INGAA FOUNDATION

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A Practical Guide for Environmental Inspectors

October 2024

ACKNOWLEDGEMENTS

This document was developed through the joint and continual support of all INGAA Foundation members.

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1 INTRODUCTION

This guide provides the details related to the role and duties of an Owner Company's Environmental Inspector (EI) in terms of the monitoring and inspection requirements throughout the typical lifecycle of both the pipeline and facilities construction processes. Other areas of specialty inspection are beyond the scope of this document.

This document represents best practices for environmental construction inspection beyond those already captured in the:

- INGAA Foundation Lessons Learned Repository
- INGAA Environmental Inspector Guidance Recommended Qualifications and Best Practices
- FERC Upland Erosion Control, Revegetation and Maintenance Plan
- FERC Wetland and Waterbody Construction and Mitigation Procedures
- INGAA Continuous Improvement Log

These practices are based on the accumulated experience and consensus amongst the majority of INGAA Foundation member companies.

2 PURPOSE

The purpose of this document is to provide Environmental Inspectors with guidelines for best practices in the industry, as well as some background and context beyond the existing regulations. As such, this document is not intended to replace formal training, regulation, or Company-specific practices (which may vary based on individual circumstances); rather, it is intended as a complementary guide to those sources (e.g., FERC).

3 SCOPE

The scope of this document is limited to the construction phases for gas and liquid facilities and pipelines. Specifically, content is focused on those items that are relevant to the role of an Environmental Inspector as they relate to best practices within the industry. This document is intended to serve as a supplemental reference to other project- and jurisdiction-specific regulations, guidelines, best practices, and industry guidance. Some relevant references and regulations are provided; however, it is not intended to serve as a comprehensive regulatory resource or a substitute for adequate knowledge of the applicable regulations.

For the purposes of this document, pipelines are defined as the pipe, usually located underground, intended to move gas or liquid products over long distances (including isolation valve assemblies). This document includes inspection items for the construction phases of transmission pipes; however, it may be appropriately applied to accommodate inspection of the construction of distribution pipe. This document also includes inspection items for the Right-of-Way (ROW).

Facilities are defined as all of those systems, equipment, and pipe physically located within the confines of a compression, pumping, or meter station – usually delineated by fencing. Facilities are sites intended to move, store, measure, or otherwise transform the products

moving within the site (i.e., a fenced isolation valve along a section of pipe would not be considered a facility under this scope). This document also includes inspection items for access roads to the facility site, as well as any areas that are deemed a designated worksite for the purposes of a facility construction project (e.g., lay down areas).

This document includes inspection items for the construction of greenfield facilities (i.e., new construction); however, it may be appropriately applied to accommodate inspection of the construction of brownfield facilities (i.e., expanding an existing site or working next to an existing site). Note that additional safety requirements and specific environmental considerations may apply to the construction of brownfield facilities.

Commissioning activities are outside of the scope of this document; however, inspection activities and reporting are key aspects of transitioning to commissioning staff.

4 REVISIONS TO THIS DOCUMENT

This document will be reviewed periodically (as per existing INGAA Foundation practices) to ensure the content within remains relevant and accurate. However, it remains the responsibility of the user to ensure that the most current revision of documents (e.g., codes and standards) are referenced, where appropriate.

5 HOW TO USE THIS DOCUMENT

With an eye to practicality and ease of use, this document is organized to reflect the typical construction process for facility and pipeline sites and adjacent affected areas for Environmental Inspectors, which is loosely based on a typical drawing package. There are three main sections: Foundational Information, Planning and Constructing Pipelines, and Planning and Constructing Facilities (Figure 1). Each section is divided into chapters that detail the many phases of pipeline or facility construction. Within each chapter, five headings are used consistently:

- Overview – a brief description of the specific activities in the facilities or pipeline construction phase.
- Inputs – detailed information regarding typical document types, specifications, and other information the Environmental Inspector will require in that phase of facility or pipeline construction.
- Execution – detailed information regarding items the Environmental Inspector should typically watch for in that facility or pipeline construction phase. For ease of use, items are typically formulated as actions using verbs such as: ensure, monitor, confirm, check.
- Outputs – detailed information listing with the typical information the Environmental Inspector will be required to produce or report on for the Owner Company.
- References – a list of key relevant reference documents for those seeking additional information for each phase of facilities or pipeline construction.

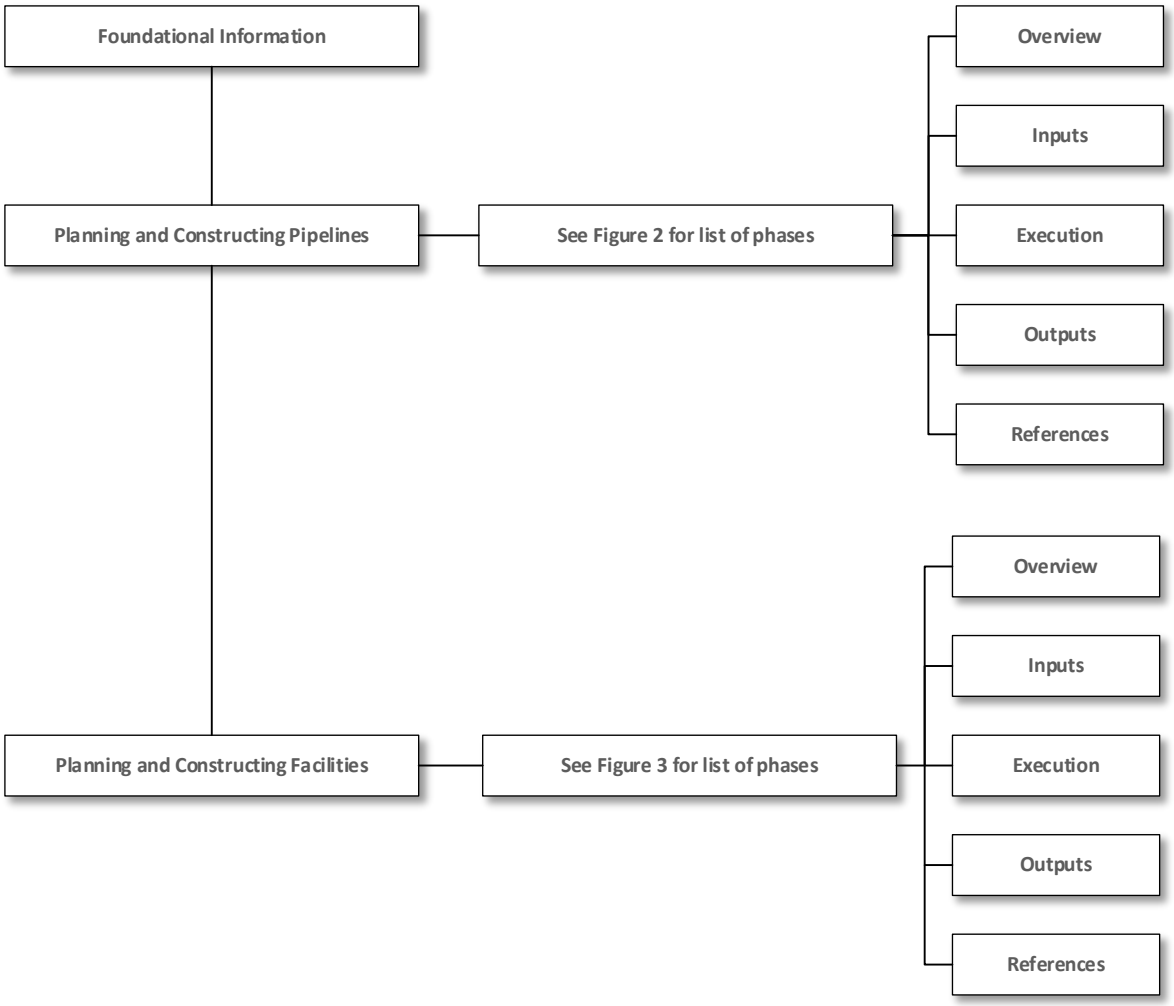


Figure 1: Document Structure

The use of the word “ensure” throughout this document is intended to convey that Environmental Inspectors “ensure” that the Contractor has performed the inspected work properly through observing, monitoring, assessing, evaluating, verifying, deciding, resolving, reporting, and documenting the project requirements are met. Inspection items in checklists throughout the document use wording such as “Ensure {item} is properly installed” – proper installation means compliance with governing Issued for Construction (IFC) drawings, Owner Company or project specifications, Manufacturer specifications, etc.

6 ENVIRONMENTAL INSPECTOR – FOUNDATIONAL INFORMATION

The items covered in this section are those that are relevant through all phases of the Pipeline construction process (see Figure 2) or the facilities construction process (see Figure 3). As such, any specific content in other sections of this publication is intended to be used in conjunction with the information provided within this section.

