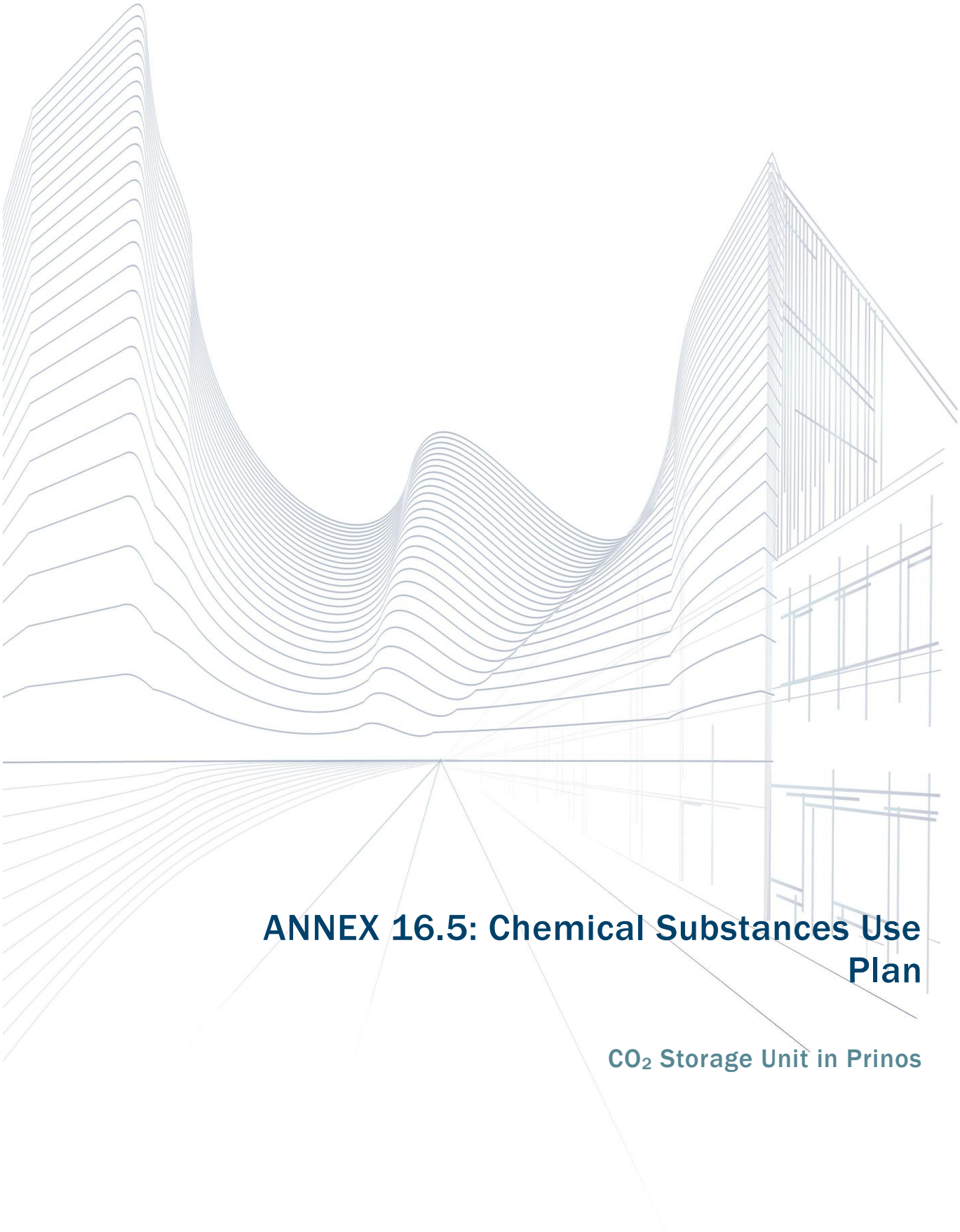
ENEARTH



ANNEX 16.5: Chemical Substances Use Plan

CO_2 Storage Unit in Prinos

LDK CONSULTANTS

wsp

THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK

Copyright Statement

Project	CO_2 Storage Unit in Prinos		
STUDY PHASE	Chemical Substances Use Plan within the framework of the Environmental Impact Assessment (EIA)		
STUDY CODE	CCP - 2902		
DATE	25.11.2024		
VERSION	v.01		
REVISION	v.01		
ENVIRONMENTAL CONSULTANT	LDK CONSULTANTS A.E. – WSP SA		
PROJECT OWNER	ENEARTH GREECE		
PREPARATION	Study Team LDK – WSP		
REVIEW	Kostis Nikolopoulos, LDK Project Manager Anna Borroni, WSP Project Director		
APPROVAL	Kostis Nikolopoulos Project Manager	LDK CONSULTANTS A.E. ΠΑΡΟΔΟΣ ΘΗΒΑΪΔΟΣ 21 - ΚΗΦΙΣΙΑ - Τ.Κ. 145 64 ΤΗΛ. 210 8196700 Α.Φ.Μ. 094061957 - ΔΟΥ: Φ.Α.Ε. ΑΘΗΝΩΝ ΑΡ. ΓΕΜΗ : 324501000	
APPROVAL	Vasilis Tsetoglou Health, Safety and Environmental Manager		
PROJECT OWNER REPRESENTATIVE	Katerina Sardi, Chief Executive Officer – Country Manager	ENEARTH GREECE ΜΟΝΟΠΡΟΣΩΠΗ Α.Ε ΛΕΩΦ.ΚΗΦΙΣΙΑΣ 32 - ΜΑΡΟΥΣΙ Τ.Κ. 151 25 ΤΗΛ. 210 81 74 200 – FAX. 210 81 74299 ΑΦΜ: 802522310 – ΔΟΥ ΚΕΦΟΔΕ ΑΤΤΙΚΗΣ	

THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK

CONTENTS

TABLES

1 INTRODUCTION

This Chemical Substances Use Plan complies with Article 9(1) and Article 1(ia) of the Protocol "for the Protection of the Mediterranean Sea against Pollution Resulting from Exploration and Exploitation of the Continental Shelf and the Seabed and its Subsoil" of the Barcelona Convention (Decision 2013/5/EU).

This Plan applies to the Project: **CO_2 Storage Unit in Prinos**. The Project falls within the scope of the Protocol, as the storage activity constitutes the exploitation of resources in the Protocol's area, in accordance with point (d)(iii) of Article 1.

1.1 PROJECT SUMMARY

The project under study concerns the installation of a full-scale carbon dioxide (CO_2) storage unit in Prinos (the "Project"). The proposed CO_2 storage site is located within the Prinos Basin, in the Gulf of Kavala, in the Northern Aegean. The area of interest for CO_2 storage lies within the Prinos Concession, where Energean Oil & Gas SA ("Energean"), an affiliate of EnEarth, holds 100% of the interests and management rights for oil and natural gas exploration and production activities since 2007. The potential CO_2 storage location is situated within the Prinos structure and the underlying aquifer.

The operation of the facility is planned to be developed in two distinct phases based on capacity (Phase 1 and Phase 2), for reasons of scalability and adaptation to market conditions.

