



North Sea
Transition
Authority

Guidance on the content of an Offshore Carbon Storage Site Management Plan

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Introduction

The Oil and Gas Authority ('OGA') is now operating as the North Sea Transition Authority ('NSTA') and will be referred to as the NSTA in this document. The OGA remains the legal name of the company, and all licences and other legal documentation will continue to refer to the OGA.

The NSTA is the licensing authority for carbon dioxide storage in an offshore UK controlled place or English controlled place (as set out in the Energy Act 2008¹), granting Carbon Dioxide Appraisal and Storage Licences ('CS Licence') and storage permits.

Anyone who wishes to explore for or use a geological feature for the long-term storage of carbon dioxide in a UK offshore area must hold a CS Licence, pursuant to section 18 of the Energy Act 2008 issued by the NSTA. A storage permit may be applied for and is required for the storage of carbon dioxide in a storage site with a view to its permanent containment during the operational phase of the CS Licence. A CS Licence is required to apply for a storage permit.

Upon grant of a storage permit the approved storage operator ('Operator') enters the Execute Phase of the Operational Term of the licence. A storage permit may require a Storage Site Management Plan ('SSMP') to be submitted to NSTA.

¹ Energy Act 2008 (legislation.gov.uk)

Scope and purpose of the document

This document (“guidance”) is intended to assist the Operator in the preparation of the SSMP and outlines the NSTA’s requirements for the content and scope of a SSMP, including how the Operator will ensure the store is operated in a manner that is consistent with the terms of the permit and the long-term integrity of the store.

The NSTA considers that a SSMP provides a useful tool for its stewardship during the development and operation of a carbon storage project and the content of a SSMP will be examined with that objective in mind.

The Operator will normally prepare the SSMP, however where the SSMP is prepared by another party, this guidance applies equally. The Operator should ensure full ownership of all elements of the SSMP, including the endorsement of both in house and third party analyses.

This guidance sets out the NSTA’s expectations for a SSMP, and is not intended as a prescriptive list of requirements. This guidance is not a substitute for any regulation or law and is not legal advice. It does not have binding legal effect. Where the NSTA departs from the approach set out in this guidance, the NSTA will endeavour to explain this in writing to the person seeking a decision from the NSTA.

The guidance will be kept under review and amended as appropriate. If the NSTA changes its guidance in a material way, it will publish a revised document.

Requirement for the content of Storage Site Management Plans

The SSMP is applicable to the Operate Phase of a CS Licence and should describe the management of three key components of a storage project:

- Surface and injection facilities
- Wells
- Storage unit

Set out below are suggested section headings together with the topics that should typically be addressed in the SSMP, though the actual content will depend on the complexity of the store and the identified risks. The content of the SSMP should be agreed with the NSTA.

The SSMP should set out the proposed approach to the management of the storage site so that the NSTA can consider whether it considers the approach to be satisfactory.

The Operator is responsible for preparing, implementing, and periodically updating the SSMP. The frequency with which the SSMP is updated will be agreed with the NSTA during ongoing stewardship. In considering the frequency of updates, the Operator should take into account potential triggers for revision and, where appropriate, seek to align SSMP updates with revisions to related plans and approved storage permit documents such as the Containment Risk Assessment (CRA), Monitoring Plan (MP) and Corrective Measures Plan (CMP).

It is suggested that the SSMP should be no longer than 50 pages, including text and associated figures, diagrams and tables. For developments involving more complex or challenging surface and injection facilities, wells or storage unit, a longer document may be required. The appropriate level of detail and scope of the document should be determined and agreed through early engagement with the NSTA.