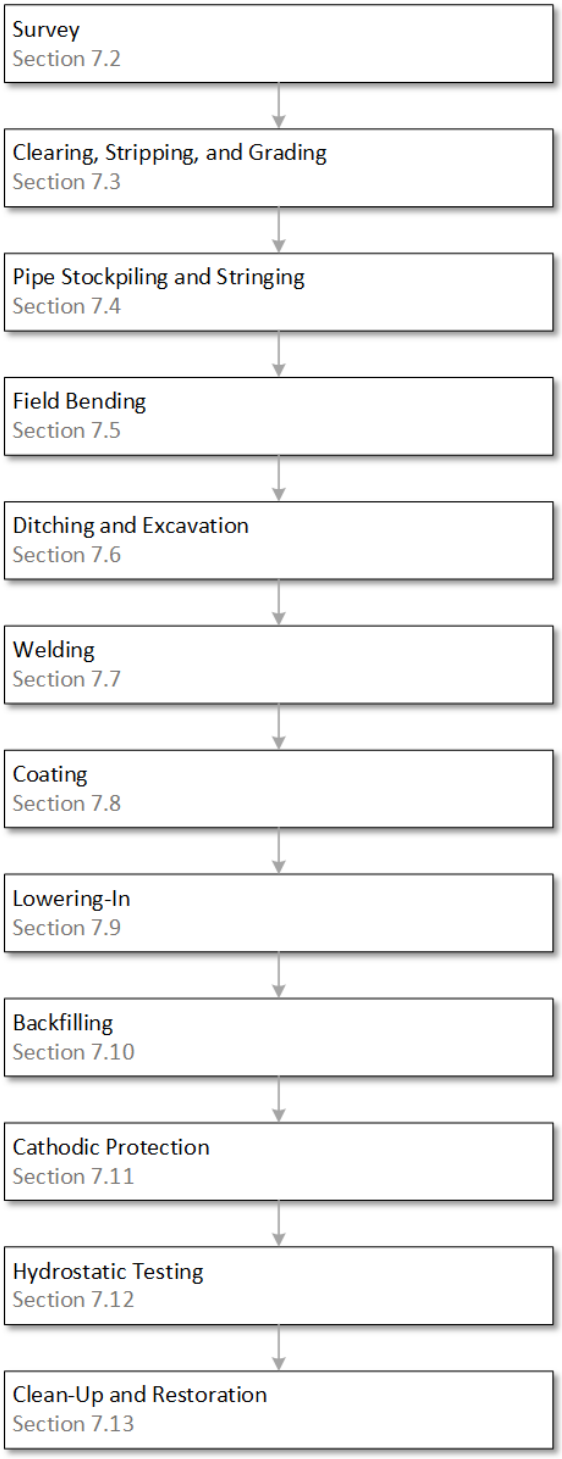


Figure 2: Typical Pipeline Construction Phases

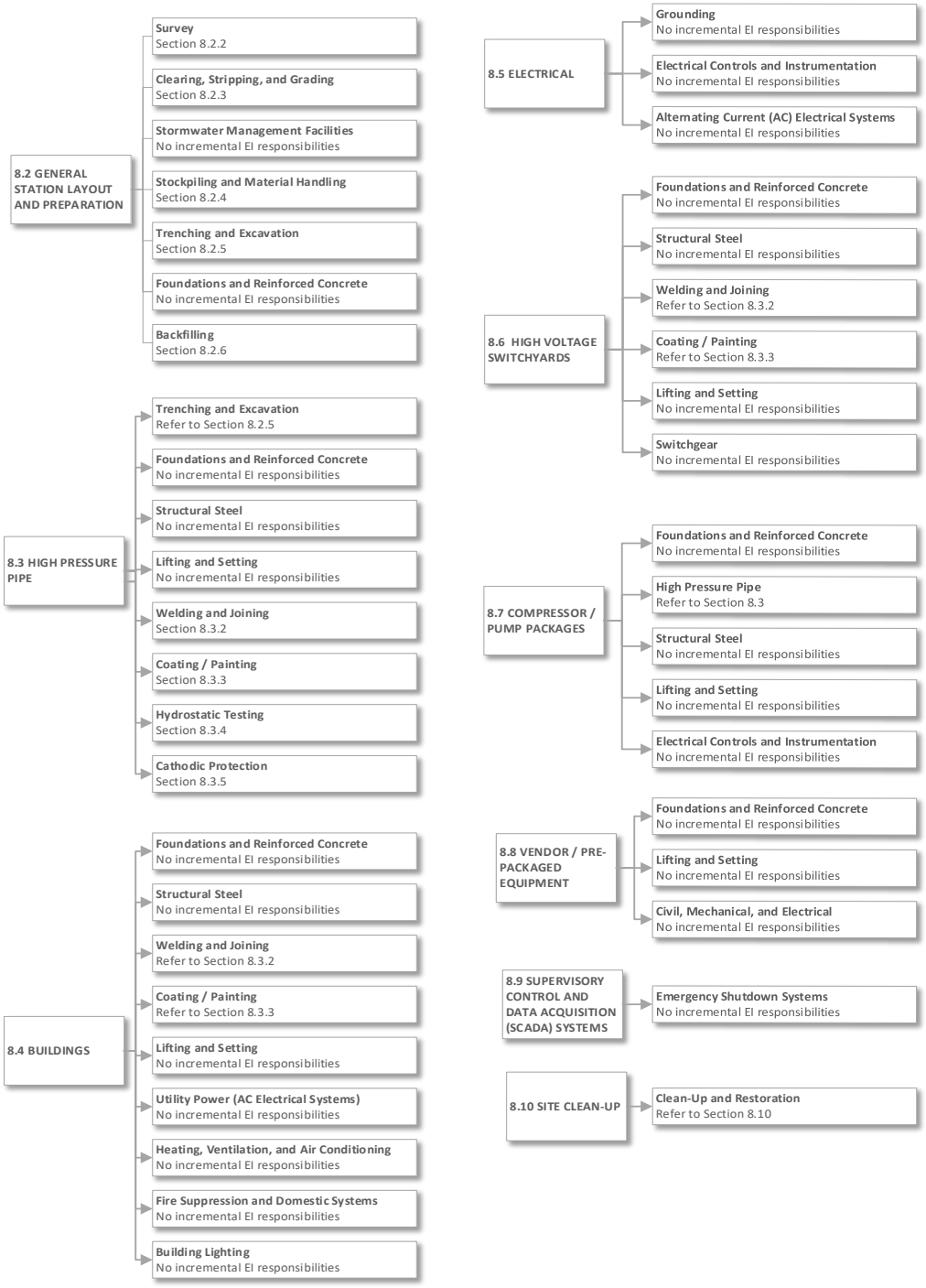


Figure 3: Typical Facilities Construction Phases

The Environmental Inspector acts as the Owner Company's authorized representative for non-financial matters relating to the environment and continuously observes the Contractor's activities to ensure they are in accordance with the following:

- Environmental codes and standards
- Environmental regulatory permits and requirements
- Owner Company safety and environmental requirements

- Drawings, plans, and specifications
- Terms of the construction contract or agreement

The Environmental Inspector has a multidisciplinary role where they must collaborate effectively with other general and specialized Inspectors (e.g., Backfill Inspector, Tie-In Inspector) and management, using their expertise to proactively identify potential environmental challenges and provide recommendations to ensure construction activities do not have an adverse effect on the environment. Different project needs may require Environmental Inspectors with different specializations (e.g., Agricultural Inspector). Please refer to the INGAA Environmental Inspector Guidance Recommended Qualification and Best Practices section 3.2 for more details on specific environmental roles. Environmental Inspectors shall have peer status with all other Inspectors.

In addition to executing specific responsibilities in the following sections, the Environmental Inspector has key responsibilities in the main areas identified in Table 1 with additional detail provided in the corresponding section.

Table 1: Main Areas of Environmental Inspector Roles and Responsibilities

Topic Area	Section Number
Authority	Section 6.1
Code of Conduct	Section 6.2
Worker, Site, and Construction Safety	Section 6.3
Quality, Deficiencies, and Non-conformance Procedures	Section 6.4
Environmental Considerations	Section 6.5
Execution of Work	Section 6.6
Administration of Environmental Contractual Obligations	Section 6.7
Records Management	Section 6.8
Personnel Qualifications and Certifications	Section 6.9
Equipment Calibration	Section 6.10
Environmental Incident Reporting	Section 6.11
Post-Construction Considerations	Section 6.12

6.1 Authority

The Environmental Inspector on-site is part of a larger Project Team; as such, the Inspector should understand their role within the established chain of command and recognize situations that may need to be escalated in the best interests of the Owner Company. This is important for day-to-day operations but becomes particularly important in the handling of deficiencies / non-conformances discussed later in this section. In particular:

- Roles of the Contractor and Environmental Inspector will be established before performing inspections or audits to determine whether the work or an item complies with environmental specifications and permit requirements
- Specialized Inspectors are responsible for ensuring crews follow appropriate methods during each stage of the facility and pipeline construction lifecycle. The Environmental

Inspector supports the specialized Inspectors by ensuring that operations do not have an adverse effect on the environment.

- If the Contractor performs inspections or audits unassisted (e.g., documenting volumes of water withdrawn from a waterbody, equipment cleaning procedures utilized prior to arriving on-site), the Environmental Inspector should be clear about the level of witnessing required and make sure that the equipment and instruments used by the Contractor are correct and that documentation of proper equipment calibration records are available upon request.
- The Contractor should be aware of the Environmental Inspector's duties and authority outlining quality, deficiencies, and non-conformance procedures (as defined in Section 6.4).
- The Environmental Inspector, along with all other Inspectors on-site, have "stop work" authority when there is imminent danger to people or the environment.

6.2 Code of Conduct

As the Environmental Inspector represents the Owner Company, they should always act ethically, professionally, objectively, consistently, and honestly when performing the required roles and responsibilities.

More specifically, the actual ethical conduct required from Environmental Inspectors is governed by the Owner Company's Code of Conduct, which typically includes (but is not limited to) the items identified in Table 2.

Table 2: Typical Code of Conduct Considerations

✓	Description
Behaving in an Ethical Manner	
	Abide by confidentiality agreements
	Do not accept gratuities of any kind that may be perceived to affect judgment in the work being performed as an Environmental Inspector; if gratuities are offered, this information should be reported to the Owner Company
	Endeavor to be fair, reasonable, and objective towards those performing work requirements at all times
	Do not make assumptions; consult with the Construction Manager / Chief Inspector (or designate) if there are uncertainties in the requirements
	Accept or reject the work performed by the Contractor based on the quality of the work
	Comply with all relevant codes, standards, systems, permits, contracts, agreements, specifications, procedures, approved drawings, and line lists
	Document all deviations and, when required, escalate in an appropriate manner for approval
Professional Approach to Work	
	Be knowledgeable of and understand the relevant parts of the construction process
	Be knowledgeable of and understand the Owner Company's standards and specifications
	Be knowledgeable of and understand relevant industry and government standards
	Verify all applicable permits required to execute the work are in place and on-site prior to commencing the work
	Uphold the Owner Company's industry practices to ensure safety, minimize risk, and avoid hazards in the workplace
	Be knowledgeable of the Owner Company's construction timelines and understand the Owner Company's construction schedule, costs, and components of the work

✓	Description
	Understand their role relative to other Stakeholders in the construction process and engage other expertise accordingly
	Make accurate decisions by being well informed and familiar with applicable contract documents and design requirements
	Arrive on-site before the Contractor's crew and remain until after the crew leaves the site for the day as necessary to assess and document project compliance with environmental permits, company commitments, and Landowner agreements
	Take breaks when the Contractor's crew takes breaks and remain on-site during construction activities that require inspection
	Obtain all applicable documents before the start of the inspection
	If questions arise that cannot be answered, seek those who have the authority to resolve
	Be proactive in problem solving and raise issues / concerns to the attention of the Construction Manager / Chief Inspector (or designate)
Positive Image in Representation of Owner Company	
	Behave in a courteous and respectable manner at all times
	Be a knowledgeable resource for the project team
	Show respect through good driving habits at the facility, on the ROW, and on access or public roads
	Check the work area for good housekeeping and tidiness (e.g., equipment should be correctly stored, maintained, and unused materials discarded)

6.3 Worker, Site, and Construction Safety

One of the key roles of the Environmental Inspector as a member of the Project Team is to assist the Owner Company in ensuring a safe work environment both for its workers as well as the public. Safety is a shared responsibility, and all members of the Project Team are responsible for ensuring that construction activities are conducted in compliance with safe work practices and project-specific Job Safety Analyses (JSA) at all times. As such, all Project Team members, including the Environmental Inspector, have "stop work" authority should an unsafe situation arise. The Environmental Inspector should actively communicate / coordinate with other Inspectors to ensure that relevant safety hazards and requirements are identified and understood, particularly related to environmental hazards within their scope of expertise.

Safety is a shared responsibility between all Inspectors and Project Team members; typical safety considerations are detailed in Table 7.

Table 3: Typical Safety and Hazard Considerations

✓	Description
	Ensure each member of the activity crew understands their role and responsibility with respect to safety in the execution of the work
	Be aware of changes in work activities or site conditions that were not identified in the daily tailgate meeting, along with any changes to precautions that need to be taken as a result of these changes
	Proactively participate in morning Contractor safety meetings (i.e., support the development of Job Safety Analysis [JSA] applicable to environmental hazards)

✓	Description
	Promote a safe working environment of continuous improvement through communications of project environmental hazards, issues, and solutions
	Continuously inspect and monitor activities for compliance with regulations, policies, and procedures, and ensure conformance to the Owner Company's Health and Safety specifications and Site-Specific Safety Plans
	Ensure emergency / after-hours contact information is posted in site offices and provided to active Contractors
	Continuously monitor for compliance with personal protective equipment (PPE) requirements
	Ensure "safety and exclusion zones" are in place and maintained (e.g., powerline locations, nesting sites)
	Participate in weekly Project Site Specific Safety Audits and provide a constructive Corrective Action Plan to communicate safety issues to the Contractor
	Be aware of areas of high risk when entering a work zone and collaborate with the craft inspector(s) to ensure it is safe to enter the work zone

In support of a safe work environment, the Owner Company's safety policies typically include (but are not limited to) those identified in Table 4.