- **Phase 1** with an initial nominal capacity of up to **1 MTPA** for 20 years (starting around the end of 2025 to early 2026). The CO_2 will be supplied mainly in bulk, via third-party pipelines reaching the facility's boundaries under suitable conditions for injection. Additionally, small quantities of CO_2 shipments will be received at the Sigma onshore facilities in containers, transported by trucks, as part of pilot CO_2 capture projects.
- During **Phase 2**, an expansion is planned to reach a final nominal capacity of up to **3 MTPA**. The facility will be modified to also receive liquefied CO_2, which will be delivered via sea transport to a newly constructed jetty. For this purpose, marine facilities for mooring, unloading, storage and processing (pumping, heating) of the liquefied CO_2 will be built within the onshore area of the Sigma plant operations. The CO_2 will be transported to the offshore facilities through the subsea pipeline constructed during Phase 1.

This study focuses on **Phase 1 of the Project**.

The new facilities and wells planned for the operation of Phase 1 of the CO_2 storage Project, which are the subject of this study, include:

- Onshore facilities: modification of a designated area within the existing Sigma plant site for the construction of the CO_2 reception manifold and an unloading and compression area.
- Offshore pipeline: subsea pipeline connecting the Sigma plant area with the offshore Beta platform, approximately 20 km in length.

- Offshore platforms: modification and/or use of the existing offshore facilities at Prinos (Beta and Delta platforms) for the reception of CO_2 from the new subsea pipeline and CO_2 shipments in containers, injection into the new wells, and treatment of produced water (Delta platform).
- Wells: 2 CO_2 injection wells and 2 water production wells at the existing Beta platform of the Prinos offshore complex.

The CO_2 sources and the main reception processes during Phase 1 of the CO_2 storage Project will be as follows:

- Supply of bulk CO_2 under suitable conditions for injection via a third-party pipeline to an onshore reception station within the Sigma facilities operational area.
- Reception of CO_2 shipments from trucks carrying ISO containers at the Sigma onshore facilities. The containers will be loaded onto supply vessels/barges with a crane, transported, and unloaded at the existing Beta platform of the Prinos offshore facilities. It is noted that provision is also made for the direct injection of CO_2 shipments into the onshore reception manifold via a compression station during unloading from the trucks.

The CO_2 stream from the onshore station within the Sigma facilities will be transported via a new dedicated subsea pipeline, approximately 20 km in length, to the existing Beta platform of the offshore facilities, where the CO_2 injection into the reservoir will be carried out through specialized injection wells.