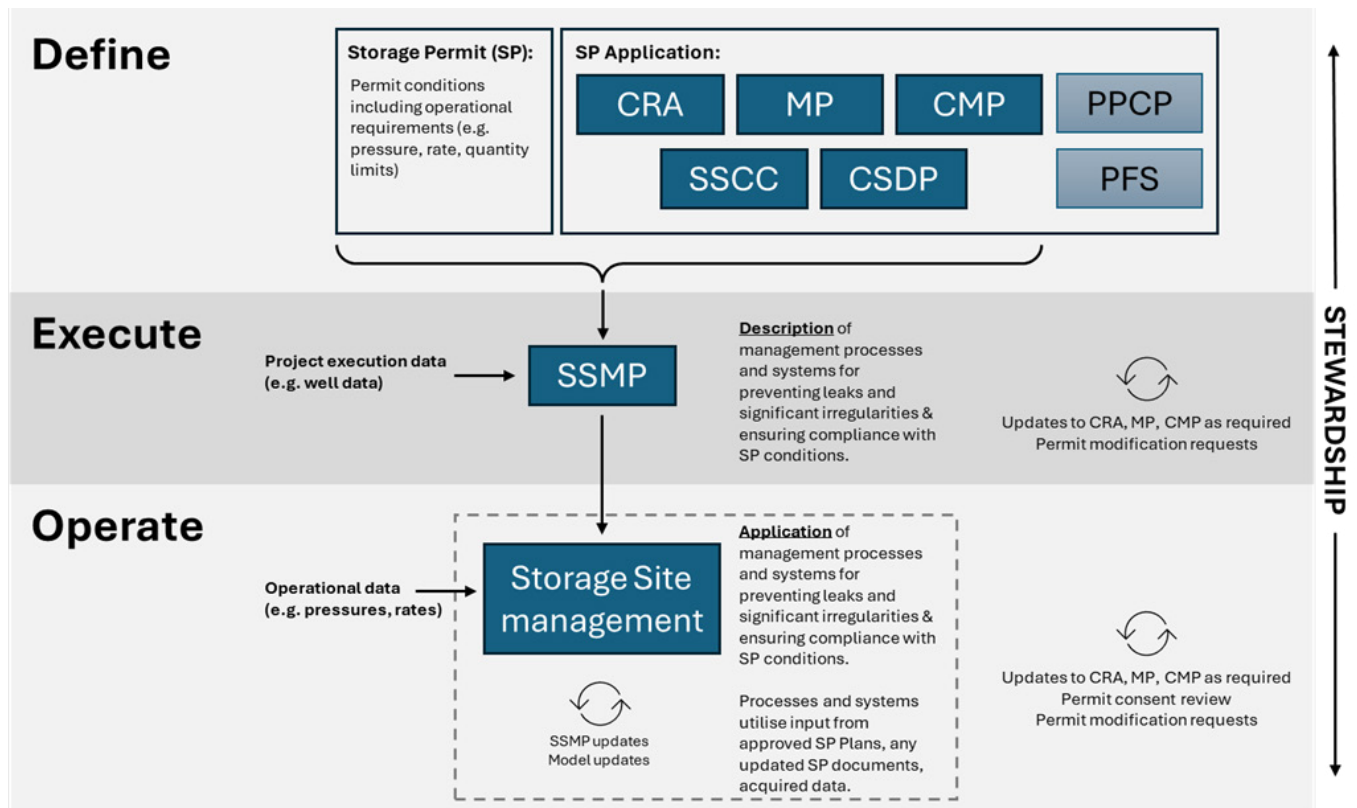
The SSMP should not reproduce detailed material already submitted as part of the storage permit application process. Operators are encouraged to reference these materials (and other documents and studies where applicable) to keep the SSMP concise. A list of relevant materials should be added and copies of these documents should be made available to the NSTA as and when requested.

The proposed approach to the management of the storage site should reflect learnings from any development drilling and data acquisition occurring between storage permit application and SSMP submission.

In addition to what is below, any specific requirements for the SSMP that are set out in the storage permit should be addressed in the SSMP.

Figure 1 illustrates the interfaces between the SSMP and other activities in the Define, Execute and Operate phases.