Table 4: List of Typical Owner Company Safety Policies / Practices / Procedures

✓	Description
	H2S Safety
	Working Alone Policy
	Fall Protection Practice
	Restricted Work Areas Policy
	Confined Space Entry Practice
	Hearing Conservation Practice
	Manual Lifting and Carrying Practice
	Lock-out / Tag-out Procedure
	Vehicle and Equipment Safety Practice
	Cellular Phone / Communication Radio Policy
	Drug and Alcohol Policy
	Job Safety Analysis (JSA)
	Stop Work Protocols
	Other Owner Company or project-specific requirements, as applicable

6.4 Quality, Deficiencies, and Non-Conformance Procedures

The Environmental Inspector plays a significant role in assisting the Project Team with managing the quality of work performed during facilities and pipeline construction. As such, the Environmental Inspector should recognize that inspection requires the monitoring of regulatory obligations in addition to the relevant elements of the Owner Company's quality management system (QMS). Those items that are specifically relevant to the Environmental Inspector typically include the items listed in Table 5. As the Environmental Inspector

identifies any deviations, Owner Company-specific escalation processes will need to be followed.

Table 5: List of Typical Owner Company Quality Documentation

✓	Description
	QMS Manual
	Quality Plan
	Inspection and Test Plan (ITP)
	Orientation with approved and current Owner Company-specific requirements, processes, procedures, contracts, and drawings relevant to their role
	All issued permit requirements relevant to their role
	Federal and state issued guidelines for environmental standards (e.g., restoration standards, preservation standards for biologically significant areas, or air and water quality standards)

6.4.1 Escalation Processes

Since the Environmental Inspector monitors all facilities and pipeline construction activities and operations for safety, environmental stewardship, and compliance with project specifications and pertinent regulations, the Owner Company will have an escalation process in place to deal with any identified deficiencies that may require elevation to a non-conformance. Any identified non-conformance(s) needs to be addressed through corrective action(s).

Specific processes vary from Company to Company, and Environmental Inspectors will familiarize themselves; accordingly, however, all escalation processes will typically be structured as follows:

1. Verbal discussion with Third Party Individuals Employed by the Contractor
2. Verbal warning with notification
3. Written warning, including signed documentation
4. Stop work with potential health, safety, and environmental impacts to the worksite, in the community, and on the land where the work is being conducted

All communications regarding compliance concerns should be properly documented.

6.4.2 Personal Violations

The Project Team, including all inspection staff, should continuously observe and report individuals for personal violations. Typical examples of personal violations are included in (but not limited to) the items identified in Table 6.

Table 6: Examples of Personal Site Violations

Type	Description	Potential Consequence / Outcome
Conduct	Not wearing appropriate personal protective equipment (PPE)	Removal of the worker from the worksite
	Wearing incorrect attire (e.g., sleeveless shirts, shorts, or clothes made of synthetic fibers)	

Type	Description	Potential Consequence / Outcome
	Using headphones or other distracting devices while on duty	
	Roughhousing on the worksite	
	Not wearing seatbelts	
	Not respecting the environment or historical resources	Permanent removal of the worker from the worksite
	Being under the influence of drugs or alcohol	
	Harassment in the workplace	
	Disregard for health, safety, and environmental procedures	
	Not adhering to safety policies, including those for firearm possession	
	Insubordination	
	Behaving in a manner that can cause serious harm or injury	
Worksite	Not having proper guards or shrouds	Stopping the use of or removing the vehicle or equipment from the worksite
	Not having nor maintaining safety zones in required places (e.g., at powerline and nesting site locations)	
	Non-functional backup alarms on tracked equipment and rubber-tired vehicles	
	Not having canopies for clear Operator vision on machinery	
	Not having fire extinguishers or, if required, absorbent on welding units, vehicles, and heavy equipment	
	Using defective tools	
	Not addressing equipment leaking fluids	
	Engaging in any unsafe conditions or practices, as determined by the Owner Company Construction Manager / Chief Inspector (or designate) or inspection resources	Construction Shutdown
	Engaging in construction activities that are not compliant with applicable safety, contract, and regulatory requirements	

6.5 Environmental Considerations

The Owner Company views compliance with applicable environmental regulations as a priority and is committed to constructing project facilities in compliance with environmental permit requirements. Environmental compliance is a shared responsibility, and all members of the Project Team are responsible for ensuring that construction activities are conducted in compliance with environmental permits and requirements at all times. In general, environmental considerations are included in this document for the facility or pipeline construction site and potential access roads; however, additional environmental considerations may be required based on the specific situation.

As part of the construction contract, the project-specific Environmental Protection Plan (EPP), Environmental Management System (EMS), or equivalent, outlines specific environmental mitigations and procedures for each construction phase of the project that the Contractor must adhere to, including, but not limited to, the following:

- Watercourses

- Wetlands and Water Bodies
- Wildlife Habitats
- Migratory Routes
- Stormwater Management
- Erosion and Sediment Control
- Trench Dewatering
- Fuel Containment
- Hydrostatic Test Water Withdrawal and Disposal
- Disposal of Surplus Construction Materials and Debris
- Restoration and Revegetation
- Hazardous or Contaminated Material Handling and Disposal (e.g., pipeline liquids, cleaning solutions)

Environmental stewardship is a shared responsibility between all Inspectors, as detailed in Table 7.

Table 7: List of Typical Environmental Activities

✓	Description
General	
	Participate in training or tailgate meetings to inform and instruct all employees / contractors of environmental concerns, special conditions, regulations, and specific permit conditions applicable to the construction area and the work itself
	Liaise with regulatory personnel regarding environmental issues, if applicable
	Ensure all Inspectors responsible for on-site activities are engaged and understand the project-specific environmental requirements
	Ensure that disturbance or damage to the environment is minimized, especially the following: • Uncontrolled fires • Soil and water erosion • Damage, degradation, or loss of biologically significant areas • Air, noise, and water pollution
	Ensure construction entrances are maintained to prevent tracking mud and debris onto public roadways
	Monitor for spills and complete documentation related to spill response
	Ensure all specified vehicles have a minimum specified amount of commercial sorbent material to address spills on both water and land in accordance with project-specific requirements
	In case of unanticipated disturbance or damage caused by construction activities: stop work, assess restoration requirements, and mitigate as soon as possible to restore affected areas to their original condition (to the extent possible) in a manner satisfactory to the Owner Company, Landowners, Land Holder, and regulatory authorities
	Ensure that all construction debris (e.g., rags, oil cans) and garbage is collected and disposed of at an approved facility
	Verify that roading, vehicles, equipment, and piping remain on approved paths and avoid exclusion zones
	Ensure all environmentally sensitive material (e.g., mats and skids, topsoil) is collected and disposed of at an approved facility
Soil, Vegetation, and Terrestrial Life	
	Observe for feeding or harassment livestock or wildlife; if observed, report the incident immediately to the Construction Manager / Chief Inspector (or designate)

✓	Description
	Watch for possession of pets while on or off the facility site or ROW. If observed, report the incident immediately to the Construction Manager / Chief Inspector (or designate)
	Ensure temporary or permanent erosion and/or sediment control structures (e.g., silt fences, sediment traps, drainage ditches) have been constructed and maintained in alignment with the EPP, and any damage has been repaired within the designated timeframe
Watercourses, Wetlands, and Aquatic Life	
	Ensure equipment is not fueled, serviced, or staged within specified distances of water bodies
	Ensure that hazardous materials are stored the specified distances away from water bodies
	Ensure equipment cleaning protocols are followed in areas where invasive / noxious / prohibited species are present
Air and Noise Pollution	
	Ensure appropriate measures for dust management are implemented (e.g., minimizing soil erosion, dust suppression through the use of water trucks or chemical trucks)
	Ensure appropriate measures for noise abatement are implemented (e.g., time of day restrictions)

6.6 Execution of Work

Monitoring the work for conformance to the applicable EPP, drawings, specifications, and permit conditions is critical not only for meeting site safety and environmental expectations but also for ensuring the quality of construction, which is necessary for the long-term safety, environmental protection, and cost-effectiveness of the facilities or pipeline assets.

Best practices relevant for each phase of facilities and pipeline construction are identified in the following sections in significant detail; however, additional activities that the Environmental Inspector will undertake include:

- Ensuring all construction personnel are aware of and consistently interpret the relevant environmental regulations, policies, and approvals
- Participating in training and tailgate meetings
- Disseminating and explaining Owner Company environmental specifications, project-specific documentation, and other EI-relevant documentation to other Inspectors and Contractors (where required); it is critical that the latest construction drawings and specifications are utilized
- Advance planning and organization of construction activities, such as: surveying environmentally sensitive features, coordinating with third party environmental resource specialists, completing agency notifications where required by applicable permits, and ensuring all relevant approvals have been obtained prior to the commencement of construction
- Maintaining lines of communication with key Stakeholders as appropriate (including but not limited to):
    - Construction Manager / Chief Inspector (or designate)
    - Specialized Inspector(s) (e.g., General Inspector, Welding Inspector)
    - Land Agents
    - Project Manager / Engineer
    - Pipeline System Operations Personnel
    - Owner Company community relations and/or Tribal relations representatives

- Contractors and Subcontractors
- Third party representatives (where applicable)
- Government agencies representatives

- Following site-specific communications protocol as defined in the project

6.7 Administration of Environmental Contractual Obligations

It is part of the Environmental Inspector's role to understand environmental contractual obligations (e.g., project schedule, permits, extra work activities) and ensure that the Contractor is carrying out construction activities / operations accordingly. The Environmental Inspector's role in the administration of environmental contractual obligations is summarized in Table 8. The EI may need to understand the types of agreements and contracts issued to, or applied for, by the Owner Company as detailed in Table 9.

Table 8: Environmental Inspector Role in Administration of Environmental Contractual Agreements

✓	Description
	Maintain, coordinate, and communicate progress and schedule updates per Owner Company requirements as related to environmental work
	Ensure Owner Company agreements (such as permits, Landowner line lists, and/or land agreements) are adhered to and up to date
	Ensure approval is received from the Construction Manager / Chief Inspector (or designate) prior to commencing any extra work activities that have an environmental impact
	Ensure only the most current revision of Issued for Construction (IFC) drawings, approved contract documents, and specifications are referenced for construction
	Ensure that any applicable proposed deviations from environmental specifications, design changes, or material substitutions are discussed and approved by the Construction Manager / Chief Inspector (or designate) prior to proceeding with the work
	Communicate lessons learned and foster an environment of continuous improvement, including participating in post-job review meetings

Table 9: Typical Approvals / Permits Issued or Applied for by the Owner Company

Type	Description
Licenses / Approvals	Watercourse Crossing Agreements – needed to cross active watercourses within the facility site limits or to access the facility, or that are along the proposed pipeline route
	Wetland Crossing Agreements – needed to cross any wetlands within the facility site limits or to access the facility, or that are along the proposed pipeline route
	Sensitive Land Use Agreements – Required to build on sensitive land. They may include provisions for: • Vegetation • Sensitive habitats • Specific Landowner requirements

Type	Description
Permits	Regulatory and jurisdictional permits (in some cases these would be obtained by the Contractor), which may include: • Public Land Work Permit • Private Land Work Permit • Fenced Enclosure Permits • Encroachment Permits • Environmental Permits (including Air Quality) • Road Use Permits • Road Transport Permits • Dangerous Goods Permits • Safe Work Permits • Burning Permits • Blasting Permits • Third Party Crossing Permits • Water Withdrawal and Discharge Permits for Hydrostatic Test • Building Permits (both temporary and permanent construction) • Stormwater Permits • Damage Control Licenses / Permits • Water Crossing Permits • Wetlands Permits • Incidental Take Permits
Other Activities with Possible Environmental Contractual Obligations:	Materials Storage / Contractor / Pipe Yards
	Construction survey
	Emergency Medical Service (EMS)
	Clearing / Grading
	Pipeline, facility, or integrity construction activities
	Fabrication
	Compaction testing
	Restoration activities
	Heavy lift (Facilities only)
	Hydrovac excavating
	As-built documentation
	Security
	Pigging (Pipelines only)
	Trenchless crossings (Pipelines only)

6.8 Records Management

A critical element of the Environmental Inspector's role is to support Owner Company record keeping, which is critical to compliance with regulations and audits as well as the long-term management of the facility or pipeline. For example, details captured during the construction phase can be one of the critical pieces of information when maintaining the structural integrity of the facility or pipeline in the future. While specific record keeping requirements

are identified within each section, general requirements are listed in Table 10. Where record keeping is incomplete, poorly worded, or lacking entirely, Environmental Inspector duties are deemed to be incomplete.