Modifications will be made to the existing Beta platform to include the necessary CO_2 injection facilities. The platform has slots for 12 wells and is connected to the Delta processing platform. As part of the Project, 4 of the 12 slots will be used for the two new CO_2 injection wells and the two new water production wells (Table 1-1). Electric Submersible Pumps (ESPs) will operate in the two water wells to extract water from the reservoir, providing a means of active pressure management. Water management will take place at the existing processing facility on the Delta platform.

Table 1-1: Final Drilling Depth Criteria (UTM Zone 35N)

Well Type	Name	Spudding Well	Spud Depth of New Well (m)	Target	Surface Location
CO_2 Injection	PBC-1	PB-17A	1.000	X:287725.69 y:4518803.72 Z:-2779.95	X:288963.21 y:4519413.86
CO_2 Injection	PBC-2	PB-24	1.000	X:287778.73 y:4519015.54 Z:-2718.38	X:288963.21 y:4519411.57
Water production	PBW-1	PB-22	1.000	X:290192.01 y:4517931.73 Z:-2741.54	X:288967.79 y:4519416.15
Water production	PBW-2	PB-23A	1.000	X:290060 y:4518995 Z:-2840	X:288965.50 y:4519413.86

The modification of the Delta platform will involve a comprehensive upgrade of the auxiliary facilities, the produced water treatment and disposal unit and the control and safety systems. This will ensure that the water produced for reservoir pressure management purposes will be treated using the existing facilities. This integrated approach optimizes resource utilization while enhancing the operational performance of the platform, environmental management, and the protection of the marine environment.

During the construction phase of the Project, the following activities will be carried out:

- Structural works and modifications, installation of CO_2 reception and handling equipment at the Sigma onshore facilities
- Installation of buried CO_2 transport pipelines (onshore pipeline section and offshore pipeline).
- Construction of CO_2 injection wells and water production wells:
    - Delivery & installation of the drilling rig
    - Preparation of the existing spudding well (placement of permanent mechanical barrier and preparation for sidetracking)
    - Drilling of a 16" diameter well to a depth of approximately 2,200 m
    - Drilling of a 12-1/4" x 13-1/2" diameter well to a depth of approximately 3,150 m
    - Drilling of an 8-1/2" diameter well to a depth of approximately 3,700 m

The drilling muds to be used are provided in the following table:

Table 1-2: Drilling Mud Program by Section and Used Additives

Section	Diameter (inches)	Estimated volume of drilling mud per well (m^3)	Drilling mud system – Main additives	Mud type
I	16"	+/- 700	Gel / Polymer / Lime Additives: Bentonite, Potassium Chloride, Polypac, CMC, Lime, Calcium Carbonate, Sodium Chloride, Flo-Vis.	Water-based / Lime
II	12 1/4"	+/- 490	Versavert LTOBM Additives: EDC 95/11, Safe-Scav, Safe Carb, Bentonite, Calcium Chloride, Barite, Versatrol	Oil-based
III	8 1/2"	+/- 350	FLO-PRO WBM or Versavert LTOBM Additives: Flo-Trol, Soda Ash, Safe-Scav, Sodium Chloride, Zinc Oxide, Conqor	Oil-based/water-based

The project shutdown, prioritizing the well closure and reservoir safety, will be carried out in accordance with best practices and guidelines (Offshore Energies United Kingdom (OEUK), 2022).

1.2 LEGISLATION – BARCELONA PROTOCOL

On December 17, 2012, the Council approved the accession of the EU to the Offshore Activities Protocol, highlighting the EU's commitment to reducing the environmental impacts of offshore activities in the

Mediterranean through effective regional cooperation (Decision 2013/5/EU). The legal consequence of this is that the Offshore Activities Protocol has now become part of EU legislation.

The Protocol "for the Protection of the Mediterranean Sea against Pollution resulting from the Exploration and Exploitation of the Continental Shelf and the Seabed and its Subsoil" under the Barcelona Convention refers to the protection of the Mediterranean Sea from pollution arising from the exploration and exploitation of the continental shelf, seabed and its subsoil.

Article 9(1) of the Protocol requires operators to obtain approval from the competent authority for the use and storage of chemical substances related to their activities (based on the Chemical Use Plan), which is not subject to regulatory provisions within the Regulation Plan.

According to Article 1(ia) of the Offshore Activities Protocol for the Protection of the Mediterranean Sea against Pollution caused by the Exploration and Exploitation of the Continental Shelf, the Seabed, and its Subsoil, this Protocol mandates the preparation of a Chemical Use Plan.