Figure 1: Storage Site Management Plan interfaces with Define, Execute and Operate Phase activities



Suggested contents of the SSMP

The suggested section headings for the SSMP document are set out below. Additional details of what the NSTA expects will be covered in these sections are set out below.

- **Executive summary**
- **Storage site description**
- **Storage site management**
 - Surface and injection facilities management
 - Well management
 - Storage unit management
- **Risk management**
- **Emissions during operations**
- **Engagement and reporting**
- **List of references**

Executive summary

The Executive Summary should set out, in high-level terms, the essential features of the SSMP including:

- A summary of any notified changes related to storage site management proposed or approved since the time of permitting
- A summary of the proposed management processes and systems, including management of the key components of the storage site (surface and injection facilities, wells, storage unit)
- A summary of how risks will be tracked and managed during operations

Storage site description

This section should provide a brief description of the storage site, associated infrastructure, and relevant storage permit limits that form the frame of reference for the SSMP. The description should include references to relevant approved plans, permit documentation and any other reports as appropriate.

The store description overview should include:

- A map of the store location showing licence area boundaries, storage site and complex boundaries, expected carbon dioxide plume extent at cessation of injection, and the location of existing and proposed wells within the storage site and complex
- A brief geological overview including a depth top-structure map of the storage unit and representative depth cross-sections showing the storage unit and the seal stratigraphy and lithology of the storage complex
- A brief overview of pressure and temperature limits and predictions during the Operate Phase, along with an illustrated description of the expected dynamic behaviour of carbon dioxide within the storage unit
- A summary of the uncertainties and assumptions with the greatest impact on store behaviour
- A brief overview of surface and injection facilities, including wells

Storage site management

The Operator must manage the storage site in a manner that prevents significant irregularities and leaks and ensures compliance with the conditions of the storage permit. The SSMP should describe how the Operator proposes to achieve these objectives with reference to their management processes and systems.

Any changes regarding the Operator that have been notified since permit award (including aspects such as governance and technical competence) should be summarised along with details of implementation, and any associated actions or mitigations.

The SSMP should summarise both the overarching management processes and systems that apply across the entire storage site, as well as the specific processes

and systems relevant to key components, including the surface and injection facilities, wells, and storage unit. The SSMP is not expected to include all the details associated with these processes and systems; the Operator is expected to maintain records and documentation and the NSTA may request copies and/or further information.

Management processes, systems and governance structures that have already been submitted to and approved by the NSTA, for example those relating to the proposed Operator for the purpose of the storage permit application, do not need to be repeated in detail and appropriate summaries and references should be provided.

Storage site management processes and systems may include (but not be limited to):

- Store performance reviews: regular structured reviews to confirm that operational requirements, such as injection rates and pressures, remain within permit limits and track progress against other SSMP objectives
- Performance metrics and key performance indicators: measurable targets linked to SSMP objectives (e.g., injection reliability, well integrity compliance, risk review frequency, plume conformance), including frameworks for tracking, reporting, and continuous improvement
- Management of Change: assessment of operational changes (e.g., new emitter, revised injection strategy) against permit limits, approved plans, other permit application documents, and regulatory notification of change requirements
- Decision-making and prioritisation frameworks: how operational decisions are made using risk-based prioritisation, aligned with permit limits, approved plans, and other permit application documents
- Interface management: processes for coordinating activities across wells, facilities, storage unit, and external stakeholders, and how these processes reduce risk of misalignment and ensure integrated decision-making
- Incident and deviation management: the processes for detecting, reporting, and investigating non-compliant or

anomalous events, and how these processes ensure corrective measures are implemented promptly and lessons learned are captured

- Data and information management: systems for retaining and managing operational data to ensure accuracy, traceability, and accessibility for decision-making, and explain how these systems support monitoring, modelling, and reporting to the NSTA (further information provided in the section on Engagement and reporting)

Surface and injection facilities management

The NSTA expects the Operator to manage the injection system such that its integrity and reliability is maintained.