Table 10: Typical Activities Associated with Supporting Records Management

✓	Description
General	
	Ensure the timely completion and submission of all required documentation
	Document compliant activity as well as non-compliant activity
	Complete relevant documentation for any interactions with Stakeholders, Regulators, and Tribal Communities
	Ensure all forms, reports, and submitted data are as complete and accurate as possible
	Verify all environmental as-built information pertaining to the construction progress has been recorded
	Provide information on an ongoing basis that will assist in closing Contractor claims
	Continually gather data to support a post-construction evaluation and lessons learned document
	Continually review base estimates and schedules to actual environmental work performed and provide feedback
	For each phase, collect photographic evidence of pre-construction, daily progress (as needed), and post-construction conditions
	Obtain approval from the Construction Manager / Chief Inspector (or designate) prior to commencing any extra work activities
	Ensure environmental reports are completed and forwarded to the applicable Project Team members in accordance with the Project-specific communication protocols, these reports include (but are not limited to): • Agency Report • Problem Area Report • Non-Compliance Report • Serious Violation Report • Rare or Protected Species Report • Variance Report • Near Miss or Near Hit Reports • Incident Reports
Daily	
	Complete Inspection reports (e.g., materials, workmanship, areas inspected, pre-construction and progress photos)
	If applicable, complete Construction Progress reports (e.g., materials, workmanship, areas inspected)
	If applicable, record lengths, locations, and units of work completed on a daily basis
	Record daily rain events
Weekly	
	Provide applicable input to Weekly Progress reports including identification of potential environmental hazards and their potential schedule impacts and environmental work progress, where applicable
	Maintain, coordinate, and communicate weekly progress to the Construction Manager / Chief Inspector (or designate)
Project End	
	Prepare an end-of-project report (if required by the Owner Company)
	Prepare a project summary (if required by the Owner Company)
	Identify lessons learned and/or participate in sessions in support of lessons learned

6.9 Personnel Qualifications and Certifications

The Environmental Inspector should confirm the qualifications of environmental individuals allowed on-site as an important element of ensuring a quality product is constructed. For example, wetland assessments have very specific requirements for the qualification of biologists and the work they undertake (e.g., Certified Wetland Scientist). These qualifications / certifications are identified, where relevant, and reviewed and accepted prior to construction (e.g., Stormwater Management Certification). Qualifications and certifications should also comply with applicable regulatory requirements (e.g., Owner Company Operator Qualification (OQ) Plans).

6.10 Equipment Calibration

Often, activities during pipeline and facilities construction require specialized equipment for environmental testing. For example, turbidity monitors (used to measure water clarity) may be used in watercourse crossing projects. In these situations, the Environmental Inspector will ensure that only properly calibrated test equipment is used on-site and supporting calibration records are available.

6.11 Environmental Incident Reporting

Should an environmental incident occur (e.g., a spill), the Environmental Inspector is expected to assist the Owner Company and, where necessary, the local authorities in conducting a formal and objective Incident Report based on the Environmental Inspector's knowledge of the situation. In particular, the Environmental Inspector should keep in mind the items identified in Table 11.

Table 11: Typical Environmental Incident Considerations

✓	Description
	Issue stop work order if required, and take immediate action or assist on-site personnel to ensure injuries are attended to and emergency services are contacted
	Freeze the worksite if required, based on the Construction Manager / Chief Inspector (or designate) authority (see Section 6.1)
	Immediately report all injuries, vehicle incidents, near misses, and any unsafe conditions to the Construction Manager / Chief Inspector (or designate)
	Ensure that site evidence is preserved, pictures are taken, and documentation and witness statements are gathered and retained as soon as practical
	Participate in incident investigations (as required)
	If the site has been shut down, obtain authorization from the Owner Company when the site can be returned to services

6.12 Post-Construction Considerations

After the facilities or pipeline construction project is completed (i.e., after clean-up and restoration of the pipeline or facility site), the company will determine what involvement the Environmental Inspector will be responsible for during the Post-Construction Monitoring; typical items are identified in Table 12.

Table 12: Typical Post-Construction Considerations

✓	Description
	Restoration inspection along the site or ROW (may be handled by a Restoration Specialist)
Soils Assessment (to be performed following the first growing season)	
	Assess topsoil and subsoil compaction, texture, and degree of admixing
	Measure topsoil depth
	Assess stoniness, counter restoration, and erosion potential
Vegetation monitoring	
	Monitor for issues with: • Inadequate vegetation or crop regrowth • Excessive increase in weed growth, density, or distribution
Site or ROW Monitoring	
	Monitor for issues, including: • Subsidence (i.e., areas of sunken trench) or crowning • Soil erosion
Wetland Monitoring	
	Monitor for issues with: • Re-vegetation • Water quality • Hydrological functions
Water Crossing Monitoring	
	Monitor for issues with: • Erosion and bank stability • Revegetation • Functioning • Flow impediment • Sedimentation
Communication	
	Coordinate with land agents on Landowner engagement and communication approach.
	Communicate with the land agent during the first and second growing seasons to discuss: • Restoration progress • Any issues with restoration that need to be addressed
Reporting	
	Maintain Environmental Punch List, including: • Record of identified issues • Status of identified issues (i.e., resolved, or unresolved) • Mitigative measures undertaken
	Prepare Post-Construction Monitoring Report based on the Environmental Punch List

6.13 References – Foundational Information

Note to user: The reference information provided in Table 13 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate to each unique project and locale.

Table 13: List of References – Foundational

Document No.	Type	Title / Description
American Petroleum Institute (API)		
API RP 1169	Recommended Practice	Pipeline Construction Inspection
API RP 1184	Recommended Practice	Pipeline Facilities Construction Inspection
Bureau of Land Management		
N/A	Regulation / Easement	Special Use Permit for crossing a BLM land
Code of Federal Regulations (CFR)		
40 CFR 1500	Regulation	National Environmental Policy Act
49 CFR 172	Regulation	Hazardous Materials Table
40 CFR 300	Regulation	National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR 112	Regulation	Oil Pollution Prevention
29 CFR 1910	Regulation	Occupational Safety and Health Standards
33 CFR 321	Regulation	Permits for Dams and Dikes in Navigable Waters of the United States
40 CFR 300	Regulation	National Oil and Hazardous Substances Pollution Contingency Plan
50 CFR 21	Regulation	Migratory Bird Permits
Federal Energy Regulatory Commission (FERC)		
18 CFR380.12(d)	Guidance	Wetland and Waterbody Construction and Mitigation Procedures
18 CFR380.12 (i)	Guidance	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Guidance	Guidelines for Reporting on Cultural Resources Investigations for Natural Gas Projects
N/A	Guidance	Guidance for Horizontal Directional Drill Monitoring, Inadvertent Return Response, and Contingency Plans (HDD Plan Guidance)
N/A	Regulation / Authorization	Certificate for transportation of natural gas as authorized by the Natural Gas Policy Act and the Outer Continental Shelf Lands Act
International Organization for Standardization (ISO)		
ISO 9000	Standard	Quality Management Systems – Fundamentals and Vocabulary
ISO 14000, 14001	Standard	Environmental Management Systems
Interstate Natural Gas Association of America (INGAA)		

Document No.	Type	Title / Description
N/A	Guidance	Environmental Inspector Guidance Recommended Qualifications and Best Practices
N/A	Guidance	Planning Guidelines for Pipeline Construction During Frozen Conditions
N/A	Video Series	Video Series Backfilling and Compaction
N/A	Guidance	Construction Safety & Quality Consensus Guideline CS-R-16: Steep Slope Construction
Local Regulations		
N/A	Permit	Levee / Ditch Crossing Permits
N/A	Permit	Road Crossings Permits
N/A	Ordinance	Noise Level Limits, Time of Day Restrictions
National Marine Fisheries Service, National Oceanic and Atmospheric Administration		
N/A	Regulation / Authorization	Consultations for impacts on federally listed threatened and endangered marine species and critical habitat under section 7 of the Endangered Species Act
United States Army Corps of Engineers		
N/A	Regulation / Authorization	Obtain a permit
United States Code (USC)		
16 USC Chapter 35	Regulation	Endangered Species
33 USC Chapter 9	Regulation	Protection of Navigable Waters and of Harbor and River Improvements Generally
54 U.S.C. § 306108	Regulation	National Historic Preservation Act
United States Department of Agriculture		
N/A	Guidance	Natural Resources Conservation Service (NRCS) National Plant Materials Manual
N/A	Consultation	NRCS Wetland Reserve Program
N/A	Consultation	NRCS Wetland Reserve Easements Program
N/A	Consultation	NRCS Agricultural Conservation Easement Program
N/A	Consultation	Farm Service Agency Conservation Reserve Program
United States Environmental Protection Agency (EPA)		
33 U.S.C. §1251	Regulation	Clean Water Act
40 CFR Part 112	Regulation	Oil Spills Prevention and Preparedness Regulations
United States Fish and Wildlife Service		
16 U.S.C. 1531-1544	Regulation / Authorization	Endangered Species Act
16 U.S.C. 703-712	Regulation / Authorization	Migratory Bird Treaty Act
16 U.S.C. 668-668d	Regulation / Authorization	Bald and Golden Eagle Protection Act
N/A	Regulation / Authorization	Fish and Wildlife Coordination Act
United States Forest Service		
N/A	Regulation / Easement	Special Use Permit for crossing a national forest
State Regulations (Administered by State-Specific Agencies)		

Document No.	Type	Title / Description
N/A	Regulation / Permit	Major or Minor source air operating permit under Clean Air Act part 70
N/A	Regulation / Certificate	Water Quality Certificate under Clean Water Act section 401
N/A	Regulation / Permit	General Permit for Construction Stormwater Discharge under the National Pollution Discharge Elimination System (Includes compliance with a Stormwater Pollution Prevention Plan)
N/A	Regulation / Permit	General Permit for Construction Dewatering and Discharge of Hydrostatic Test Water under the National Pollution Discharge Elimination System
N/A	Regulation / Permit	State Water Crossing Permit
N/A	Regulation / Permit	Water Appropriation Permit
N/A	Regulation / Authorization	Consultation for impacts on fisheries, wildlife, and state-listed species
N/A	Regulation / Authorization	Consultation for impacts on historic properties under National Historic Preservation Act section 106
N/A	Regulation / Permit	Right-of-Way Grant to cross state lands

7 PLANNING AND CONSTRUCTING PIPELINES

7.1 Overview

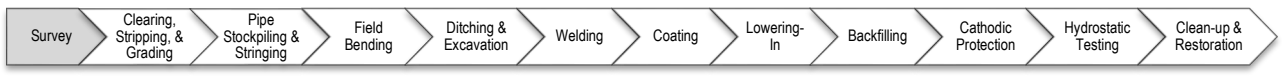
Planning and Constructing Pipelines consists of the following major activities:

1. Survey (Section 7.2)
2. Clearing, Stripping, and Grading (Section 7.3)
3. Pipe Stockpiling and Stringing (Section 7.4)
4. Field Bending (Section 7.5)
5. Ditching and Excavation (Section 7.6)
6. Welding (Section 7.7)
7. Coating (Section 7.8)
8. Lowering-In (Section 7.9)
9. Backfilling (Section 7.10)
10. Cathodic Protection (Section 7.11)
11. Hydrostatic Testing (Section 7.12)
12. Clean-Up and Restoration (Section 7.13)

The relevant Environmental Inspection requirements are described within this section, roughly in sequence of construction. Note that requirements and duties may be repeated throughout multiple stages; this redundancy is intended to reduce cross-referencing and ensure each phase is represented holistically and independently for ease of use. While this document is written sequentially, due to the complexities of the modern construction environment, not all aspects of a project are planned and executed in a sequential order. Thus, each section of the document can be read alone as a comprehensive listing of the Environmental Inspector's responsibilities during that activity.