The Chemical Use Plan includes the following requirements:

- The chemical substances that the operating entity intends to use during the operations
- The purposes for which the operating entity intends to use the chemical substances
- The maximum concentrations of chemical substances, as well as the maximum quantities expected to be used during all periods
- The area within which the chemical substance may potentially be released into the marine environment

2 DESCRIPTION OF CHEMICAL SUBSTANCES

The chemical substances that the operator intends to use in the new CO_2 storage facilities are described below.

No modifications to the existing Sigma facilities are planned for the implementation of the Project. The onshore CO_2 management facilities (reception, processing and pumping to the storage field) are located within the Sigma facility

The existing Beta platform has slots for 12 wells and is connected to the Delta processing platform.

Modifications will be made on the Beta platform to include the necessary CO_2 injection facilities. The platform will be equipped with a hoist, a gathering pipeline, equipment for processing CO_2 shipments, and the auxiliary facilities may be upgraded to accommodate the new activities. Two CO_2 injection wells and two water production wells will be drilled. The new wells will be sidetracked using the existing slots on the Beta platform

The modification of the Delta platform will involve a comprehensive upgrade of the auxiliary facilities, the processing and disposal unit for produced water, and the control and safety systems, so that the water produced for reservoir pressure management can be treated using the existing facilities.

The following tables summarize the required materials for the aforementioned modifications as well as the total basic materials used for the preparation of drilling fluids.

For the onshore facilities of the CO_2 storage project, the following will be required during the construction phase:

Table 2-1: Required Materials for Onshore Facilities

Material	Quantity
Carbon steel pipes and protective steel casings	50 tn
Concrete for pipeline coatings, foundations, pipeline supports, temporary access	350 tn
Copper cables for electrical installations and instruments of various sizes	2 tn

The following materials are expected to be required for the construction of the new subsea CO2 transport pipeline:

Table 2-2: Required Materials for the Construction of the New Subsea CO_2 Transport Pipeline

Material	Quantity
Carbon steel pipes for the offshore pipeline	2.480 tn
Concrete for pipeline coating	3.800 tn
Anti-corrosion coating with epoxy polyethylene/polypropylene (3LPE/PP)	102 tn
Anodes for cathodic protection of pipelines: Mix of Magnesium, Zinc, Aluminium	2 tn

For the new CO2 injection and produced water wells on the Beta platform, the following will be required:

Table 2-3: Required Materials for the Construction of the New Wells

Material	Quantity
Carbon steel pipes and protective steel casings	30 tn
Valves, pipe fittings, flanges	25 tn
Copper cables for electrical installations and instruments, of various sizes	3 tn

The basic materials to be used for the preparation of drilling fluids are summarized in the following Table, based on the Safety Data Sheets (SDS) and the European Regulation (EU) 2015/830.

The Safety Data Sheets (SDS) for each substance describe the properties, hazards, hazard symbols, as well as the safety measures.

The concentrations of substances in the drilling mud for each well on the Beta platform, as well as the estimated quantities of materials for the preparation of the drilling mud by wellbore section, are presented in Tables 4.1 and 4.2, respectively

Table 2-4: Properties of Key Chemical Substances for the Preparation of Drilling Fluids According to the SDS

Chemical Substance	CAS[1] - Number	Properties	Hazards	Safety Measures	Hazard Symbol
Bentonite	14808-60-7	Clay mineral used to increase the specific gravity of the drilling mud and to compensate for hydrostatic pressure.	Bentonite at the proposed concentrations is a mineral and is not considered hazardous to the environment. In other cases, it is considered possibly carcinogenic if inhaled (H351) or may cause organ damage through prolonged or repeated exposure by inhalation (H373).	Avoid inhalation. In case of inhalation, move to an area with fresh air. Seek medical attention if respiratory irritation develops or if breathing becomes difficult. Avoid contact with eyes. In case of contact, immediately rinse eyes with plenty of water for at least 15 minutes and seek medical attention if irritation persists. In case of skin contact, wash the area with water and soap and seek medical attention if irritation persists. Avoid ingestion. In case of ingestion,	

[1] Chemical Abstracts Service

Chemical Substance	CAS[1] - Number	Properties	Hazards	Safety Measures	Hazard Symbol
				rinse the mouth with water several times.	
POLYPAC	-	It consists of polyanionic cellulose and is a high-quality water-soluble polymer designed to control fluid loss. It is an ultra-low dosage additive, therefore causing zero to minimal reduction in fluidity. The typical concentration is 5 - 15 kg/m^3.	POLYPAC at the proposed concentration is not considered hazardous to the environment.	For prolonged or repeated skin contact, use appropriate protective gloves. There is no specific recommendation, but respiratory protection may be required in exceptional circumstances when there is excessive air contamination. Dust filter P2 (for fine dust).	-
Lime	-	Used as a source of calcium (Ca^{2+}) and alkalinity (OH^-) in water-based drilling fluids.	Lime at the proposed concentration (**Table 4.1**) is not considered hazardous to the environment. Causes skin irritation (H315), serious eye damage (H318) and may cause respiratory irritation (H335).	Wear protective gloves/protective clothing/eye protection/face protection. Avoid contact with eyes. In case of accidental contact, rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing. In case of skin contact, immediately remove contaminated clothing and wash the skin with soap and water. Seek immediate medical attention if symptoms appear after washing. To avoid environmental hazards, do not allow it to enter drains, sewers or watercourses.	
CMC HV	-	It is high-viscosity sodium carboxymethyl cellulose, designed to control drilling fluid loss to the borehole walls and to manage the rheology of water-	No physical, environmental, or human health hazards are classified.	Inhalation: In case of inhalation, move away from the area to fresh air. Seek medical attention if respiratory irritation develops or if breathing becomes difficult.	-

