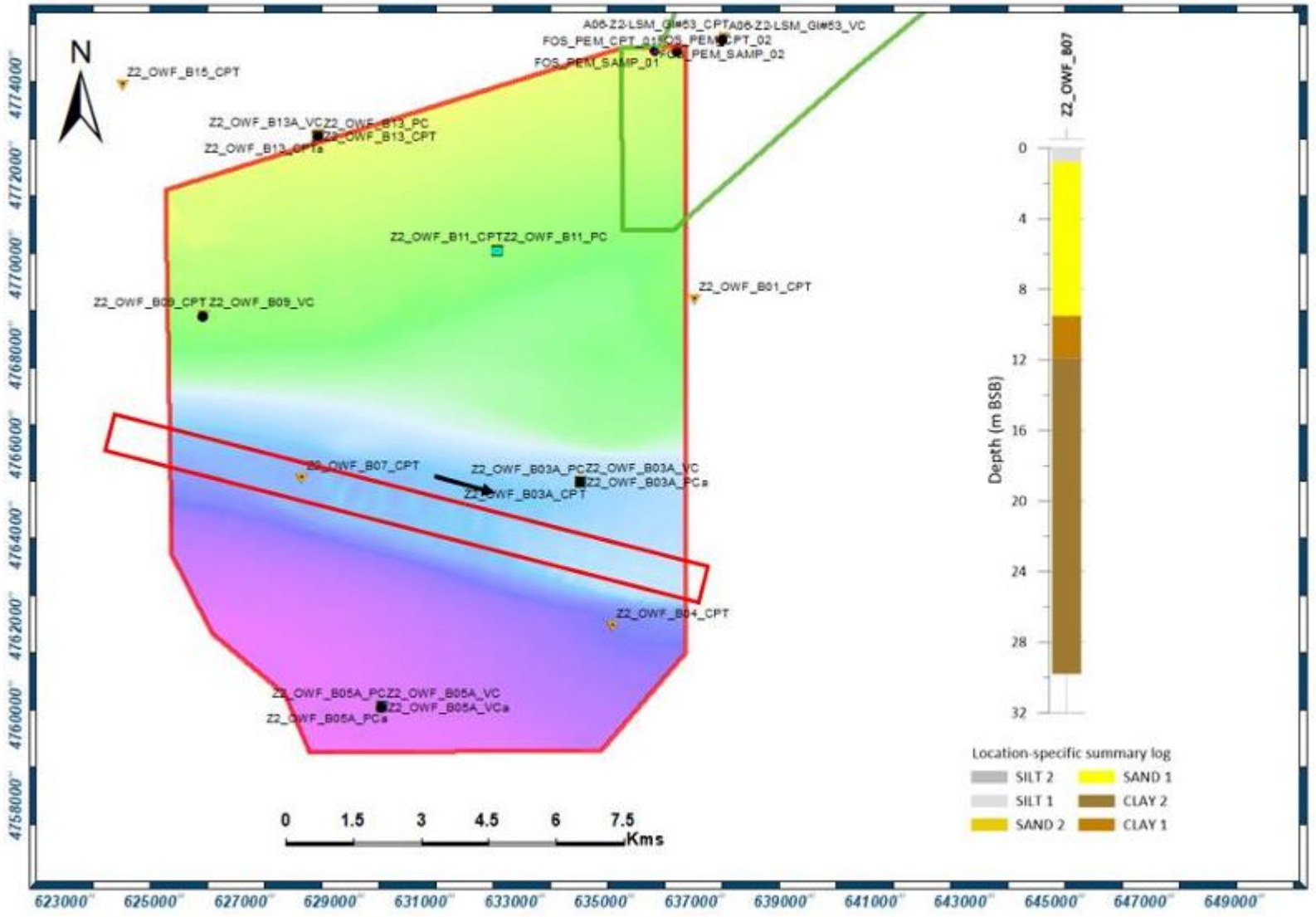
Paca project 3 - B07



Paca project 3 – Section



Paca project 3 – Section



Strength and consolidation DSS and CRS

TECNOAMBIENTE
A TRADEBE COMPANY

Location ID	Sample ID	Test Depth	Test Type	INDEX PROPERTIES						LOADING STEPS		Effective	In-Situ		Coeff.	Coeff.	Overconsolidation Ratio	
				Water Content		Unit Weight		Initial Void Ratio	Specific Gravity	Max. Load	Min. Unload	In-Situ Stress	Void Ratio	Constrain. Modul.	Vertical Consol.(2)	Vertical Perm.(2)		e/e0
-	-	(m)	-														OCR	
				(%)	(%)	(kN/m³)	(kN/m³)	(-)	(-)	(kPa)	(kPa)	(kPa)	(-)	(MPa)	(m²/s)	(m/s)		(-)
Z1_OWF_B01_PC	A	4.80	CRS	31.6	21.1	18.7	19.0	0.86	2.70	3302	32	37.9	0.83	2.05	3.53E-7	1.74E-9	3.4	0.03
Z1_OWF_B05_PC	A	5.90	CRS	24.4	19.3	19.7	20.0	0.66	2.69	3291	26	46.6	0.63	4.08	1.38E-5	3.41E-8	3.6	0.04
Z1_OWF_B20A_PC	A	4.00	CRS	23.0	19.0	20.0	20.3	0.63	2.71	3294	34	39.6	0.61	4.84	2.55E-5	5.32E-8	6.7	0.03
Z2_OWF_B03A_PC	A	3.30	CRS	23.0	17.8	19.7	20.0	0.62	2.65	3300	39	32.7	0.61	4.99	2.06E-5	4.07E-8	2.1	0.01
Z2_OWF_B05A_PCa	A	2.80	CRS	31.3	23.8	18.6	18.9	0.83	2.66	3295	19	20.3	0.82	3.58	7.57E-6	2.13E-8	2.4	0.02
Z2_OWF_B05A_Vca	A	7.85	CRS	25.1	18.6	19.6	19.9	0.68	2.70	3297	36	77.7	0.62	4.75	1.49E-6	3.18E-9	2.4	0.09
Z2_OWF_B18A_VC	D	5.05	CRS	25.4	14.3	19.2	19.8	0.717	2.68	3323	25	39.9	0.63	1.29	0.00000155	1.2E-08	1.3	0.12

Location ID	Sample ID	Test Depth	Test	INDEX PROPERTIES				Effective in Situ Stress	CONSOLIDATION						STATIC FAILURE				
				Water Content		Unit weight	Initial void ratio		Vertical final pressure	Unit weight		Axial consoli d. Strain	Skempton Param.	In-Situ void ratio	Axial Axial consolid. Stess	Undrained shear strenght	Excess pore pressure	Failure Strain	Strength Ratio
		(m)	Type	Initial (%)	Final (%)	(kN/m³)	(-)	(kPa)	(kPa)	total (kN/m³)	dry (kN/m³)	(%)	B (-)	(-)	(kPa)	(kPa)	(kPa)	(%)	(-)
Z1_OWF_B01_PC	B	3.75	DSS	32.4	28.1	18.9	0.85	29.6	39.6	19.3	14.3	4.9	-	0.75	27.4	31.1	12.2	20.0	0.78
Z1_OWF_B05_PC	C	3.85	DSS	21.1	20.4	19.8	0.61	30.4	39.8	20.6	16.4	4.0	-	0.55	25.9	20.1	13.8	20.0	0.51
Z1_OWF_B05_PC	A	5.80	DSS	25.0	23.8	19.7	0.67	45.8	59.6	19.9	15.7	1.9	-	0.64	43.8	34.2	15.8	20.0	0.57
Z1_OWF_B15_VC	G	2.10	DSS	23.4	22.5	19.8	0.64	20.8	25.0	20.2	16.1	2.3	-	0.60	20.7	24.0	4.3	20.0	0.96
Z1_OWF_B15_VC	D	5.08	DSS	20.6	17.5	20.5	0.55	50.3	54.6	21.1	17.0	5.2	-	0.47	61.6	33.2	- 7.0	20.0	0.61
Z1_OWF_B20A_PC	B	2.90	DSS	28.5	27.0	19.0	0.79	28.7	29.7	19.5	14.7	3.4	-	0.72	29.9	26.0	- 0.2	20.0	0.88
Z2_OWF_B03A_PC	B	2.25	DSS	22.8	19.8	20.3	0.60	22.3	25.2	20.7	16.5	4.1	-	0.53	19.3	17.8	5.9	20.0	0.71
Z2_OWF_B05A_PCa	B	1.75	DSS	28.0	25.3	19.5	0.74	13.1	24.6	19.7	15.2	3.2	-	0.68	23.9	25.0	1.3	20.0	1.02