One activity that may occur in a different sequence from other parts of the project is trenchless crossing, often considered a "project within a project". For trenchless crossing, all requirements of the relevant sections apply in addition to the items specific to trenchless crossing. The additional duties are identified within the following sections:

1. Survey (Section 7.2)
2. Clearing, Stripping, and Grading (Section 7.3)
3. Ditching and Excavation (Section 7.6)
4. Lowering-In (Section 7.9)
5. Backfilling (Section 7.10)
6. Clean-Up and Restoration (Section 7.13)



7.2 Survey

7.2.1 Overview

Surveying is an integral part of pipeline construction and refers to the installation of visual reference points and markers (e.g., stakes, pins, lath, hubs) that will define the right of way (ROW) limits and guide the construction of the pipeline and necessary appurtenances according to the Issued for Construction (IFC) drawings. The references also mark the safe limits of ROW work areas as well as sensitive environmental features and associated setbacks or buffers as outlined in the environmental protection plan (EPP).

A General Inspector is the technical liaison for survey information between the Construction Manager / Chief Inspector (or designate), Survey Contractor, and other on-site Contractors. The Environmental Inspector (EI) supports the General Inspector by ensuring surveying activities do not have an adverse effect on the environment, as well as ensuring environmental features are adequately marked.

The EI's responsibilities during surveying include, but are not limited to:

- Providing clear instructions and confirmation of surveying activities conducted in the vicinity of environmentally or culturally sensitive areas as defined in the EPP, to reduce disturbance of site-specific environmental or cultural resources
- Identifying areas associated with special permit conditions (e.g., riparian areas, designated wetlands)
- Ensuring setbacks, buffers, and/or workspace reductions (neckdowns) are properly marked in the field
- Ensuring the proper signage / staking / flagging has been installed in accordance with the project environmental plans and commitments (e.g., waterbody and wetland signs, refueling restrictions, equipment cleaning locations, environmentally sensitive areas)

7.2.2 Inputs

As part of preparing for Environmental Inspection during the surveying process, the EI will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner Company technical specifications as identified in Table 15.

7.2.3 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the surveying process are identified in a series of checklists as detailed in Table 14.

Table 14: Monitoring Requirements for Survey Inspection

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 16

Item	Description	Reference
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 17
General	• Identifies general items that should be monitored throughout the construction surveying process	Table 18
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 19
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and are particularly sensitive to construction activity	Table 20
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 21
Trenchless Crossings	• Specific considerations relating to trenchless crossings that should be monitored throughout the construction surveying process	Table 22

7.2.4 Outputs

The EI is required to report on environmentally relevant workmanship and progress on a periodic basis by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for survey inspection appear in Table 23.

Detailed Checklists – Survey

7.2.5 Typical Input Requirements during the General Surveying Process

Table 15: Information Requirements for General Survey Inspection

✓	Description
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to surveying, such as: • Alignment Drawings • Access Road Drawings • Line List (e.g., special concerns for each Landowner) • Issued for Construction (IFC) Drawings • Environmental studies
	Contracts and agreements related to: • Environmental Resources • Road Use • Crossing for Buried Facilities • Construction Survey • Landowner and/or Regulatory Requirements • Landowner and/or Regulatory Approvals • Third Party Crossing Agreements • Jurisdictional Agencies • Temporary Workspace Agreements

✓	Description
	Permits related to: • Environmental Conditions and/or Commitments • Road Use • Third Party Crossing Permits • Federal, State, and Local
	Owner Company specific Safety Plan, including (but not limited to): • Traffic Control Plan • Requirements for Personal Protective Equipment (PPE) • Emergency Medical Services (EMS)
	Project-specific Environmental Protection Plan (EPP), detailing surveying requirements
	Other project-specific Plans, which may include: • Fire Prevention / Firefighting Plan • Survey Plans • Alignment Sheets • Environmental Impact Statements (EIS) or Environmental Assessments Reports • Environmental Measures, Policies, and Plans • Unanticipated Discovery Plans
	Owner Company-specific Pre-Construction Consideration related to: • Weather Conditions • Environmental Resources (soils, vegetation, watercourse crossings, wetlands) • Wildlife and Aquatic Resources • Agricultural Activities • Historic Sites, Culturally Significant Sites, and Sensitive Landscapes • As-built Data • Ground Disturbance Documentation

7.2.6 Best Practice for Environmental Inspection During Typical Surveying Operations

Table 16: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental and cultural concerns • Duties of Inspector(s) • Pipeline Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Locate and flag environmentally and culturally sensitive sites
	Assist pioneer crews (i.e., first crews at the site), if necessary, at the commencement of any on-site work including hydrovacing and signage installation for access

Table 17: Safety Concerns during the Surveying Process

✓	Description
	Ensure that damage to or obliteration of any survey references are reported per Owner Company processes and treated as a safety concern

Table 18: Typical Monitoring Requirements – General

✓	Description
	Monitor daily activities for compliance with all environmental requirements
	Ensure construction activities are contained inside the approved ROW, designated access roads, and ancillary sites
	Assist surveyors in staking any pre-determined environmentally sensitive or archaeological sites
	Ensure a photographic record is made of all sensitive features to be protected or restored
	Adhere to Owner and project-specific requirements for the storage and disposal of hydrovac slurry
	Verify that stakes, marks, and flags are maintained throughout construction, if feasible, and communicate with the Surveying Contractor when any need to be re-established
	Communicate known environmental hazards (e.g., invasive species, biomonitors, contaminated soil, poison ivy) during JSA activities

Table 19: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
	Ensure setback requirements for rare vegetative crops and/or species are adhered to
	Confirm the accuracy of flagged environmentally sensitive areas, including protected species habitats, culturally sensitive areas, ornamental trees, windbreaks, or specialty shrubs, in consultation with survey crews
	Ensure that any locations with crops, crop disease, or weed infestations are flagged, staked, and clearly marked with signage
	Ensure nest surveys have been completed along the ROW where / when applicable
	Ensure any restricted areas (e.g., nesting sites, rare species) are appropriately flagged
	Ensure there are flags, stakes, and clearly marked signage at any locations requiring special soil handling techniques (e.g., three-lift soil handling)
	Ensure that taller stakes are installed in high crop areas or snow to ensure visibility, and hub-staking is used in livestock pastures
	Ensure that flagging is placed more frequently in heavily vegetated, treed areas, and at project workspace neckdowns to provide better visibility for Clearing Equipment Operators
	Ensure appropriate soil compaction testing and mitigation are carried out

Table 20: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
	Ensure that the resources are staked and flagged in accordance with relevant requirements
	Ensure that temporary workspaces (TWS) do not encroach within the vegetated buffers of watercourses and wetlands
	Ensure that extra workspaces at watercourse crossings are sufficiently marked
	Ensure that vehicle maintenance, refueling buffers, and equipment storage locations are well-marked
	Ensure that vehicles do not ford watercourses unless permitted

✓	Description
	Re-establish the final alignment of the watercourse after construction of the crossing, as specified in the EPP or equivalent
	Ensure drainages are staked and flagged in the fall prior to heavy snowfall to avoid flooding or erosion problems during spring break-up

Table 21: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	There are no incremental specific monitoring requirements for air and noise pollution beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 22: Typical Monitoring Requirements – Trenchless Crossings

✓	Description
	Monitor and review locations set for acoustic monitoring, if applicable
	Verify that survey markings of the center line and other underground features are maintained throughout construction and communicate with the Surveying Contractor when any need to be re-established
	Ensure that extra workspace is properly identified
	Ensure that areas identified for mud handling are in accordance with permit requirements

7.2.7 Typical Outputs for Survey Inspection

Table 23: Typical Reporting Requirements

✓	Description
General	
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here
Daily	

	Complete daily surveying Environmental Inspection Progress reports, including (but not limited to):
	• Work completed to date, including:
	  ○ Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters
	  ○ A record of any observations, events, and violations using a daily log, camera, and other technology
	  ○ Information regarding non-jurisdictional drain locations
	• Documenting compliance with Project permit conditions, which includes:
	  ○ Updating the company-specific environmental commitment tracking system
	All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

7.2.8 References – Survey

Note to user: The reference information provided in Table 24 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 24: List of References – Survey

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation Inc.) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Pipeline Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
N/A	Guidance	Construction Safety & Quality Consensus Guideline CS-R-16: Steep Slope Construction
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures

7.3 Clearing, Stripping, and Grading

7.3.1 Overview

Clearing, stripping, and grading is the next phase of pipeline construction after surveying, where the pipeline right of way (ROW) is prepared for the upcoming pipeline installation activities. This phase typically represents the highest gradient of disturbance to the environment, with the removal of trees, vegetation, and soil, requiring a high degree of oversight by Environmental Inspectors (EI). Key steps of the clearing, stripping, and grading process typically include:

- Clearing, which involves the cutting of trees and brush from the pipeline ROW and access roads
- Grubbing, which involves the removal of tree stumps and large roots from specific areas along the ROW
- Timber salvage, which involves the recovery and temporary storage of useful, merchantable timber from the ROW
- Unsalvageable timber and brush disposal, which involves the removal or elimination of on-site non-merchantable timber and brush by chipping, mulching, or burning
- Stripping, which involves the removal, segregation, and storage of topsoil and/or the organic layer for later redistribution after the pipe has been backfilled
- Erosion control, which will be implemented immediately after clearing, unless otherwise specified, and soil erosion contingency measures
- Cut and fill activities, which are sometimes required for preliminary grading of the ROW
- Temporary fencing
- In some cases, grade rock blasting, excavation, and removal may be required

A Grading Inspector, sometimes referred to as a General or Craft Inspector, is responsible for ensuring crews follow appropriate methods during clearing, stripping, and grading operations. The EI supports the Grading Inspector by ensuring clearing, stripping, and grading operations do not have an adverse effect on the environment.

The EI's responsibilities during clearing, stripping, and grading include, but are not limited to:

- Ensuring proper handling, salvage, and disposal of merchantable and non-merchantable timber as per project requirements
- Ensuring soil integrity is maintained by implementing proper soil segregation and handling techniques (e.g., prevent mixing of topsoil with subsoil)
- Monitoring to ensure activities stay within approved boundaries and avoid environmentally sensitive exclusion zones

7.3.2 Inputs

As part of preparing for Environmental Inspection during the surveying process, the EI will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 26.