Chemical Substance	CAS[1] - Number	Properties	Hazards	Safety Measures	Hazard Symbol
		based mud. It is resistant to bacterial degradation and has high tolerance to the chemical reactions of the mud. CMC HV is biodegradable.		Ingestion: Avoid swallowing. In case of ingestion, rinse the mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if symptoms occur. Skin contact: Avoid skin contact. In case of contact, wash immediately with soap and plenty of water, removing all contaminated clothing and shoes. Seek medical attention immediately if symptoms appear. Eye contact: Avoid eye contact by using special safety goggles. In case of contact, immediately rinse the eyes with plenty of water while lifting the eyelids. Continue rinsing for at least 15 minutes. Seek medical attention if any irritation persists.	
POLYDRILL	-	It is a polymer for water-based mud that controls fluid loss and the rheology of the mud and is particularly effective at high temperatures as well as in fluids with high electrolyte content. Usually dark brown to black powder, non-flammable.	It can form a concentration of flammable dust in the air.	Avoid inhalation. If respirable aerosols/dust are generated, wear respiratory protection if ventilation is inadequate. Use a NIOSH-certified (or equivalent) organic vapor/particulate respirator. Safety goggles with side shields are recommended. Wear protective clothing as required to minimize contact. Handle according to	-

Chemical Substance	CAS[1] - Number	Properties	Hazards	Safety Measures	Hazard Symbol
				good industrial hygiene and safety practices.	
Barite	7727-43-7	Usually in the form of a gray or brown powder, odorless or with no distinct smell. It is used to increase the specific gravity of drilling mud and to counterbalance hydrostatic pressure.	Barite is a mineral and is not considered hazardous to the environment. In case of accidental contact with eyes or skin, it may cause irritation to the eyes, skin and respiratory tract. Prolonged inhalation of particles may cause lung damage.	Eye contact: Immediately rinse eyes with plenty of water, lifting the eyelids. Continue rinsing for at least 15 minutes. Seek medical attention if any irritation persists. Skin contact: Wash skin thoroughly with soap and water. Remove contaminated clothing and wash it before reuse. Seek medical attention if any discomfort persists. Inhalation: Move the person to fresh air. If they are not breathing, administer artificial respiration. If breathing is difficult, provide oxygen. Ingestion: Dilute with 2–3 glasses of water or milk, if conscious. Never give anything by mouth to an unconscious person. If signs of irritation or toxicity appear, seek medical attention.	-
FLO-VIS	-	It is a high-quality biopolymer (clarified xanthan gum biopolymer), which can enhance the rheological properties of the drilling mud.	It is not considered hazardous to the environment. No physical hazards or public health risks are classified.	There is no specific recommendation, but respiratory protection may be required under exceptional circumstances when there is excessive air contamination. For prolonged or repeated skin contact, use appropriate protective gloves	-

Chemical Substance	CAS[1] - Number	Properties	Hazards	Safety Measures	Hazard Symbol
				(made of rubber, neoprene, or PVC). Wear approved chemical safety goggles where eye exposure is reasonably likely.	
FLO-TROL	-	It is a highly modified starch derivative used for controlling fluid loss and viscosity. This product has been classified as not containing hazardous ingredients in accordance with EC directives.	It is not considered hazardous to the environment. It is not considered hazardous to health according to applicable legislation.	For prolonged or repeated skin contact, use appropriate protective gloves (rubber or plastic). Wear dust-resistant safety goggles where there is a risk of eye contact. Wear suitable clothing to avoid repeated or prolonged skin contact. An eye wash station should be available.	-
SAFE-SCAN HS	-	It reacts with hydrogen sulfide and remains soluble even after the chemical reaction with it. It is based on an organic chemical substance, as an alternative to the use of zinc or iron mixtures.	Harmful if inhaled, in contact with skin, and if swallowed. Irritates the eyes and skin.	Avoid contact with skin. Use protective gloves made of neoprene, nitrile, polyethylene, or PVC. Wear protective goggles to prevent any possible eye contact.	 -
SAFE-CARB	471-34-1	SAFE-CARB is a high-purity, acid-soluble calcium carbonate used as a bonding agent in drilling, treatment, and completion fluids. Compared to limestone, it has higher hardness and purity, providing better acid solubility.	No environmental, physical, or other hazards are recorded.	Avoid skin contact. In case of contact, immediately remove contaminated clothing and wash the skin with soap and water. Avoid contact with the eyes. In case of contact, ensure that any contact lenses are removed before rinsing. Rinse the eyes immediately with plenty of water, lifting the eyelids.	-
Calcium Carbonate	14808-60-7	It is produced in different grain sizes that can be used as a weighting agent to increase the specific gravity of drilling mud and to reduce	This product has not been classified as hazardous. Therefore, no hazard statements	Inhalation: In case of inhalation, move to an area with fresh air. Seek medical attention if respiratory irritation develops or if	-