**** AO9 in red***

Strength UU UUr and CIU

TECNOAMBIENTE
A TRADEBE COMPANY

Location ID	Sample ID	Test Depth (m)	Test Type	Material	SHEARING						
					Undrained Shear Strength (kPa)	Excess Pore press (kPa)	Failure Strain (%)	Axial Strain at 50% of Failure (%)	Secant Young's Modulus (MPa)	Strength Ratio (-)	e/e_0 (-)
Z1_OWF_B01_PC	B	3.70	UU	Cohesive	23.4		9.1	1.1	2.1	0.80	
Z1_OWF_B01_PC	B	3.70	UUR	Cohesive	21.7		15.0	1.2	1.9	0.74	
Z1_OWF_B01_PC	A	4.65	CIUC	Cohesive	110.7	2.0	15.0	4.2	2.7	2.21	0.02
Z1_OWF_B05_PC	C	3.70	UU	Cohesive	23.4		9.1	1.1	2.1	0.80	
Z1_OWF_B05_PC	B	4.75	CIUC	Cohesive	93.2	- 21.9	15.0	5.9	1.6	1.86	0.06
Z1_OWF_B05_PC	A	5.85	UU	Cohesive	40.2		15.0	4.5	0.9	0.87	
Z1_OWF_B05_PC	A	5.85	UUR	Cohesive	24.4		12.1	1.7	1.4	0.53	
Z1_OWF_B15_VC	F	3.20	UU	Cohesive	52.7		15.0	4.2	1.3	1.66	
Z1_OWF_B15_VC	F	3.20	UUR	Cohesive	24.9		15.0	5.6	0.5	0.79	
Z1_OWF_B15_VC	C	6.15	UU	Cohesive	42.9		15.0	3.0	1.4	0.70	
Z1_OWF_B15_VC	C	6.15	UUR	Cohesive	25.1		15.0	5.3	0.5	0.41	
Z1_OWF_B20A_PC	C	2.00	UU	Cohesive	24.4		12.6	2.3	1.1	1.23	
Z1_OWF_B20A_PC	B	2.85	CIUC	Cohesive	50.4	- 8.0	13.5	2.0	2.5	1.68	0.03
Z2_OWF_B03A_PC	B	2.30	UU	Cohesive	25.9		15.0	3.7	0.7	1.14	
Z2_OWF_B03A_VC	B	7.45	UU	Cohesive	116.2		12.3	0.8	14.9	1.58	
Z2_OWF_B03A_VC	B	7.45	UUR	Cohesive	49.5		15.0	1.1	4.7	0.67	
Z2_OWF_B05A_PCa	B	1.65	UU	Cohesive	22.7		12.8	2.6	0.9	1.83	
Z2_OWF_B05A_PCa	A	2.70	CIUC	Cohesive	48.1	- 15.7	15.0	2.4	2.0	1.60	0.02
Z2_OWF_B05A_VCa	D	5.00	UU	Cohesive	28.8		15.0	3.0	1.0	0.58	
Z2_OWF_B05A_VCa	D	5.00	UUR	Cohesive	17.9		15.0	2.4	0.7	0.36	
Z2_OWF_B05A_VCa	C	6.00	UU	Cohesive	41.6		6.0	1.3	3.1	0.70	
Z2_OWF_B05A_VCa	C	6.00	UUR	Cohesive	25.9		10.9	3.5	0.7	0.44	
Z2_OWF_B05A_VCa	B	6.95	UU	Cohesive	64.8		10.7	1.6	3.9	0.94	
Z2_OWF_B05A_VCa	B	6.95	UUR	Cohesive	28.8		13.9	1.8	1.6	0.42	
Z2_OWF_B05A_VCa	A	7.90	CIUC	Cohesive	111.6	- 6.0	9.8	1.3	8.9	1.40	0.04
Z2_OWF_B18A_VC	D	5.10	CIUC	Cohesive	75.1	0.3	15.0	2.9	2.6	1.37	0.05
Z2_OWF_B18A_VC	C	6.10	UU	Cohesive	25.1		15.0	2.5	1.0	0.52	
Z2_OWF_B18A_VC	B	7.05	UU	Cohesive	30.0		13.8	1.7	1.8	0.54	
Z2_OWF_B18A_VC	B	7.05	UUR	Cohesive	20.4		15.0	3.0	0.7	0.37	

AO9 in red

Direct Shear – Granular

Location ID	Sample ID	Test Depth (m)	Test Type	Effective In-Situ Stress (kPa)	CONSOLIDATION Spec. 1 Vertical stress (kPa)	CONSOLIDATION Spec. 2 Vertical stress (kPa)	CONSOLIDATION Spec. 3 Vertical stress (kPa)	Failure Envelope Effective cohesion (kPa)	Failure Envelope Effective friction angle (°)
Z1_OWF_B10_VC	H	1.05	DS	8.3	20.0	40.0	80.0	2	37
Z1_OWF_B10_VC	F	3.05	DS	24.1	20.0	40.0	80.0	1	36.7
Z1_OWF_B18_PC	A	1.90	DS	18.8	20.0	40.0	80.0	8	34.7
Z1_OWF_B20A_PC	A	3.90	DS	38.6	20.0	40.0	80.0	10	33.4
Z2_OWF_B03A_PC	A	3.10	DS	30.7	20.0	40.0	80.0	4	31.2
Z2_OWF_B03A_VC	E	4.40	DS	43.6	20.0	40.0	80.0	2	35.4
Z2_OWF_B03A_VC	C	6.38	DS	63.2	20.0	40.0	80.0	5	35.3
Z2_OWF_B03A_VC	A	8.45	DS	83.7	20.0	40.0	80.0	0	32.8
Z2_OWF_B09_VC	G	1.55	DS	15.3	20.0	40.0	80.0	1	35.3
Z2_OWF_B09_VC	E	3.55	DS	35.1	20.0	40.0	80.0	2	35.3
Z2_OWF_B11_PC	C	1.90	DS	18.8	20.0	40.0	80.0	3	31.9
Z2_OWF_B11_PC	B	2.80	DS	27.7	20.0	40.0	80.0	8	32.9
Z2_OWF_B13_PC	A	2.80	DS	27.7	20.0	40.0	80.0	5	31.4
Z2_OWF_B13A_VC	D	3.80	DS	26.2	20.0	40.0	80.0	0	31.9
Z2_OWF_B13A_VC	C	5.15	DS	35.5	20.0	40.0	80.0	5	37.2
Z2_OWF_B13A_VC	A	7.20	DS	49.7	20.0	40.0	80.0	1	33.9
Z2_OWF_B14A_VC	G	1.35	DS	10.7	20.0	40.0	80.0	2	36.3
Z2_OWF_B14A_VC	E	3.40	DS	26.9	20.0	40.0	80.0	2	37.4
Z2_OWF_B18A_VC	G	2.20	DS	17.4	20.0	40.0	80.0	0	35.1
Z2_OWF_B18A_VC	A	8.10	DS	64.0	20.0	40.0	80.0	1	35.7

**** AO9 in red***

CID – Granular

Location ID	Sample ID	Test Depth	Test type	Effective In-Situ Stress	CONSOLIDATION							
					Specimen 1		Specimen 2		Specimen 3		Failure Envelope	
-	-	(m)	-		Vert effective stress	Hor effective stress	Vert effective stress	Hor effective stress	Vert effective stress	Hor effective stress	-	-
				(kPa)	(kPa)	(kPa)	(kPa)	(kPa)	(kPa)	(kPa)	(°)	(kPa)
Z1_OWF_B15_VC	E	3.91	CID	38.7	20.0	20.0	40.0	40.0	80.0	80.0	34	2
Z2_OWF_B03A_VC	D	5.50	CID	54.4	20.0	20.0	40.0	40.0	80.0	80.0	35.5	3
Z2_OWF_B09_VC	F	2.45	CID	24.3	20.0	20.0	40.0	40.0	80.0	80.0	37.6	3
Z2_OWF_B11_PC	A	3.80	CID	37.6	20.0	20.0	40.0	40.0	80.0	80.0	36.9	4
Z2_OWF_B13A_VC	B	6.10	CID	42.1	20.0	20.0	40.0	40.0	80.0	80.0	31.8	1
Z2_OWF_B14A_VC	F	2.40	CID	19.0	20.0	20.0	40.0	40.0	80.0	80.0	34.2	1
Z2_OWF_B14A_VC	C	5.45	CID	43.1	20.0	20.0	40.0	40.0	80.0	80.0	34.8	1
Z2_OWF_B18A_VC	F	3.05	CID	24.1	20.0	20.0	40.0	40.0	80.0	80.0	35.9	3

**** AO9 in red***

Contact us

España

Catalunya (HQ)
Ronda Can Fatjó 19-B, Parc Tecnològic del Vallès
08290 Cerdanyola del Vallès (Barcelona)
T. +34 93 594 20 36
F. +34 93 387 80 39
tecnoambiente@tecnoambiente.com

Catalunya (Laboratory)
C/ Indústria, 550 – 552
08918 Badalona (Barcelona)
T. +34 93 387 80 80
F. +34 93 387 80 39
tecnoambiente@tecnoambiente.com

Andalucía
c/ Newton nº 15 Letra E, Parque empresarial
11407 Jerez de la Frontera (Cádiz)
T. +34 956 30 24 86
F. +34 956 31 01 39
delegacion.andalucia@tecnoambiente.com

Galicia
Avda. Fisterra, 275, 2º
15008 A Coruña
T. +34 981 27 47 20
F. +34 981 27 47 77
delegacion.galicia@tecnoambiente.com

Aragón (Laboratory)
C/ Sisallo, nave D9, Pol. Ind. Empresarium
50720 Zaragoza
T. +34 976 13 26 33
F. +34 976 13 26 48
delegacion.aragon@tecnoambiente.com