7.3.3 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress on a periodic basis. Typical items that the EI will monitor for during the clearing, stripping, and grading process are identified in a series of checklists as detailed in Table 25.

Table 25: Monitoring Requirements for Clearing, Stripping, and Grading

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 27
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 28
General	• Identifies general items that should be monitored throughout the construction clearing, stripping, and grading process	Table 29
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 30
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 31
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 32
Trenchless Crossings	• Specific considerations relating to trenchless crossings that should be monitored throughout the construction clearing, stripping, and grading process	Table 33

7.3.4 Outputs

The EI is required to report on workmanship and progress on a periodic basis by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for clearing, stripping, and grading appear in Table 34.

Detailed Checklists – Clearing, Stripping, and Grading

7.3.5 Typical Input Requirements for Clearing, Stripping, and Grading Environmental Inspection

Table 26: Information Requirements for Clearing, Stripping, and Grading

✓	Description
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to clearing, stripping, and grading, such as: • Alignment Drawings • Access Road Drawings or Route Sheets • Grading Drawings • Line List (e.g., special concerns for each Landowner) • Environmental Studies • Commissioned Reports
	Contracts and agreements related to: • Clearing • Grading (if required) • Road Use • Crossing for Buried Facilities • Timber Salvaging: contracts / agreements may be with the Landowner, a public land holder, or forestry management • Timber Sales • Construction Survey • Fencing
	Permits related to: • Environmental Conditions and/or Commitments • Road Use • Burning • Blasting • Water Withdrawal • Watercourse Crossings including Wetlands
	Owner Company-specific Safety Plan, including (but not limited to): • Requirements for Personal Protective Equipment (PPE) • Emergency Medical Services (EMS) • Blasting Safety
	Project-specific Environmental Protection Plan (EPP), Detailed Clearing, Stripping, and Grading Requirements
	Other project-specific Plans, which may include: • Access Road Plans • Blasting Plan • Pre-Construction Grade Plan • Burn Plan • Timber Salvage Plan • Fire Prevention / Firefighting Plan • Heritage Sites • Soil Surveys

✓	Description
	• Environmental Impact Statements (EIS) or Environmental Assessments Reports • Environmental Measures, Policies, and Plans • Compliance Documents • Stormwater Management • Erosion and Sediment Control • Environmental Alignment Sheets • Spill Prevention, Control, and Countermeasure Plan (SPCC) • Unanticipated Discovery Plans
	Owner Company-Specific Pre-Construction Consideration related to: • Weather Conditions • Wildlife and Aquatic Resources • Wetlands • Agricultural Activities • Historic Sites, Culturally Significant Sites, and Sensitive Landscapes

7.3.6 Best Practice for Environmental Inspection During Typical Clearing, Stripping, and Grading Operations

Table 27: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Pipeline Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Identify environmental issues for consideration in the development of the pre-construction Grade Plan
	Ensure timber / swamp mats are used if ground conditions are unstable and low-ground pressure equipment cannot be used
	Ensure that sensitive habitats, specimen trees, and shrubs identified in the Environmental Protection Plan (EPP) are marked and protected both along and marginally off the ROW or workspaces by an approved method
	Ensure well water monitoring plan is adhered to, when required
	Ensure stormwater management plans are in place
	Ensure stakes and signage are installed, visible, and intact

Table 28: Safety Concerns for Clearing, Stripping, and Grading

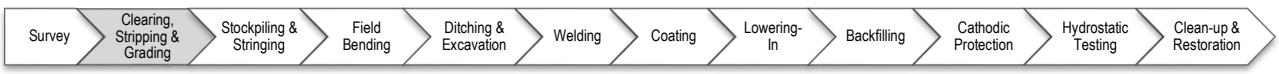
✓	Description
	Ensure that damage to or obliteration of any survey references are reported per Owner Company processes and treated as a safety concern

Table 29: Typical Monitoring Requirements – General

✓	Description
	Ensure clearing, stripping, and grading operations are limited to the approved ROW, access roads, and approved work areas
	Monitor for adherence to conditions noted in all environmental approvals and permits issued
	Ensure mitigative measures for permafrost are adhered to (e.g., minimizing grading activities)
	Ensure appropriate measures are implemented when artifacts are unearthed
	Provide input on environmental considerations when additional clearing, stripping, and grading may be required
	Ensure push-outs along the outer edge of the pipeline ROW are constructed in approved areas only
	Ensure any temporary workspace (TWS) for storage of excavated material, grubbing, or salvageable timber has been constructed as per the EPP
	Verify that the Contractor picks up and properly disposes of any fly-rock from blasting activities
	Monitor temporary fencing requirements
	Ensure a watch person is present at open gates to control livestock (if required)

Table 30: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
Clearing Trees and Brush	
	Ensure any vegetation (e.g., trees, shrubs) that needs to be transplanted is stored properly to prevent drying out before replanting
	Ensure trees, shrubs, and tall grasses are cleared prior to the onset of migratory bird or species-specific time of year restrictions (TOYR)
	Ensure adherence to operator or project-specific measures for any trees containing biological resources (e.g., active nests, dens, or burrows)
	Ensure proper equipment is used to minimize terrain disturbance during non-frozen conditions when clearing non-merchantable timber
	Ensure that on land with a significant slope in any direction (per criteria defined by Owner Company in contract documents), removal of brush and trees is minimized, and root systems are left intact to prevent slope erosion
	Ensure cuts are treated per contract requirements where branches are removed from a standing tree outside the ROW (if required)
	Ensure trees are felled into the approved project workspace
	Ensure the Contractor refrains from skidding timber through partially thawed and/or muddy ground
	Monitor for proper placement of all removed trees and brush from and adjacent to the ROW
	Ensure the Contractor clears wetlands, water bodies, and riparian vegetation areas using approved Owner Company procedures as per the EPP
	Ensure methods are used to minimize clearing debris from falling into a watercourse and if it occurs, ensure debris is removed immediately
Grubbing	
	Ensure appropriate surface erosion control measures are implemented immediately after clearing and prior to commencing grubbing unless otherwise specified



✓	Description
	Ensure natural surface drainage can be re-established or installed where appropriate
	Ensure proper equipment (e.g., brush rake attachment) is used for grubbing to preserve topsoil
	On erosion prone slopes, restrict root grubbing to minimize potential for erosion and soil disturbance
	Restrict grubbing near the ROW boundary, as specified by the Owner Company, where possible
	Suspend grubbing when weather conditions promote sedimentation
	Ensure adherence to specific requirements for grubbing near watercourses and/or wetlands
	Ensure grubbing in wet areas is minimized to prevent bog holes
Timber Salvage and Storage	
	Ensure timber is salvaged in accordance with Timber Salvage Plan or other project-specific requirements (e.g. Landowner Agreements)
	Consult the Timber Salvage Plan regarding any merchantable timber that appears to not meet specifications, then notify the Construction Manager / Chief Inspector (or designate) and Clearing Contractor for a decision on how to proceed
	Ensure stacked timber is not located in reforested areas or grade areas, unless otherwise approved
	Ensure materials retained for chip and/or mulch material and the location of use is in accordance with the regulatory requirements
	Ensure adherence to any specific requirements associated with cutting and removal near watercourses
	Ensure Contractor refrains from skidding timber through watercourses, water bodies, or wetlands
	Ensure timber stockpile sites are located away from watercourses
Timber and Brush Disposal	
	Ensure proper burn permits are in place
	Ensure burning activities comply with the Burn Plan, permit stipulations, Landowner requirements, and EPP
	Ensure burn locations are only on top of mineral soils and not on topsoil, in peat, or wetland areas (the Contractor may have to strip surface organics and replace them after burning)
	Ensure burn piles are located on the ditch and away from any existing aboveground facility to allow for sufficient space for stacking and working
	Ensure the location of burn piles are identified, if required
	Ensure continuous (24/7) monitoring during any controlled burn
	Ensure fires are completely extinguished once the burn pile is consumed
	Ensure that all residual materials from burning are disposed of as per contract documents and/or Owner Company or project specifications
	If burning is not permitted, confirm chipping or mulching is conducted as per contract specifications
	Ensure chips, woody debris, or mulch are not piled in a wetland, unless approved by the regulatory authority
	Ensure appropriate regulatory approval and waivers are in place before disposing of merchantable timber
	Ensure the Clearing Contractor hauls away all timber and brush from the ROW that cannot be processed by the above means
Topsoil Stripping and Storage	
	Ensure topsoil is stripped from the following areas in accordance with environmental specifications: • Agricultural Lands with weed infestations • Cultivated lands and lands with agricultural potential that are prone to soil mixing and compaction • Areas to be filled or graded

✓	Description
	• Any special areas, if warranted, that allow for a wider or deeper trench, storage of larger volumes of spoil, grading, and heavy equipment traffic • Areas in accordance with Landowner requirements and in compliance with project requirements
	Ensure adherence to project specifications for topsoil stripping (e.g., width and depth of topsoil stripped) unless appropriate approval is received
	Ensure topsoil is stored within the construction ROW, and is stored in a manner that prevents mixing of topsoil with subsoil
	Ensure the topsoil pile has been stabilized in accordance with project-specific permit conditions, company commitments, and Landowner agreements using mulch, tackifiers, temporary seeding, or similar measures
	Ensure adherence to Landowner or regulatory authority requirements for windrow gaps
	Ensure project-specific soil surveys are used to identify soil characteristics and contingency measures are adhered to
	Ensure adherence to Operator or Project-specific mitigative measures for procedures relating to clubroot disease, weed infestations, and other crop diseases
	Suspend topsoil stripping during high winds unless a tackifier is applied to the topsoil pile
Topsoil Stripping – Three-Lift Soils Handling	
	Ensure this technique is only implemented for salvaging topsoil during dry and non-frozen conditions and areas where lower subsoils are poorer in quality than upper subsoil
	Ensure that the salvaged upper subsoil is twice the width of the trench, and the depth is as listed in the Environmental Alignment Sheet
	Ensure this technique is implemented to maintain groundwater flow in areas characterized by sands overlying clays at shallow depths
	Ensure there is separation between the topsoil and subsoil piles, and that the upper subsoil is stored separately from the lower subsoil
Topsoil Stripping – Frozen Soil Conditions	
	Ensure there is snow cover present over the soil stripping area and remove snow immediately prior to stripping activities
	Ensure mulching of frozen topsoil when necessary
	Ensure adherence to project specifications for storing stripped topsoil on frozen ground
Erosion Control and Soil Erosion Contingency Measures	
	Ensure temporary and/or permanent erosion and/or sediment control structures (e.g., silt fences, sediment traps, drainage ditches) have been constructed in alignment with the EPP
	Ensure construction activities are restricted or suspended when environmental conditions (e.g., wet weather, frozen soils) make it advisable to avoid negative impacts on the ROW, as required by the EPP
	Ensure all the necessary materials, equipment, and personnel are correct (as per the EPP) and available for installation and maintenance of erosion control
	Ensure topsoil stripping and salvage occur at the appropriate time, or just prior to trenching for areas prone to wind erosion
Tackification	
	Ensure permits are in place prior to application of a tackifier and applied in alignment with the EPP
	Ensure all ground preparations (e.g., restoration) activities are completed before applying a tackifier
	Ensure any revegetation (e.g., seed application) takes place prior to tackification
	Ensure the application of the tackifier adheres to site specifications and manufacturer requirements
	Ensure all products applied are biodegradable and have been approved by the Owner Company