The SSMP should demonstrate how the operating, control and maintenance procedures and philosophies, surveillance strategies, data acquisition and risk management are integrated.

The injection system management must ensure permit compliance and should be risk based and adaptive. It should ensure effective management of the injection facilities from commissioning handover to the closure of the site.

The SSMP should describe how the injection management system incorporates the requirements of key assessments and plans, such as the CRA, MP and CMP.

Injection system management

The Operator should clearly describe the injection system including any physical and operational limits, any operational exclusions and describe any systems outside the boundaries which integrate with the injection system.

The SSMP should summarise the overarching management processes and describe the key processes and principles that apply across the injection facilities to ensure the management of the injection system can do the following:

- Demonstrate how injection of carbon dioxide has been optimised with the permitted operating envelope
- Identify and manage the key system and stakeholder interactions
- Demonstrate appropriate resource planning and competency
- Maintain infrastructure integrity and controls to facilitate the effective operation of the injection system
- Incorporate and be aligned with the MP, CMP, Metering and Measurement Plan, ensuring system modifications are tracked
- Ensure robust surveillance and demonstrate use of data acquisition for active management of the system

Injection system operability, reliability and technical integrity

The Operator should describe how the injection system operability will be maintained during steady-state and transient conditions across the full operating envelope of the injection system considering aspects including, but not limited to:

- Phase behaviour within the injection system considering all of the relevant interfaces across the carbon capture and storage chain
- Normal steady-state operation, start up and shutdown
- Transient flow behaviour during shut-in conditions, emergency shutdown, and re-start from prolonged shut in or emergency shutdown
- System turndown considering reduced carbon dioxide availability or flow fluctuations
- All feasible operating modes such as ramp up, continuous injection and phased or batch injection, inclusive of credible future operating modes
- Ullage management and flow balancing of the system
- Injection system optimisation

The SSMP should clearly set out how risk management and uncertainty is embedded in the injection system management strategies to maintain reliability and integrity.

This should include (but not be limited to):

- A description of how injection system data is captured and assessed

- A description of how non-conformance and anomalies are detected, confirmed and documented integrating the requirements of the MP and CMP
- A description of how non-conformance and anomalies are responded to and how mitigations and remedial actions will be implemented and by whom
- A summary of the relevant methodologies and standards that apply to the injection system reliability and technical integrity
- A summary of how facility surveillance strategies are incorporated in the reliability and risk assessments
- An overview of maintenance strategies and a description how injection system availability is maintained
- Sufficient provisions in the operating strategy to ensure accurate data reporting relating to the carbon dioxide inventory injected into the system and by the system into the store aligned with the metering plan

Well management

The NSTA expects the Operator to ensure all active development wells are operated safely, that they remain fit for purpose, and that long-term integrity is maintained throughout the Operate Phase.

The Well Management section of the SSMP should demonstrate how the well operating systems, procedures, workflows, surveillance strategies, data acquisition and risk management are integrated. It should

provide assurance that risks to containment, operational continuity, and regulatory compliance are identified and controlled. Key elements of the CRA, MP, CMP and Well Integrity Management Plan should be referenced.

Lifecycle control of wells

The Operator should set out a clear description of how wells will be managed from the start of operations and throughout their operational life. The SSMP should outline:

- The consented operating envelope of each well as defined in the permit
- How integrity will be maintained under normal and anomalous conditions
- How changes in well performance will be detected and addressed
- How maintenance and interventions will be prioritised, including consideration of risk
- How wells will be suspended or abandoned securely

Injection performance and recording

The SSMP should include a summary of how injection will be measured and recorded to support mass balance, operational control, and compliance. A reference to further detailed information in the Metering and Measurement Plan should be provided. The SSMP should outline:

- How per-well data will track cumulative injection and operating conditions
- How accuracy, traceability, and record retention will be ensured

- How data will be used to validate storage models and confirm compliance

Well shut in and cycling

The SSMP should outline how wells can be safely shut-in and restarted, including:

- Criteria for routine and unplanned shut-in
- How well cycling with variable CO₂ supply will be managed
- Description of ramp-up procedure on restarting injection following a shut-in event
- How the near-wellbore and well integrity will be protected during start up, ramp-down, or extended shut-in

Variable injection rates

The SSMP should outline how wells will accommodate fluctuations in CO₂ supply safely, including:

- How injection rates will be adjusted to remain within safe limits
- How extended low- or no-injection periods will be managed
- How well and storage unit performance will be reassessed before resuming higher-rate injection

Storage unit management

The NSTA expects the Operator to manage the storage unit to maintain integrity, prevent significant irregularities and leaks, and ensure compliance with the conditions of the storage permit.

The SSMP should summarise how the Operator will manage the storage unit across the range of expected operating conditions. It should include the strategies, workflows and management arrangements for conformance assessment and predictive modelling, supported by data acquisition, risk assessment, and interpretation workflows. It should be adaptable to different phases of store life and summarise changes in priorities and objectives over time.

Links to other plans and assessments, such as the CRA, MP, CMP and Metering and Measurement Plan, should be described, including how monitoring data and risk assessments inform storage unit management decisions.

The Operator should describe how the storage unit will be managed throughout the Operate Phase considering aspects including, but not limited to:

- Different operational periods and milestones (e.g., early injection, gas-phase injection, dense-phase injection)
- Normal, anomalous, shutdown, and restart scenarios, including any implications of prolonged injection interruptions
- Changes to storage unit pressures and temperatures, including reference to operational ranges and permitted limits
- Carbon dioxide plume behaviour within the storage site with reference to predictions in the Storage Permit Application and the storage site boundary

Storage unit modelling and data integration

The storage unit management strategy should describe how, and under what circumstances, the Operator will maintain and update models of the storage site and complex (and surrounding areas as appropriate) throughout the Operate Phase, ensuring that models remain representative of subsurface conditions and monitoring data and are used to support ongoing risk assessment and operational decision-making. This should include, but not be limited to:

- A modelling framework describing the subsurface models, their scope and objectives, and the management decisions each model or range of models supports
- A description of the maintenance and update processes for each type of model, covering how execution,

operational and monitoring data will be incorporated, the schedule for routine updates, and the procedures for event-based updates

- A description of how model predictions will be compared against observed data to assess conformance, referencing operational ranges and permitted operational requirements
- A summary of how remaining uncertainties (e.g. rock properties, connectivity) will be managed during operations, such as through targeted data acquisition or scenario modelling

The description of the model maintenance and update procedures should be a high-level process overview, with the specific technical details of any updates or changes being reviewed during ongoing stewardship.

Risk management

The SSMP should describe how the Operator will track and manage risks during operations, building on the CRA submitted as part of the Storage Permit Application. In line with industry good practice, the focus should be

on how all risks are tracked, reassessed, and addressed throughout the Operate Phase and how new risks will be identified. Any CRA update requirements will be discussed during ongoing stewardship with NSTA.

Emissions during operations

The Licensee is expected to demonstrate that greenhouse gas ('GHG') emissions will be considered and evaluated during operations, including how the Licensee will commit to reduce GHG emissions through its corporate culture and demonstrable action. The SSMP should describe any approved or

proposed greenhouse gas (GHG) emissions reduction measures arising since permitting, including those introduced as part of the Commissioning Plan.