Canary Islands
C/ Domingo J. Navarro, 48 - bajo
35002 Las Palmas de Gran Canaria
T. +34 93 594 20 36
F. +34 93 387 80 39
delegacion.canarias@tecnoambiente.com

Perú

Avda. Arequipa, 2450, Oficina 608
Lince, LIMA
T. +51 444 1238
sucursal.peru@tecnoambiente.com

Colombia

Calle 90, 12 -28, Oficina 24
Chicó, Bogotá D.C.
T. +571 6386894
sucursal.colombia@tecnoambiente.com

MINISTÈRE
DE LA TRANSITION
ÉNERGÉTIQUE
Liberté
Égalité
Fraternité

FUGRO

AO7 OWF Geotechnical SI

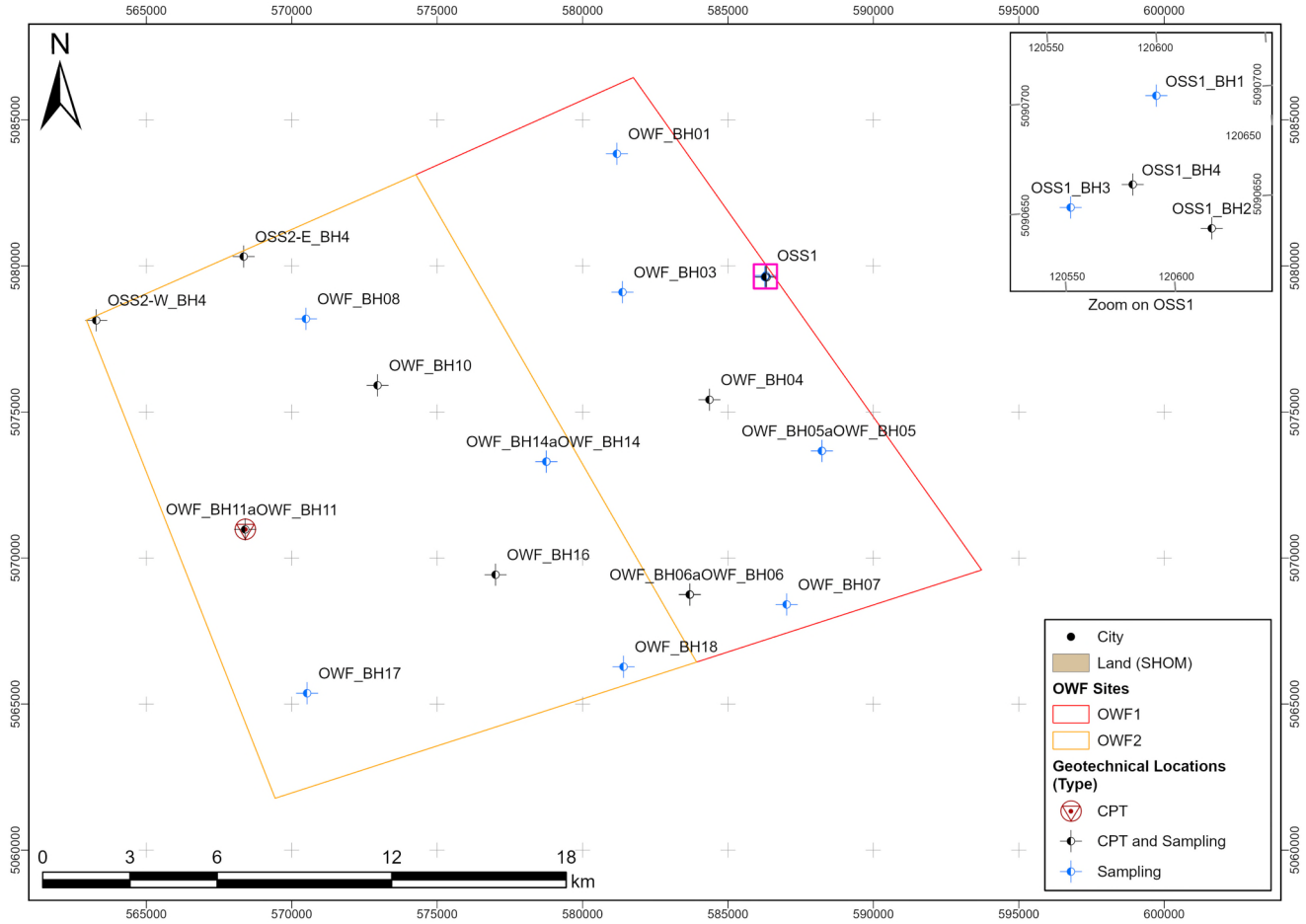
Oléron 2 – Integrated Ground Model

Arthur Blouin / Stanislas Po – 12/12/2024

Introductive Slides

Introduction

Fugro performed a geotechnical site investigation for DGEC between 2nd July and 12th September 2023 at the Oléron 1 (OWF1) and Oléron 2 (OWF2) development sites. This geotechnical investigation aimed at better understanding sub-seafloor conditions at the OWF sites and provide geotechnical parameters to help selection and design of foundation / anchor solutions.



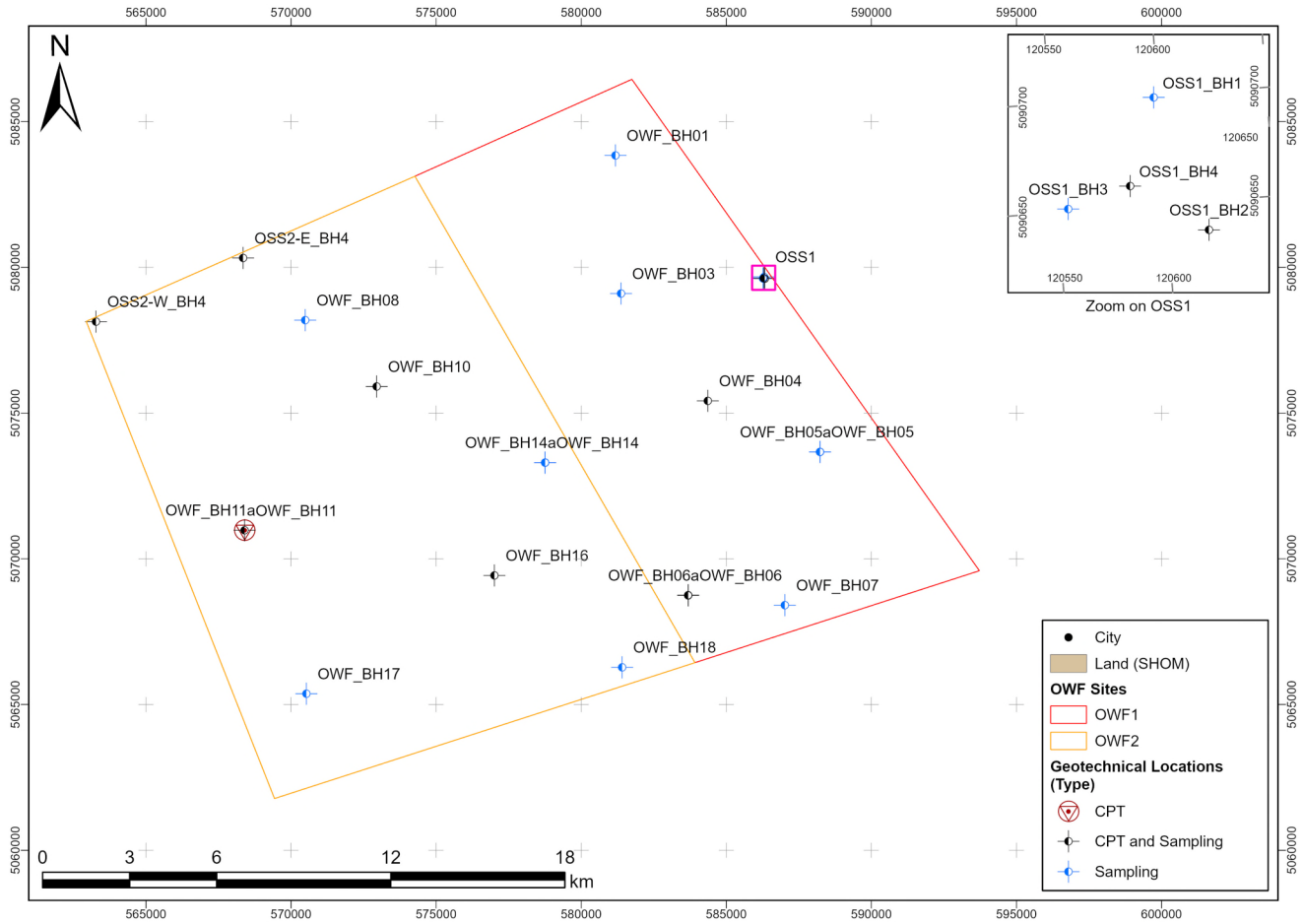
The results of the survey are presented in:

- An operational report;
- A factual report;
- **An integration report.**

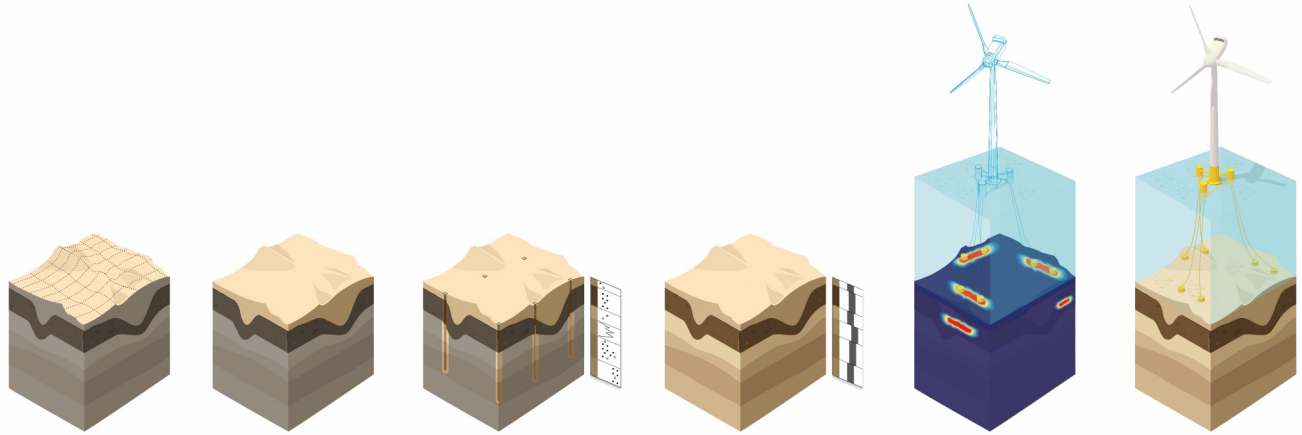
Introduction

OSS1_BH3	62.05	4 WIPs, 42 CRs
OSS1_BH4	61.00	2 CPTs, 2 WIPs, 39 CRs
OSS2-E_BH4	70.08	29 CPTs, 8 WIPs, 39 CRs
OSS2-W_BH4	70.55	38 CPTs, 18 WIPs, 21 CRs
OWF_BH01	60.20	1 WIP, 42 CRs
OWF_BH03	60.20	1 WIP, 43 CRs
OWF_BH04	60.40	9 CPTs, 39 CRs
OWF_BH05	3.25	4 WIPs
OWF_BH05a	60.40	39 CRs
OWF_BH06	23.10	22 CPTs, 1 WIP, 5 CRs
OWF_BH06a	60.70	10 CPTs, 2 WIPs, 22 CRs
OWF_BH07	34.95	11 WIPs, 21 CRs
OWF_BH08	37.90	3 WIPs, 25 CRs
OWF_BH10	30.30	5 CPTs, 16 CRs
OWF_BH11	9.84	7 CPTs
OWF_BH11a	61.00	33 CPTs, 9 CRs
OWF_BH14	15.00	4 WIPs, 10 CRs
OWF_BH14a	60.50	33 CRs
OWF_BH16	60.50	7 CPTs, 2 WIPs, 35 CRs
OWF_BH17	60.30	35 WIPs, 20 CRs
OWF_BH18	60.50	13 WIPs, 36 CRs

Note(s):
BSF = Below seafloor
CPT = Cone penetration test
WIP = Wireline push sample
CR = Core runs



Integrated Ground Model

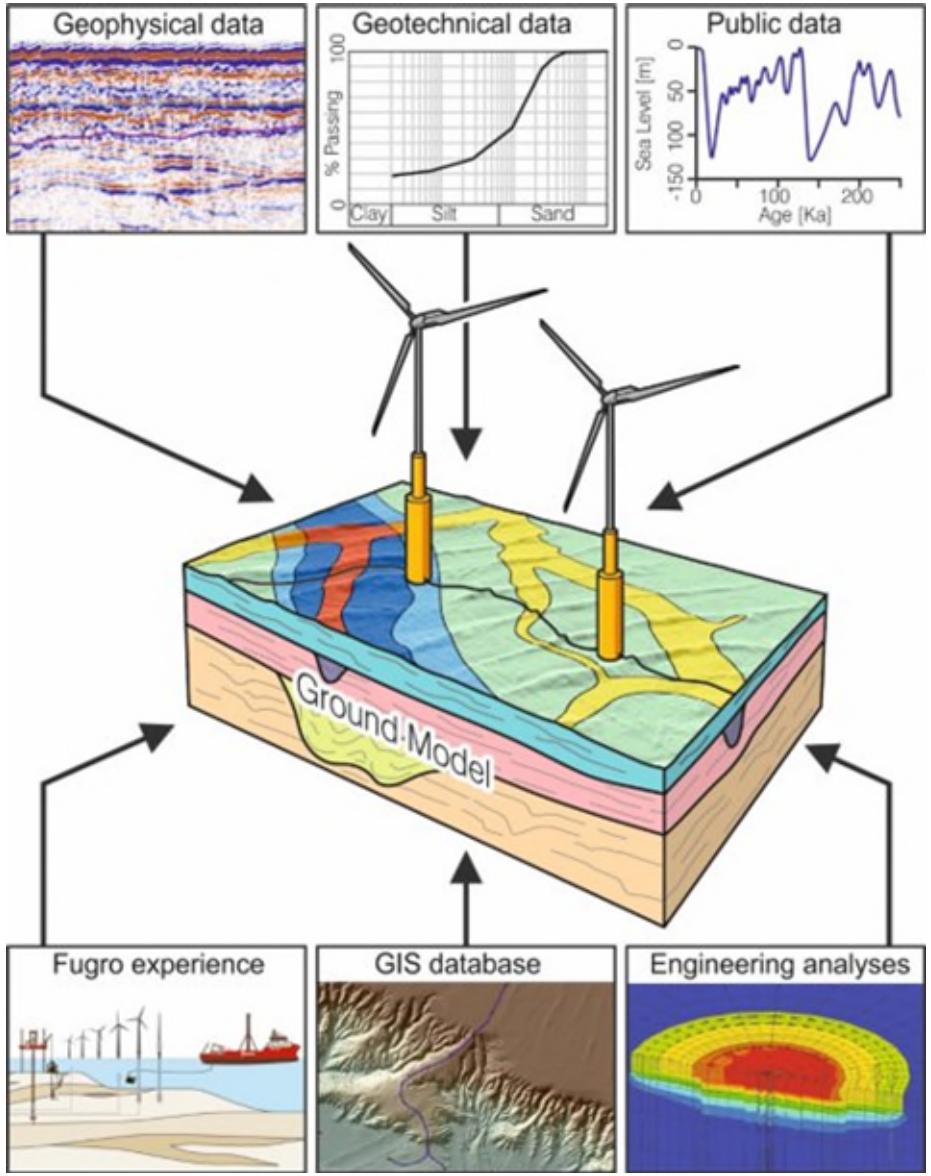


Methodology

What is a ground model?

- Integrates various datatypes to communicate the state of knowledge of the site, often with focus on predicting geotechnical conditions to an appropriate depth of interest (60 m BSF for this study)
- Provides input into survey planning, layout planning and foundation design
- Identifies engineering challenges, therefore minimizing engineering risk
- Makes the most of site investigation data
- Optimizes future site investigations by highlighting data gaps and areas of uncertainty
- Integrated Ground Model are recommended by CFMS and OSIG

IGM derived based on Fugro's geotechnical data, DGEC provided data (e.g. SHOM geophysical, geotechnical and Metocean data, TECNOAMBIENTE geophysical data), publicly available data (e.g. research papers, public databases) and Fugro experience.