✓	Description
Grading	
	Ensure appropriate erosion control measures are in place prior to grading
	Monitor and reduce disturbance to natural drainage channels and avoid blocking any existing channels during grading
	Ensure graded materials, or materials displaced to accommodate grading, are stored according to Owner or Project-specific requirements
	Implement appropriate mitigative measures for wet and/or thawed soils, when needed

Table 31: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

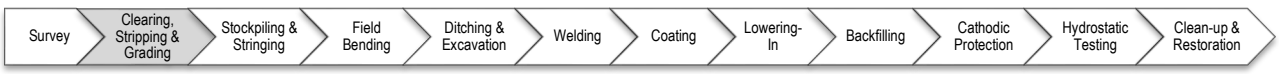
✓	Description
General	
	Ensure timely notice is given to all agreed-to parties before starting work near a creek, river, or watercourse
Equipment Crossing Watercourses	
	Ensure the Contractor plans and prepares in advance for moving equipment across watercourses
	Ensure temporary crossings over watercourses are installed according to approved permits if no bridge exists; approved temporary crossing types may include: • Clear span bridge • Bridge with instream supports • Ice bridge • Flumes • Rock fill with flumes
Grading Near Watercourses	
	Ensure grading in the vicinity of watercourses is per Owner Company specifications and Environmental Protection Plan (EPP) requirements
	Ensure project- or operator-specific mitigative measures are implemented for clearing and grading in riparian areas and buffer zones (e.g., leave an organic mat on the working side of ROW to limit sediments from entering the watercourse or wetland)
	Ensure grading close to watercourses and wetlands occurs just prior to the construction of the crossing
	Ensure vehicle crossings are in place to prevent grading equipment from operating directly in watercourses
	Ensure erosion and sediment controls are properly installed, maintained, and replaced as necessary

Table 32: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	Ensure burning activities adhere to applicable time of year restrictions, Clearing Index, and/or any other Burn Permit conditions where required

Table 33: Typical Monitoring Requirements – Trenchless Crossings

✓	Description
	Ensure extra workspace is properly cleared and prepared for the construction activity
	Ensure the mud handling pits are in accordance with company specifications and permit requirements



✓	Description
	Verify excess soil materials are stored appropriately

7.3.7 Typical Outputs for Clearing, Stripping, and Grading Environmental Inspection

Table 34: Typical Reporting Requirements

✓	Description
General	
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here.
Daily	
	Complete clearing, stripping, and grading Environmental Inspection progress reports, including (but not limited to): • Work completed to date, including: o Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters o A record of any observations, events, and violations using a daily log, camera, and other technology • Documenting compliance with Project Permit conditions and Landowner Agreements o Updating the company-specific environmental commitment tracking All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

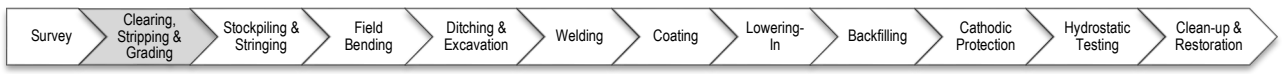
7.3.8 References – Clearing, Stripping, and Grading

Note to user: The reference information provided in Table 35 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 35: List of References – Clearing, Stripping, and Grading

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Pipeline Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
N/A	Guidance	Construction Safety & Quality Consensus Guideline CS-R-16: Steep Slope Construction
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan

Document No.	Type	Title
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures



7.4 Pipe Stockpiling and Stringing

7.4.1 Overview

For projects of significant size, Owner Company-provided materials are received at a pipe stockpiling site (e.g., a Contractor or lay down yard), typically located away from the right of way (ROW), for temporary storage. Stringing involves transporting pipe from the pipe stockpiling site to the ROW and placing pipe joints end to end along the pipeline ROW, including:

- Strategically placing pipe section supports (e.g., wooden skids, plastic tubs) next to the proposed pipeline ditch (in some cases trench may already be dug)
- Placing the pipe on top of the skids; this includes laying out material for specific crossings (e.g., water, road, railroad, HDD), sidebends, etc.

A Stockpiling and Stringing Inspector, sometimes referred to as a general or craft Inspector, is responsible for ensuring crews follow appropriate methods during stockpiling and stringing operations. The Environmental Inspector (EI) supports the Stockpiling and Stringing Inspector by ensuring stockpiling and stringing operations do not have an adverse effect on the environment.

The EI's responsibilities during stockpiling and stringing include, but are not limited to:

- Monitoring the general setup of the pipe yard to ensure erosion and sediment controls are installed and maintained in accordance with project plans and permit requirements
- Ensuring access roads are clear for use when needed and ROW is not damaged by heavy equipment passing
- Monitoring the ROW for rutting / compaction / soil mixing associated with stringing vehicle traffic
- Monitoring the ROW following rain / snow melt conditions and restricting construction activities in select locations during wet weather conditions
- Ensuring the working area is maintained and cleaned up regularly

7.4.2 Inputs

As part of preparing for Environmental Inspection during Stockpiling and Stringing, the EI will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 37.

7.4.3 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the stockpiling and stringing process are identified in a series of checklists as detailed in Table 36.

Table 36: Typical Monitoring Requirements for Executing Stockpiling and Stringing Operations

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 38
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 39
General	• Identify general items that should be monitored throughout the construction stockpiling and stringing process	Table 40
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 41
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 42
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 43

7.4.4 Outputs

The EI is required to report on workmanship and progress on a periodic basis by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for stockpiling and stringing appear in Table 44.

Detailed Checklists – Stockpiling and Stringing

7.4.5 Typical Input Requirements for Stockpiling and Stringing Environmental Inspection

Table 37: Information Requirements for Stockpiling and Stringing

✓	Description
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to stockpiling and stringing, such as: • Alignment Drawings
	Contracts and agreements related to: • Materials Storage
	Permits related to: • Environmental Conditions and/or Commitments • Road Transport
	Owner Company-Specific Safety Plan, including (but not limited to): • Pipe Transport • Pipe Loading / Unloading • Pipe Storage • Handling of Materials

✓	Description
	Project-specific Environmental Protection Plan (EPP), detailing stockpiling and stringing requirements including: • Rutting • Soil mixing • Damage and repair of erosion and sediment control devices • Maintenance of ROW ingress / egress points for safe conditions and tracking of soil onto public roadways
	Other project-specific Plans, which may include • Traffic Control Plan • Stormwater Management • Unanticipated Discovery Plans

7.4.6 Best Practice for Environmental Inspection During Typical Stockpiling and Stringing Operations

Table 38: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Pipeline Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Ensure timber / swamp mats are used if ground conditions are unstable and low-ground pressure equipment cannot be used
	Ensure stormwater management plans are in place
	Verify that erosion control measures are in place, including alignment

Table 39: General Safety Concerns for Stringing and Stockpiling

✓	Description
	Monitor for individuals standing between a suspended load and equipment or pipe
	Ensure that workers are not standing under or near a suspended load
	Ensure individuals stand clear when metal banding is cut loose or other tie down means are loosened from the load
	Ensure individuals stand clear of lifting slings or vacuum lifters while the Equipment Operator is lifting and placing pipe joints
	Monitor and be aware of other vehicles moving in the stockpile yard or right of way (ROW)

Table 40: Typical Monitoring Requirements – General

✓	Description
	Ensure banding from carriers and any other refused items are hauled away to acceptable disposal sites; burial at railway sidings, on the ROW, or stockpile sites is not permitted

✓	Description
	Ensure appropriate material is used to stabilize construction ROW for vehicle traffic
	Ensure the work area is cleaned up in accordance owner / operator project specifications

Table 41: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
	Prevent heavy trucks from accessing the construction ROW where topsoil has not been salvaged or wet conditions may result in deep rutting / soil compaction
	Ensure pipe is stored with end caps (as required by Owner Company-Specifications) to prevent wildlife from entering
	Ensure Landowner access, and livestock and wildlife crossings are maintained in accordance with Owner Company--Specifications
	Verify that irrigation systems, if applicable, remain operational per Landowner agreements

Table 42: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
	Ensure the location of the pipe yard or any construction yard is a sufficient distance away from water bodies, as specified in applicable permits
	Ensure erosion controls are in place and intact for all stockpiling yards

Table 43: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	There are no incremental specific monitoring requirements for air and noise pollution beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

7.4.7 Typical Outputs for Stockpiling and Stringing

Table 44: Typical Reporting Requirements

✓	Description
General	
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here
Daily	

	Complete stockpiling and stringing Environmental Inspection progress reports, including (but not limited to):
	• Work completed to date, including:
	  ○ Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters
	  ○ A record of any observations, events, and violations using a daily log, camera, and other technology
	• Documenting compliance with Project permit conditions, which includes:
	  ○ Updating the company-specific environmental commitment tracking system
	All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

7.4.8 References – Stockpiling and Stringing

Note to user: The reference information provided in Table 45 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently, and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 45: List of References – Stockpiling and Stringing

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Pipeline Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures

7.5 Field Bending

7.5.1 Overview

Field bending is an integral part of pipeline construction and refers to the set of activities associated with bending the pipe in the field so that it fits the shape of the ROW and trench.

A Field Bending Inspector, sometimes referred to as a General or Craft Inspector, is responsible for ensuring crews follow appropriate methods during field bending operations. The Environmental Inspector (EI) supports the Field Bending Inspector by ensuring field bending operations do not have an adverse effect on the environment.

The EI's responsibilities during field bending include:

- Ensuring the work area is maintained and cleaned up regularly.

7.5.2 Inputs

As part of preparing for Environmental Inspection during Field Bending, the EI will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 47.

7.5.3 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the field bending process are identified in a series of checklists as detailed in Table 46.

Table 46: Monitoring Requirements for Field Bending

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed.	Table 48
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 49
General	• Identify general items that should be monitored throughout the construction field bending process	Table 50
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 51
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 52
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 53

7.5.4 Outputs

The EI is required to report on workmanship and progress on a periodic basis by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for field bending appear in Table 54.

Detailed Checklists – Field Bending

7.5.5 Typical Input Requirements for Field Bending Environmental Inspection

Table 47: Information Requirements for Field Bending

✓	Description
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to field bending, such as: • Alignment Drawings
	Contracts and agreements related to: • Transport and Handling of Materials • Materials Storage
	Permits related to: • Road Transport • Storage Locations
	Owner Company-specific Safety Plan, including (but not limited to): • Site preparations
	Project-specific Environmental Protection Plan (EPP)
	Other project-specific Plans, which may include: • Traffic Control Plan • Stormwater Management Plan

7.5.6 Best Practice for Environmental Inspection During Typical Field Bending Operations

Table 48: Prior to Commencing Work

✓	Description
	Ensure timber / swamp mats are used if ground conditions are unstable and low-ground pressure equipment cannot be used
	Ensure stormwater management plans are in place

Table 49: Safety Concerns for Field Bending

✓	Description
	There are no incremental specific Safety Concerns beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 50: Typical Monitoring Requirements – General

✓	Description
	Verify that stakes, marks, and flags are maintained throughout construction, if feasible, and communicate with the Contractor when any need to be re-established
	Verify that equipment is properly maintained, any fluid / lubricant leaks are properly repaired, and contaminated areas are cleaned up

Table 51: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
	Recommend the use of end caps to prevent wildlife from becoming confined or trapped in the pipe
	Ensure that erosion and sediment control devices are maintained and replaced as necessary in accordance with Project permits, plans, and commitments
	Check the interior of the pipe for wildlife prior to the insertion of the mandrel

Table 52: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
	There are no incremental specific monitoring requirements for watercourses, wetlands, and aquatic life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 53: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	There are no incremental specific monitoring requirements for air and noise pollution life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

7.5.7 Typical Outputs for Field Bending

Table 54: Typical Reporting Requirements

✓	Description
General	
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here.
Daily	

	Complete field bending Environmental Inspection progress reports, including (but not limited to):
	• Work completed to date, including:
	  ○ Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters
	  ○ A record of any observations, events, and violations using a daily log, camera, and other technology
	• Documenting compliance with Project permit conditions, which includes:
	  ○ Updating the company-specific environmental commitment tracking system
	All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

7.5.8 References – Field Bending

Note to user: The reference information provided in Table 55 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 55: List of References – Field Bending

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Pipeline Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures

7.6 Ditching and Excavation

7.6.1 Overview

Ditching and excavation is the next activity of pipeline construction, and typically involves excavation of a trench in the right of way (ROW) for pipe installation. Typically, the ditching operations are after stringing, bending, welding, non-destructive examination (NDE), and coating due to the risk of having an open trench; however, there are a number of exceptions, including:

- Where rock is encountered, the trench may be blasted and excavated prior to stringing
- In urban areas or other areas where numerous underground utilities and obstructions may exist

It should be noted that ditching and excavation are required to create entry and exit pits for trenchless crossings.