Chemical Substance	CAS[1] - Number	Properties	Hazards	Safety Measures	Hazard Symbol
		formation fluid influx into the drilling fluids. It is a mineral and is not considered hazardous to the environment.	(H) have been assigned.	breathing becomes difficult. Ingestion: Rinse the mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if symptoms appear. Skin contact: Wash the skin thoroughly with soap and water. Seek medical attention if irritation persists. Eye contact: Immediately rinse the eyes with plenty of water, lifting the eyelids. Remove contact lenses. Continue rinsing for at least 15 minutes. Seek medical attention if discomfort persists.	
Calcium Chloride	10043-52-4	Usually in the form of an off-white powder, odorless, soluble in water.	No environmental hazards have been identified. May cause eye irritation or serious eye damage (H319).	Inhalation: Avoid inhalation. In case of inhalation, move to an area with fresh air. Seek medical attention if respiratory irritation develops or if breathing becomes difficult. Ingestion: Rinse the mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs. Skin contact: Avoid skin contact by wearing appropriate protective clothing. In case of contact, immediately wash with soap and plenty of water, removing	

Chemical Substance	CAS[1] - Number	Properties	Hazards	Safety Measures	Hazard Symbol
				all contaminated clothing and shoes. Seek medical attention immediately if symptoms develop. Eye contact: Use special safety goggles. In case of eye contact, remove contact lenses. Immediately rinse the eyes with plenty of water, lifting the eyelids. Continue rinsing for at least 15 minutes. Seek medical attention if any irritation persists.	
VESATROL (Natural Resin)	12002-43-6	It is used for high-pressure, high-temperature (HPHT) filtration control in all VERSA oil-based systems. It is often used for sealing low-pressure and depleted formations. High-temperature conditions and special applications require higher concentrations, up to 29 kg/m³. It is usually a solid, black and odorless material.	No environmental or physical hazards have been identified. Neither are there any risks to public health.	For prolonged or repeated skin contact, use appropriate protective gloves. Neoprene or nitrile gloves are recommended. Wear approved chemical safety goggles where eye exposure is reasonably likely.	-
Potassium Chloride	-	Liquid, odorless, colorless, soluble in water.	It does not contain hazardous substances in concentrations above the threshold limits according to the competent authority.	Wear safety goggles or protective glasses to guard against exposure. Regular work overalls are recommended. Avoid inhalation. In case of inhalation, move to an area with fresh air. Seek medical attention if respiratory irritation develops or if breathing becomes difficult.	-

Chemical Substance	CAS[1] - Number	Properties	Hazards	Safety Measures	Hazard Symbol
EDC 95-11	-	It is the main component of LTOBM and is also referred to as base oil. It has a high level of purity and a very low content of aromatic hydrocarbons. Liquid, colorless, and odorless, soluble in common solvents.	This product is classified as harmful according to EU regulations. It may cause lung damage if swallowed.	Inhalation: If inhaled, immediately move the exposed person to fresh air. Seek medical attention if any irritation persists. Ingestion: DO NOT INDUCE VOMITING! If vomiting occurs, keep the head low to prevent stomach contents from entering the lungs. Rinse the mouth thoroughly with water and give large amounts of milk or water to conscious persons. Seek medical attention. Skin contact: Use chemically resistant gloves required for prolonged or repeated contact, made of polyvinyl chloride (PVC), nitrile, or polyvinyl alcohol (PVA). In case of contact, wash the skin thoroughly with soap and water. Remove contaminated clothing. Seek medical attention if discomfort persists. Eyes: Wear splash-proof protective goggles to prevent any possible eye contact. In case of contact, immediately rinse the eyes with plenty of water, lifting the eyelids. Continue rinsing for at least 15 minutes. Seek medical attention if any irritation persists.	