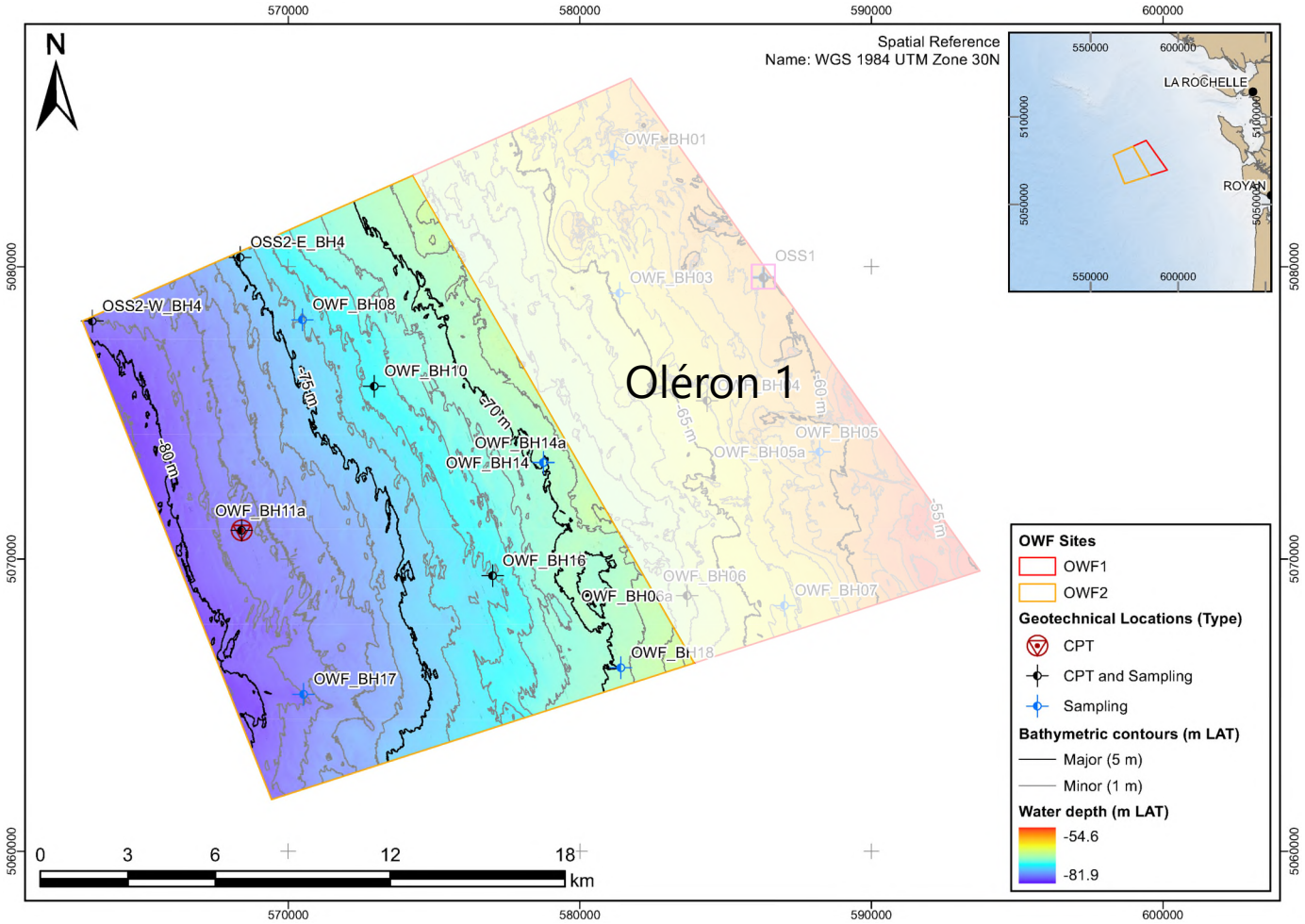


Site Conditions

Bathymetry

SHOM multibeam echosounder (MBES)

Site	Deeper [m LAT]	Shallower [m LAT]	Average [m LAT]
OWF2	-81.88	-66.00	-74.44

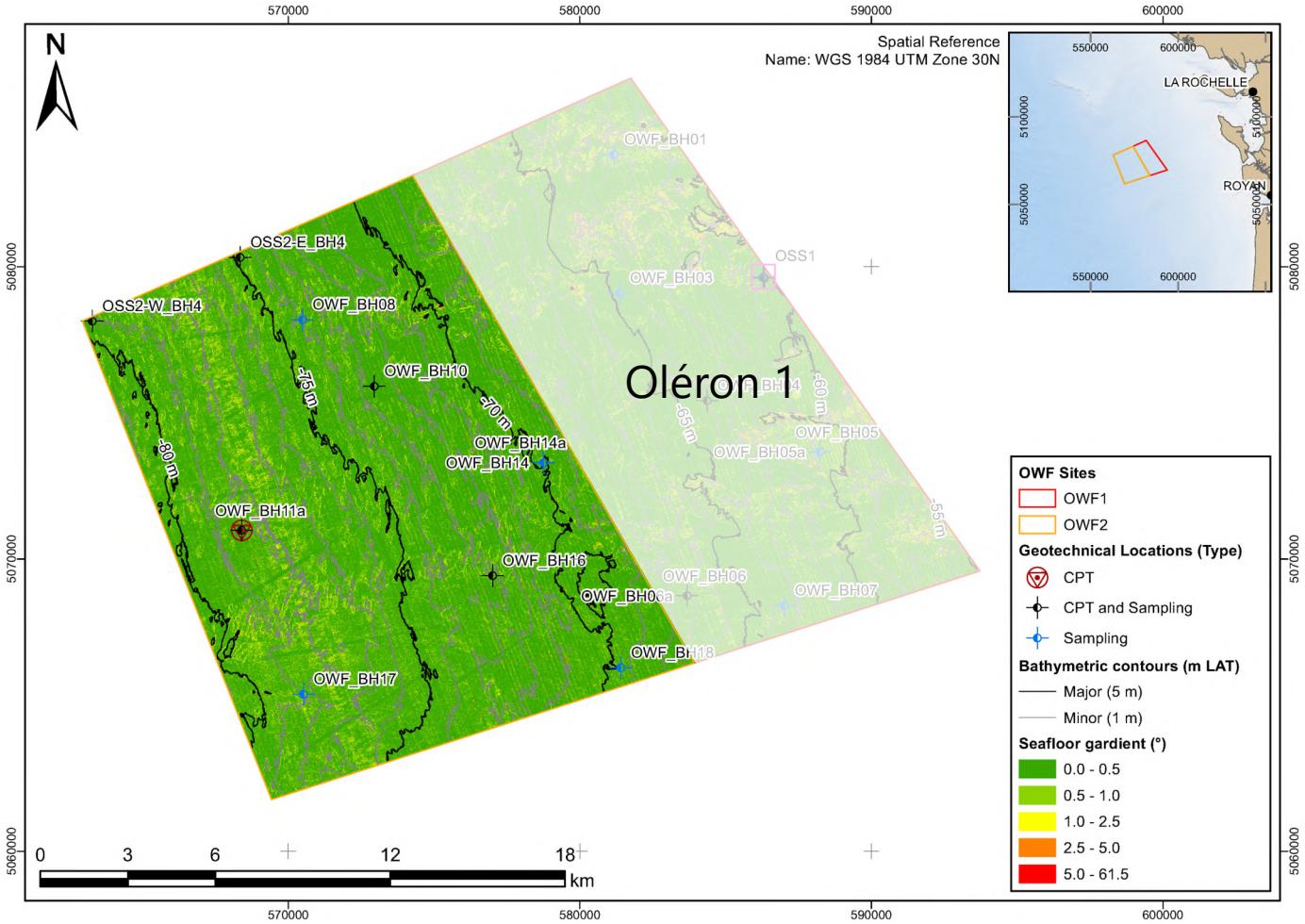


Site Conditions

Seafloor Gradient

Processed by Fugro based on SHOM MBES

Site	Minimum [°]	Maximum [°]	Average [°]
OWF2	0.00	61.52	0.37



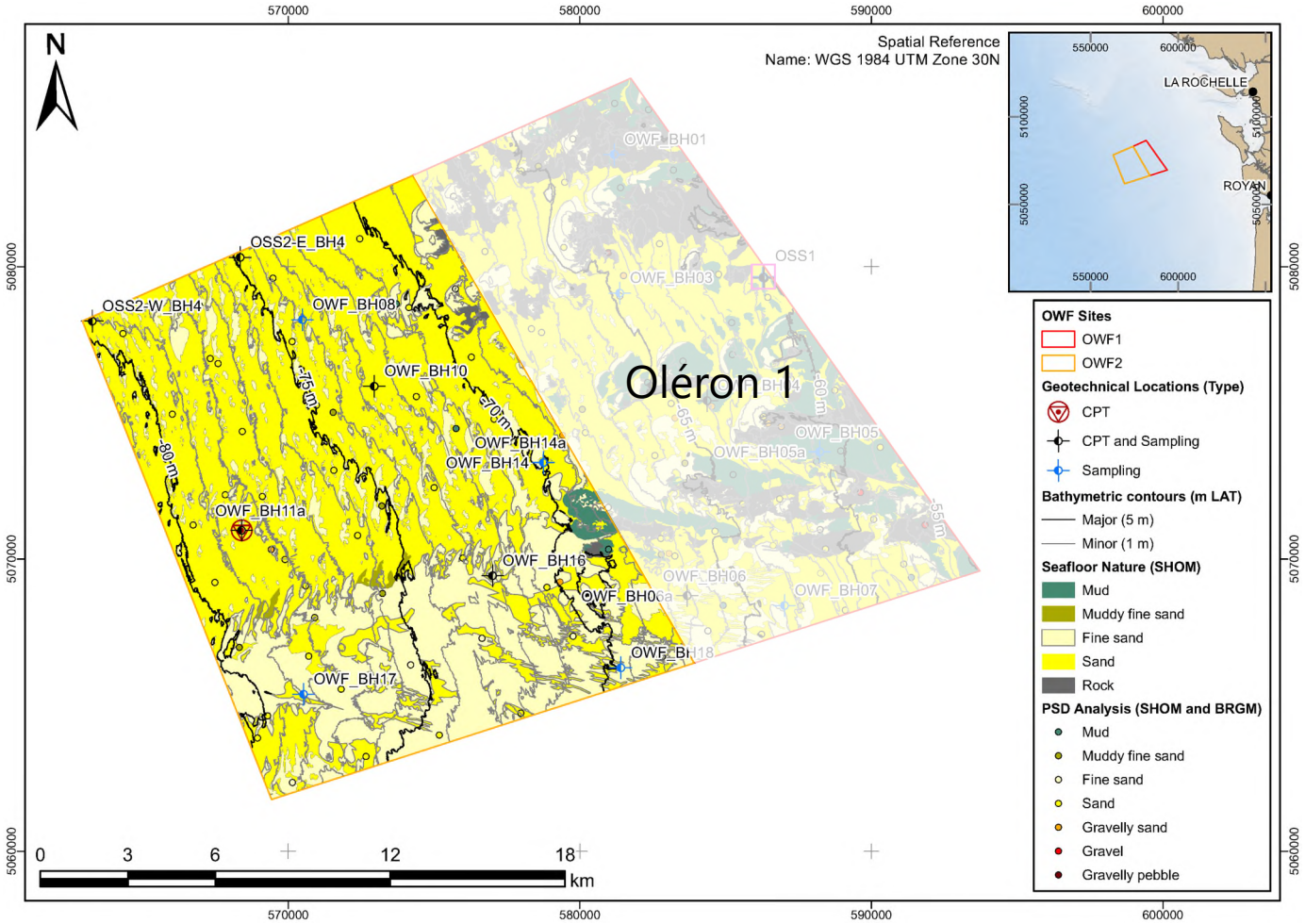
Site Conditions

Seafloor Nature

Provided by SHOM, based on MBES, backscatter, side scan sonar (SSS) and grab samples with particle size distribution (PSD) measurements