Engagement and reporting

Regular stewardship engagements between the Operator and NSTA will be held throughout the Operate Phase. The purpose of these engagements is, amongst other things, to:

- Review operational performance, including against regulatory requirements and SSMP objectives
- Confirm alignment on future activities, including but not limited to any changes to injection strategy, well or storage unit management

The SSMP should reference the requirements for information and sample retention under the Oil and Gas Authority (Carbon Storage) (Retention of Information and Samples) Regulations 2025 (the ‘CS Retention Regulations’) and the need for compliance with notices issued by the NSTA under section 112 of the Energy Act 2023. Notices issued by the NSTA under that section, for routine reporting activities, cover a range of information and samples that include operational data, monitoring results, and relevant samples. The requirement to nominate an Information and Samples Coordinator (‘ISC’) and to prepare and agree an Information and Samples Plan (‘ISP’) at certain licence events as set out in sections 109 to 111 of the Energy Act 2023 should also be acknowledged in the SSMP. The NSTA has published separate guidance on the requirements related to information and samples².

While the detailed requirements for information and sample retention and reporting will be managed separately from the SSMP, the SSMP should take these obligations into consideration and ensure alignment. This includes confirming that:

- Internal systems for information and sample management described in the SSMP support accurate, traceable, and timely reporting
- The Operator and each licensee have an appointed ISC who is familiar with the applicable information and samples guidance
- Governance processes within the SSMP (such as performance reviews and Management of Change) incorporate awareness of information and samples retention and reporting obligations

The SSMP should not duplicate the requirements of the CS Retention Regulations but should demonstrate how its management framework complements and aligns with these obligations.

² <https://www.nstaauthority.co.uk/media/dexfus5r/guidance-on-information-and-samples-plans-and-coordinators.pdf>

³ https://www.nstaauthority.co.uk/media/r4jft5s3/guidance-on-retention_-reporting-and-disclosure-of-carbon-storage-information-and-samples.pdf

List of references

The SSMP should also include a list of references which include (but are not limited to):

- Relevant permit documents (e.g. CRA, MP, CMP)
- Key engineering philosophies
- As built / finalised design information and engineering criteria. Key documents setting out the design parameters, operating envelopes, structural limits.
 - Wells Basis of Design
 - Facilities Basis of Design
- Asset Integrity Plan
- Supply Chain Action Plan

Definition of terms

1. In this guidance the following expressions have the meanings as given by the Storage Regulations:
 - “injection” means injection of carbon dioxide into a storage site;
 - “storage permit” means a consent granted under a licence, authorising the use of a place as a storage site;
2. The following expressions are as provided by the Storage Regulations and have the meanings given by Article 3 of the Directive (and cognate expressions are to be construed accordingly):
 - ‘closure’ of a storage site means the definitive cessation of carbon dioxide injection into that storage site;
 - ‘corrective measures’ means any measures taken to correct significant irregularities or to close leakages in order to prevent or stop the release of carbon dioxide from the storage complex
 - ‘carbon dioxide plume’ means the dispersing volume of carbon dioxide in the geological formation;
 - ‘leakage’ means any release of carbon dioxide from the storage complex;
 - ‘significant irregularity’ means any irregularity in the injection or storage operations or in the condition of the storage complex itself, which implies the risk of a leakage or risk to the environment or human health;
 - ‘storage complex’ means the storage site and surrounding geological domain which can have an effect on overall storage integrity and security; that is, secondary containment formations;
 - ‘storage site’ means a defined volume area within a geological formation used for the geological storage of carbon dioxide and associated surface and injection facilities;
3. The following expressions have the meanings given in NSTA guidance:
 - ‘storage unit’ means the permeable unit(s) that will contain the injected carbon dioxide.

List of abbreviations

CS – Carbon storage

CSDP – Carbon Storage Development Plan

CMP – Corrective Measures Plan

CRA – Containment Risk Assessment

GHG – Greenhouse gas

ISC – Information and Samples Coordinator

ISP – Information and Samples Plan

MP – Monitoring Plan

NDR – National Data Repository

NSTA – North Sea Transition Authority

OGA – Oil and Gas Authority

PFS – Proposal for Financial Security

PPCP – Provisional Post Closure Plan

SCAP – Supply Chain Action Plan

SP – Storage Permit

SSCC – Storage Site and Complex
Characterisation

SSMP – Storage Site Management Plan