Chemical Substance	CAS[1] - Number	Properties	Hazards	Safety Measures	Hazard Symbol
SODA ASH (Sodium Carbonate)	497-19-8	Usually in the form of a white powder, odorless, soluble in water. Sodium carbonate, as an alkalinity agent in granular form, is primarily used to increase the pH of the drilling fluid. It can also maximize the performance of bentonite and other polymers. The typical concentration is 1.2 – 2.4 kg/m³.	It may cause irritation of the skin, eyes, and respiratory tract. It may cause stomach discomfort, nausea, and vomiting if swallowed.	Avoid contact with eyes, skin, and clothing. Avoid inhaling airborne product. Keep the container tightly closed. Use with adequate ventilation. Wash thoroughly after handling.	-
CONQOR	-	It is a phosphate-based corrosion inhibitor used for water-based drilling fluids, saline water systems, and fluids in gas, aerosol, and foam forms. It is suitable for managing calcium salt deposits and is particularly effective in highly aerated fluids, such as during drilling operations. If the corrosion rate is high, its concentration should be increased to at least 1.7 L/m³. It is odorless, water-soluble, liquid in form and yellow in color.	No environmental or physical hazards have been identified, nor are there any risks to human health.	Inhalation**:** Avoid inhalation. In case of inhalation, immediately move the exposed person to fresh air. If respiratory problems occur, provide artificial respiration or oxygen. Seek medical attention if symptoms persist. Ingestion: Avoid swallowing. In case of ingestion, do not induce vomiting. Seek medical attention if any discomfort persists. Skin contact: Wear appropriate clothing to avoid any possible skin contact. In case of contact, immediately remove contaminated clothing and wash the skin with soap and water. Seek medical attention immediately if symptoms appear after washing. Eye contact: Use approved safety goggles. In case of eye contact, ensure that any contact lenses are removed before rinsing. Immediately rinse	-

Chemical Substance	CAS[1] - Number	Properties	Hazards	Safety Measures	Hazard Symbol
				the eyes with plenty of water, lifting the eyelids. Continue rinsing for at least 15 minutes. Seek medical attention if any irritation persists.	
Sodium Chloride	7647-14-5	Usually in solid form, white, odorless and soluble in water.	No environmental or physical hazards, nor risks to human health, have been identified.	Avoid skin contact. In case of skin contact, immediately remove contaminated clothing and wash the skin with soap and water. Avoid contact with eyes. In case of eye contact, immediately rinse the eyes with plenty of water while holding the eyelids open. Continue rinsing for at least 15 minutes.	-
Zinc oxide	1314-13-2	White or yellowish powder. Practically insoluble in water. Odorless. Soluble in acids, alkalis, and ammonium carbonate.	Avoid release into the environment. Very toxic to aquatic life with long-lasting effects.	Avoid skin contact. Use gloves tested according to relevant standards (e.g., Europe EN 374, USA F739, AS/NZS 2161.1, or equivalent national standard). Avoid eye contact. Wear safety goggles with side shields. Do NOT eat, drink, or smoke while handling. Avoid spills. In case of a spill, rinse the area with large amounts of water and prevent it from entering the drainage system. If drains or waterways become contaminated, notify emergency services.	

3 USE OF CHEMICAL SUBSTANCES

As mentioned above, two CO_2 injection wells will be drilled at the Beta Platform, which will start using the existing wells. The main materials used for the preparation of the drilling fluids are:

- Bentonite is a clay mineral used to increase the specific gravity of the drilling mud and to counterbalance hydrostatic pressure. It is used with pre-hydration at initial concentrations of 40 - 70 kg/m³. Bentonite at the recommended concentrations is a mineral and is not considered hazardous to the environment.
- POLYPAC consists of polyanionic cellulose and is a high-quality water-soluble polymer designed to control fluid loss. It is an additive used in very small quantities ("Ultra Low" additive), thus causing zero to minimal reduction in fluidity. The usual concentration is 5 - 15 kg/m³. POLYPAC at the recommended concentration is not considered hazardous to the environment.
- Lime is used as a source of calcium (Ca^{2+}) and alkalinity (OH^-) in water-based drilling fluids. Lime at the recommended concentration is not considered hazardous to the environment.
- CMC HV is high-viscosity sodium carboxymethyl cellulose, designed to control drilling mud losses along the borehole walls and to manage the fluidity of water-based mud. It is resistant to bacterial degradation and has high tolerance to the chemical reactions of the mud. CMC HV is biodegradable.
- POLYDRILL is a polymer used in water-based mud systems that controls fluid loss and mud rheology. It is particularly effective at high temperatures and in fluids with high electrolyte content. Polydrill reduces fluid loss by decreasing or plugging pore diameter. This polymer has significant water-binding capacity, minimizing fluid loss.
- KLA-CURE is a hydration suppression agent composed of a water-soluble, environmentally acceptable organic blend, designed to reduce the swelling and dispersion of reactive clay formations. KLA-CURE can be used in fresh or saltwater systems with low or high solids content. Typical concentrations range from 11.4 to 22.8 kg/m³, depending on hole diameter and drilling length.
- Barite is used to increase the specific gravity of the drilling mud and to counterbalance hydrostatic pressure. Barite is a mineral and is not considered hazardous to the environment.
- FLO-VIS is a high-quality biopolymer (clarified xanthan gum biopolymer) that can improve the rheological properties of drilling mud. It is not considered hazardous to the environment.
- FLO-TROL is a highly modified starch derivative used to control fluid loss and viscosity. It is not considered hazardous to the environment.
- SAFE-SCAN HS reacts with hydrogen sulfide and remains soluble even after the chemical reaction. It is based on an organic chemical substance, serving as an alternative to the use of zinc or iron mixtures
- SAFE-CARB is a high-purity, acid-soluble calcium carbonate used as a bridging agent in drilling, treatment, and well completion fluids. Compared to limestone, it has greater hardness and purity, providing better solubility in acids.
- Calcium carbonate is produced in various grain sizes and can be used to increase the specific gravity of drilling mud and to reduce the influx of formation fluids into drilling fluids. It is a mineral and is not considered hazardous to the environment.