The seafloor at the OWF site consists of:

- Mud;
- Muddy fine sand;
- Fine sand;
- Sand;
- Rock.

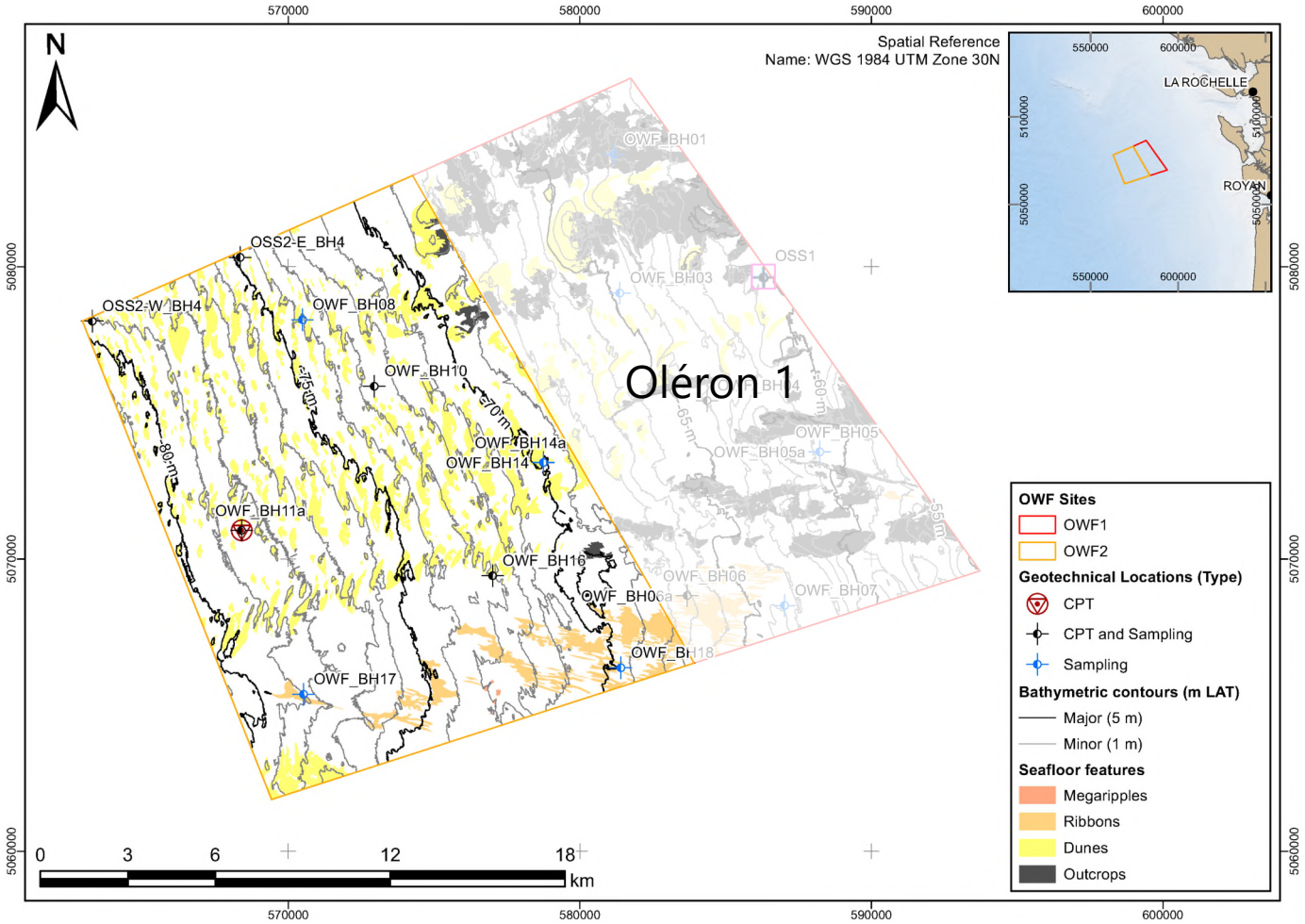


Site Conditions

Seafloor Features

Interpreted by Fugro based on SHOM data

- Rock outcrops (localized)
- Sand dunes
- Ribbons, megaripples and trawlmarks
- Shipwrecks with scour



Site Conditions

2D UHRS data interpretation

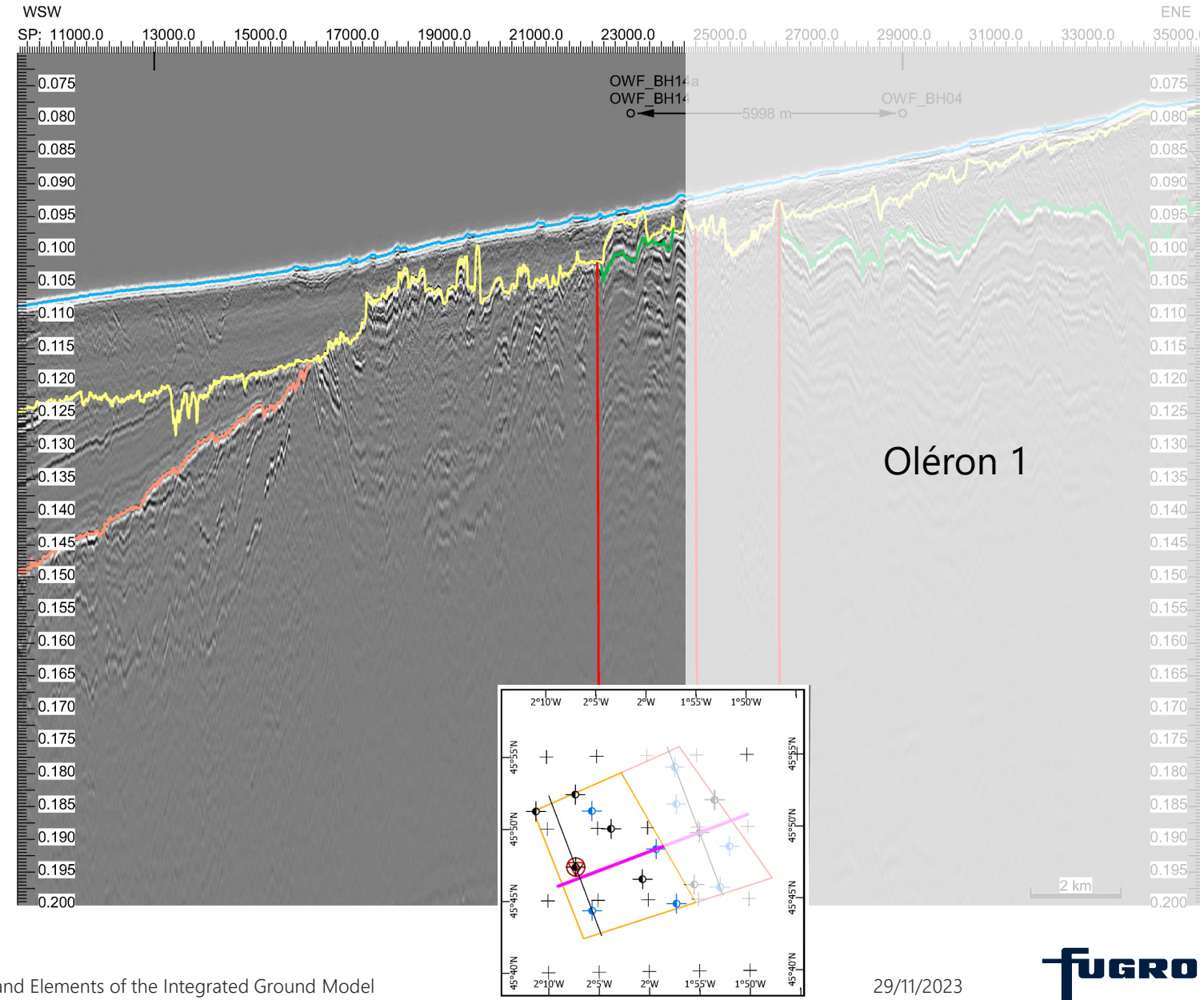
Legend

OWF Sites
- OWF1
- OWF2

Geotechnical Locations (Type)
- CPT
- CPT and Sampling
- Sampling
- 2D UHRS profile traces

- Horizon 01 (H01)
- Horizon 02 (H02)
- Horizon 03 (H03)
- Horizon 04 (H04)
- Major fault
- Seismic amplitude (+ / −)

Notes:
2D UHRS data acquired by TECNOAMBIENTE

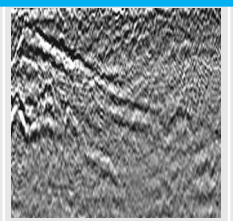
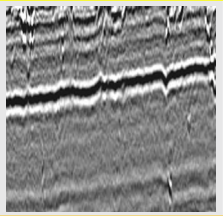
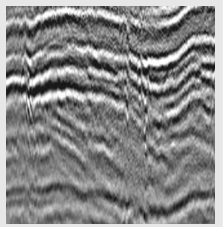


Site Conditions

Seismostratigraphic Units (SU)

Interpreted by Fugro based on TECNOAMBIENTE 2D UHRS data

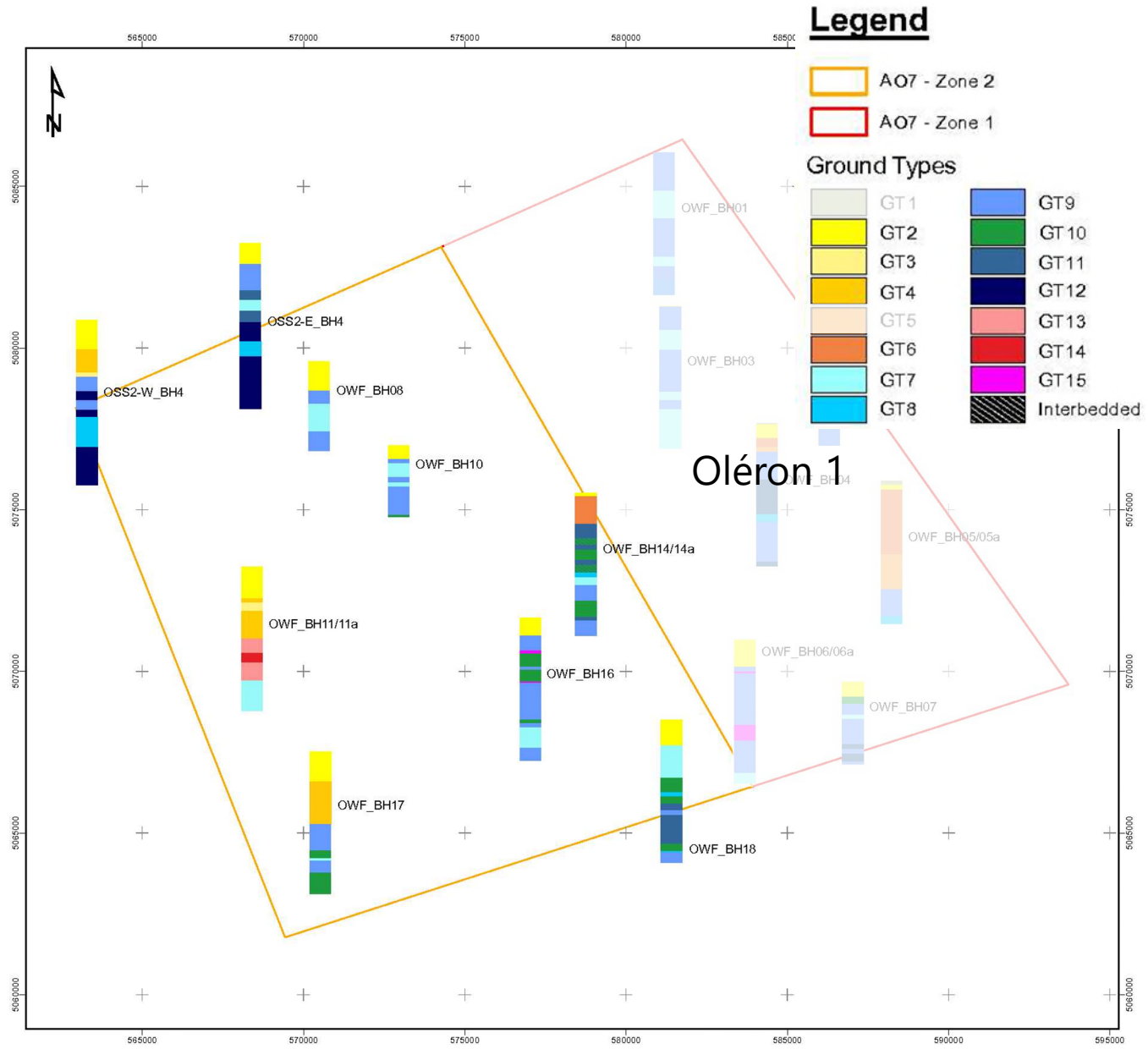
- 4 SU interpreted with 4 acoustic velocities based on correlation between unitized boreholes and seismic data
- 1 major fault, orientated East to West

SU	Top / Base Horizon	TWTT thickness [s]		Velocity [m/s]	Thickness [m]		Seismic facies example	Seismic Facies Description [configuration; continuity; amplitude]	Depositional environments	Assumed Age
		Min	Max		Min	Max				
SU1	H01 / H02	0.000	0.023	2050	0.2	24.3		Chaotic, discontinuous, low amplitude seismic reflectors.	Shallow marine deposits	Plio-Quaternary
SU2	H02 / H03	0.000	0.037	1850	0.0	34.0		Parallel, continuous, low to moderate amplitude seismic reflectors.	Marine deposits	Miocene
SU3	H01 or H02 / H04	0.000	0.054	2350	0.4	62.9		Oblique, semicontinuous, moderate to high amplitude seismic reflectors.	Shallow marine deposits	Paleogene
SU4	H01, H02, or H03 / NA	-	-	-	-	-		Semi-parallel, oblique, or contorted to mound-shaped, continuous to discontinuous, low to high amplitude seismic reflectors.	Shallow marine to marine deposits	Mesozoic

Site Conditions

Ground Types

- Identified based on Fugro geotechnical data and using detailed descriptions
- 13 ground types identified
- Sometimes interbedding each other
- GT2 to GT4: soils (SAND, SILT and CLAY)
- GT6 to GT11: sedimentary rocks (carbonates and non-carbonates)
- GT12: SAND
- GT13 to GT15: soils (SAND, CLAY)