- The natural resin VESATROL is used to control high-pressure, high-temperature (HPHT) filtration in all VERSA oil-based systems. It is often used to seal low-pressure and depleted formations. High-temperature conditions and special applications may require higher concentrations, up to 29 kg/m³.
- EDC 95-11 is the main component in low-toxicity oil-based mud and is also referred to as base oil. It has a high level of purity and a very low content of aromatic hydrocarbons
- CONQOR is a phosphate-based corrosion inhibitor used in water-based drilling fluids, brine systems, and fluids in gas, aerosol, and foam form. It is suitable for managing calcium salt deposits and is particularly effective in highly aerated fluids, such as those used in drilling operations. If the corrosion rate is high, its concentration should be increased to at least 1.7 L/m³.
- Sodium carbonate, in granular form as an alkalinity agent, is primarily used to increase the pH of the drilling fluid. It can also enhance the performance of bentonite and other polymers. The typical concentration is 1.2 – 2.4 kg/m³.

The concentrations of substances in the drilling mud of each well on Platform Beta, as well as the estimated quantities of materials for the preparation of the drilling mud per wellbore section, are presented in **Tables 4.1 and 4.2**, respectively.

4 MAXIMUM CONCENTRATIONS AND MAXIMUM QUANTITIES OF CHEMICAL SUBSTANCES

Below are the maximum concentrations of chemical substances and the maximum quantities expected to be used in the CO_2 storage project. The concentrations of substances in the drilling mud for each well on the Beta platform, as well as the estimated quantities of materials required for the preparation of drilling mud per well section, are presented in the following **Tables**.

Table 4-1: Concentration of Substances in the Drilling Mud by Well Section

Substances / Additives		Concentration per section (cross-section)		
		I	II	III
Bentonite	kg/m³	86		
Potassium chloride	kg/m³	100		100
Polypac	kg/m³	6		6
CMC	kg/m³	6		
Lime	kg/m³	11	7	
Calcium carbonate	kg/m³	100		
Sodium chloride	kg/m³	40		314
Flo-Vis	kg/m³	4		4
EDC 95-11	kg/m³		428	
Safe Scav NA	kg/m³	1		1
Safe Carb	kg/m³	100	42	100
Spercene	kg/m³	9		
Calcium chloride	kg/m³		60	
Barite	kg/m³	30	565	
Versatrol	kg/m³		14	
Flo-trol	kg/m³	9		9
Sodium carbonate	kg/m³	1		1
Safe Scav	kg/m³	1		1
Zinc oxide	kg/m³	1		1
Conqor	kg/m³	1		1

Table 4-2: Estimated Quantities of Materials for Drilling Mud Preparation by Well Section

Substances / Additives		Concentration per section (cross-section)		
		I	II	III
Bentonite	kg	45.000		
Potassium chloride	kg	53.000		23.000
Polypac	kg	3.000		1.400

Substances / Additives		Concentration per section (cross-section)		
		I	II	III
CMC	kg	3.000		
Lime	kg	6.000	3.000	
Calcium carbonate	kg	53.000		
Sodium chloride	kg	21.000		72.000
Flo-Vis	kg	2.500		1.000
EDC 95-11	kg		165.000	
Safe Scav	kg	15		7
Safe Carb	kg	53.000	27.000	23.000
Spercene CF	kg	4.500		
Calcium chloride	kg		23.000	
Barite	kg	16.000	225.000	
Versatrol	kg		5.400	
Flo-trol	kg	4.500		2.000
Sodium carbonate	kg	745		350
Safe Scav	kg	300		150
Zinc oxide	kg	375		180
Conqor	kg			100

“LDK Consultants” refers to