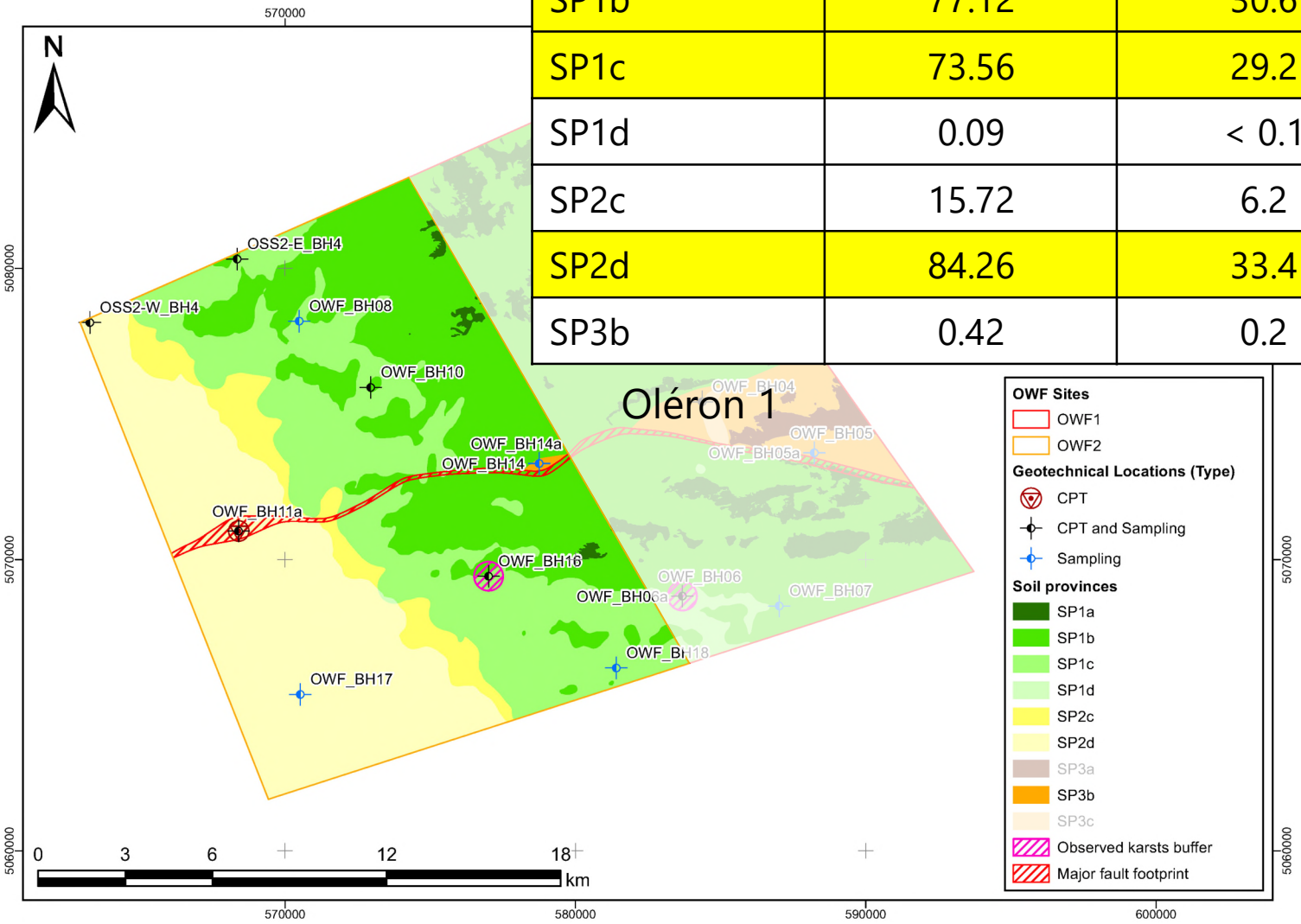


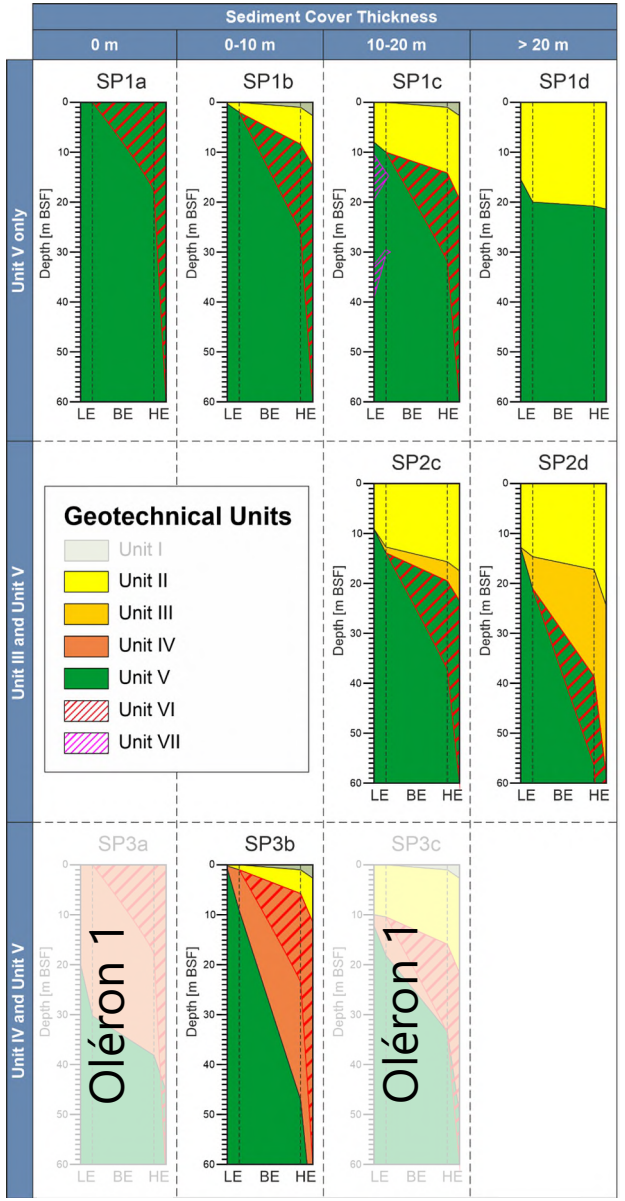
Ground Model

SU	GT		Geotechnical Units	Geotechnical Sub-Units	Thickness Min.	Thickness Max.
SU1	GT1		I	I	0.2	24.0
	GT2	GT2a	II	IIa		
		GT2b		IIb		
		GT2c		IIc		
SU2	GT3		III	IIIa	0.2	34.0
	GT4			IIIb		
SU3	GT5		IV	IVa	0.2	63.0
	GT6			IVb		
SU4	GT7		V	Va	0.0 (m BSF to top)	67.9 (m BSF to top)
	GT8			Vb		
	GT9			Vc		
	GT10			Vd		
	GT11			Ve		
	GT12			Vf		
Fault	GT13		VI	VIa	17.7	
	GT14			VIb		
Karsts	GT15		VII	VII	1.0	9.0

Ground Model

Soil Province	Area (km2)	Percentage (%)
SP1a	1.14	0.5
SP1b	77.12	30.6
SP1c	73.56	29.2
SP1d	0.09	< 0.1
SP2c	15.72	6.2
SP2d	84.26	33.4
SP3b	0.42	0.2

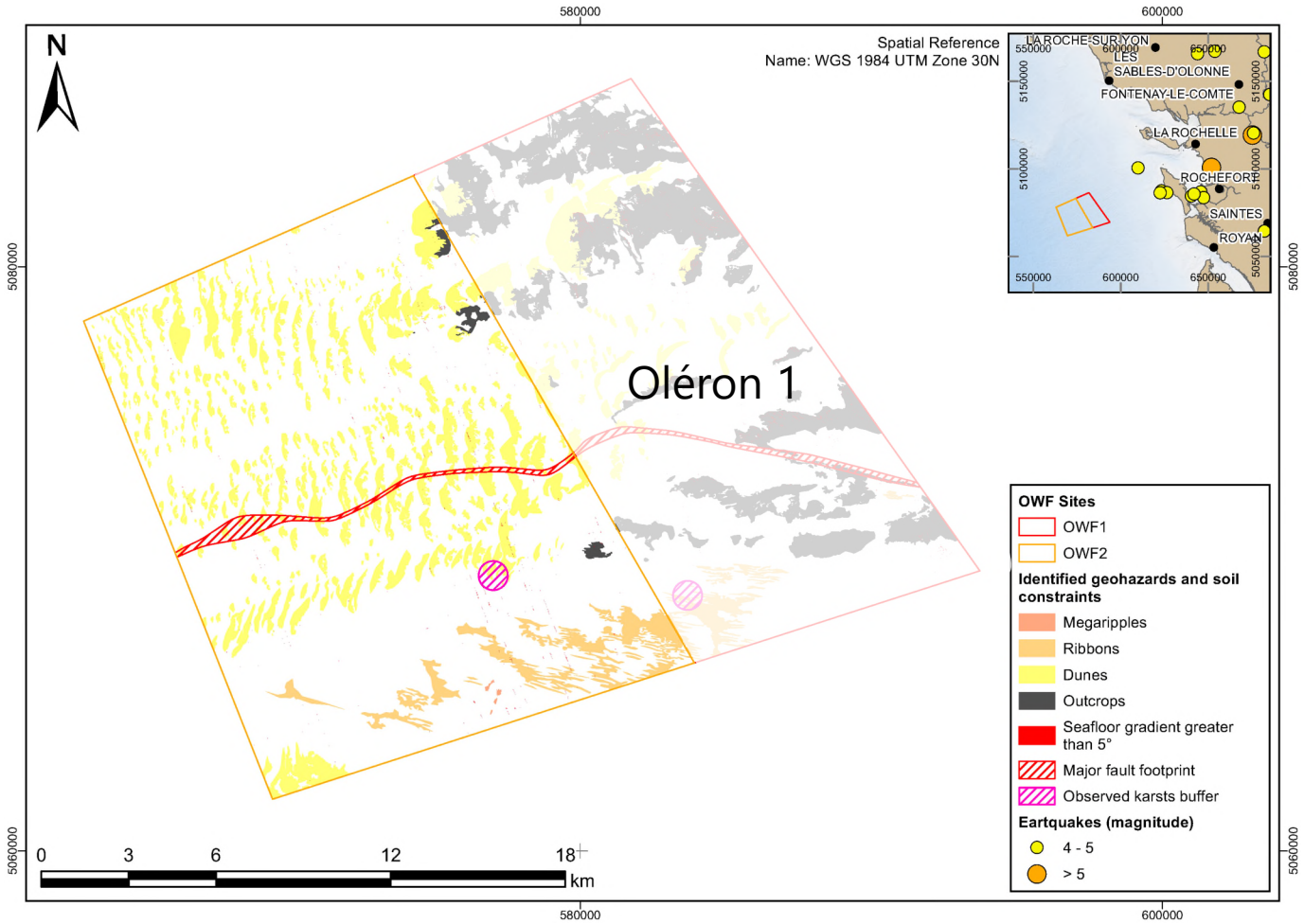




Geohazards, Soil Constraints and Anthropogenic constraints

- **Geohazards:** 6 observed, 2 inferred feasible
- **Soil constraints:** 8 observed, 2 inferred feasible
- **Anthropogenic constraints:** 3 shipwrecks, protected area, fishing activity, shipping route

Description, occurrence, implications for surveying / foundations or anchors / cables, uncertainties and possible mitigations are discussed in the report



FUGRO

Unlocking **Insights**
from **Geo-data**