There may be a need to remove accumulations of water from the partially or fully excavated trench as outlined in the Stormwater Management Plan or equivalent.

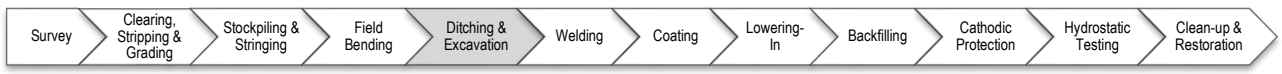
A Grading Inspector, sometimes referred to as a General or Craft Inspector, is responsible for ensuring crews follow appropriate methods during ditching and excavation. The Environmental Inspector (EI) supports the Grading Inspector by ensuring ditching and excavation operations do not have an adverse effect on the environment.

The EI's responsibilities during ditching and excavation include, but are not limited to:

- Ensuring appropriate measures (e.g., hauling equipment and material on the ROW) are taken to prevent mixing of topsoil-subsoil and soil compaction
- Ensuring fencing is placed to prevent livestock from entering in accordance with Landowner agreements
- Ensuring procedures are followed for areas of concern (e.g., drain tile crossings, high water table, culturally or biologically sensitive, and agricultural areas)
- Ensuring measures (e.g., discharging water to approved sites) are taken to prevent erosion, sedimentation, or contamination of adjacent lands, wetlands, and watercourses during trench dewatering

7.6.2 Inputs

As part of preparing for Environmental Inspection during Ditching and Excavation, the EI will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 57.



7.6.3 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the Ditching and Excavation process are identified in a series of checklists as detailed in Table 56.

Table 56: Monitoring Requirements for Ditching and Excavation

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 58
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 59
General	• Identify general items that should be monitored throughout the construction ditching and excavation process	Table 60
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 61
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 62
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 63
Trenchless Crossings	• Specific consideration relating to trenchless crossings that should be monitored throughout the construction ditching and excavation process	Table 64

7.6.4 Outputs

The EI is required to report on workmanship and progress on a periodic basis by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for ditching and excavation appear in Table 65.

Detailed Checklists – Ditching and Excavation

7.6.5 Typical Input Requirements for Ditching and Excavation Environmental Inspection

Table 57: Information Requirements for Ditching and Excavation

✓	Description
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to ditching and excavation, such as: • Alignment Drawings • Access Road Drawings

✓	Description
	• Line List (e.g., special concerns for each Landowner) • Trenching Specifications and Procedures • Topsoil Segregation Requirements
	Contracts and agreements related to: • Road Use • Landowner and/or Regulatory Requirements • Landowner and/or Regulatory Approvals • Workspace Agreements
	Permits related to: • Environmental • Road Use • Drilling Fluid Disposal and use of Approved Drilling Fluid Additives
	Owner Company specific Safety Plan, including (but not limited to): • Excavation Plan • Traffic Control Plan • Requirements for Personal Protective Equipment (PPE) • Emergency Medical Services (EMS)
	Project-specific Environmental Protection Plan (EPP), detailing ditching and excavation requirements
	Other project-specific Plans, which may include: • Fire Prevention / Firefighting Plan • Unanticipated Discovery Plans (contamination and cultural resources) • Engineered Shoring Plans • Dewatering Plans (as required) • Environmental Impact Statements (EIS) or Environmental Assessments Reports • Restoration Plan • Environmental Alignment Sheets • Stormwater Management Plan • Erosion and Sediment Control Plan
	Owner Company specific Pre-Construction Consideration related to: • Weather Conditions • Environmental Resources (soils, vegetation) • Agricultural Activities • Historic Sites, Culturally Significant Sites, and Sensitive Landscapes

7.6.6 Best Practice for Environmental Inspection During Typical Ditching and Excavation Operations

Table 58: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues

✓	Description
	• Environmental concerns • Duties of Inspector(s) • Pipeline Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Ensure timber / swamp mats are used if ground conditions are unstable and low-ground pressure equipment cannot be used
	Ensure Unanticipated Discovery Plans are in place
	Inspect temporary erosion control structures, and ensure damage is repaired prior to commencing ditching and excavation operations
	Verify exclusion zones are established, and flagging, signage, and/or staking are in place as permitted
	Work area: • Check that warning signs and temporary fencing are installed on open excavations close to public accesses • Inspect the open trench for trapped animals before commencing work; verify wildlife egress ramps are in place • Verify that wildlife and livestock crossings are in place as required
	Ensure an approved plan is in place to manage the disposal of hydrovac slurry

Table 59: Safety Concerns for Ditching and Excavation

✓	Description
	There are no incremental specific Safety Concerns beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 60: Typical Monitoring Requirements – General

✓	Description
	Ensure that if a machine strikes, contacts, is bogged down, slides into, or rests on top of a pipeline facility, work is stopped immediately, and the Construction Manager / Chief Inspector (or designate) is notified; the machine is not to be moved or extricated without Owner Company approval
	Immediately suspend ditching activity and notify the Construction Manager / Chief Inspector (or designate) if any historic sites or resources are discovered
	Verify that the Contractor picks up and properly disposes of any fly-rock from blasting activities
	Ensure that hardscape (e.g., concrete, asphalt) is disposed of as required

Table 61: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
Trench Excavation	
	Recommend minimizing the length of time the trench is left open to minimize trench sloughing and interference with wildlife, livestock, and Landowners
	Ensure trenching activities are suspended in areas where non-salvaged topsoil is sloughing into the trench
	Monitor and record trenching and spoil pile segregation for subsoils with variable horizons
	Ensure appropriate operator or project specifications are followed for trenching when using the Three-Soils-Handling technique

✓	Description
	Ensure separation between topsoil and any subsoil is maintained when special soil handling techniques (e.g., Three-Lift Soil Handling) are being used
	Confirm that the trench will be excavated to the specified clearance at all crossings (i.e., road, ditch, culvert, cable, water main, and sewer) or any other obstruction as directed by the Owner Company specifications
	Monitor for locations where available workspace is insufficient to allow compliance with safety and environmental requirements; escalate to Construction Manager / Chief Inspector (or designate) when identified
	In cultivated fields or where livestock is present, ensure that safe, temporary bridges or backfilled sections along the trench are provided for livestock, migrating wildlife, and farm machinery to cross as specified in construction drawings
	Ensure egress routes (e.g., ditch ramps) are provided to allow trapped wildlife to escape
Seasonal (Winter) Conditions	
	Ensure the Contractor blades (using the blade on a grader) a berm of loose material or snow (e.g., snow roach) to the Owner Company specification over the centerline of the trench immediately after excavating the trench to prevent trench sloughing, frost penetration, and livestock interference (Note: a berm may not be required in wetlands or if ditching commences by the end of the following day of grading)
	Ensure frozen lumps resulting from ripping the ditch line are removed by the Contractor and stored separately from the trench subsoil pile

Table 62: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
Trench Excavation	
	Ensure appropriate operator or project specifications are followed when trenching occurs near watercourses and wetlands, including scheduling and applicable time-of-year restrictions
	Ensure that the Contractor will not leave a trench open for extended periods; in particular, monitor for: • Large accumulations of water • Snow and ice accumulation in the open excavation • Minimize the duration of installation and backfilling to prevent spoil piles from freezing • Verify that wildlife escape ramps / sloped escape paths are present in accordance with Project permits, plans, and commitments
Trench Dewatering	
	Check or test the trench water for contamination (e.g., hydrocarbon sheen, high salinity) before dewatering the trench and ensure mitigative measures are implemented, if necessary, to avoid the contamination of adjacent lands, wetlands, and/or watercourses
	Ensure equipment (e.g., pumps, generators) have suitable containment to prevent spills and are appropriately located (e.g., above the normal high-water mark of watercourses and wetlands) when working within 100 feet of a watercourse or wetland
	Ensure trench water is pumped to an approved site (i.e., a well-vegetated upland area) and/or into an appropriate sediment filtering device to avoid erosion or sedimentation of adjacent lands, wetlands, or watercourses.
	Ensure the pump flow rate is managed to avoid erosion or sedimentation of adjacent lands, wetlands, or watercourses; mitigative measures (e.g., flow dissipaters on outlets) may be required to minimize ground erosion at the discharge location
	Ensure pump intake is suspended above the bottom of the excavation to minimize sediment transport and discharge
	Ensure appropriate disposal of waste products (e.g., used geotextile bags) from trench dewatering activities, as required by site-specific EPP
Ditch Plugs and Sub-drains / Drain Tiles	

✓	Description

	Ditch plugs and sub-drains may be constructed based on construction drawings; however, in some cases, the quantity and their location are best determined in the field after the trench is excavated. Monitor for:
	• Specific terrain features / drainage patterns, including:
	  o Groundwater flowing or seeping from the bottom or sides of the trench; a sub-drain (drain tile) may be required immediately downhill of the discharge point to collect the water and divert it off the ROW
	  o Locations where water can enter the trench and flow downhill through the backfill
	• Ditch water encountered on slopes and hills

	Ensure Owner Company-specifications are met or exceeded for erosion control (e.g., a sack breaker may be installed as an alternative to ditch plugs if a ditch plug is difficult to install)
	Confirm approved sediment control measures are installed (i.e. silt fence, compost filter sock)
	On slopes, confirm that the Contractor has installed and keyed in trench breakers and sub-drains in the trench per Owner Company drawings and specifications or as required
	If drain tiles are cut: • Ensure the location is marked • Confirm ends are capped to prevent clogging from dirt or debris • Ensure temporary repairs are installed to maintain drainage and prevent water from discharging into the excavated ditch • Ensure permanent repairs are completed to match or exceed pre-construction conditions and performance • Ensure permanent repairs are conducted in accordance with project-specific plans, permits / approvals, and Landowner agreements

Table 63: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	Adhere to applicable time-of-day noise restrictions
	Monitor noise levels for loud activities (e.g., sheet piling, mechanical rock excavation)

Table 64: Typical Monitoring Requirements – Trenchless Crossings

✓	Description
	Monitor for inadvertent return mud releases and/or changes to topography or watercourses
	Monitor the centerline for any indications of inadvertent returns
	Monitor turbidity for changes in water bodies
	Assist in ensuring that at the entry point of the pipe string, specific shoring, and bank stability have been implemented to avoid environmental issues
	Maintain spoil piles within the temporary workspaces (TWS)

7.6.7 Typical Outputs for Ditching and Excavation

Table 65: Typical Reporting Requirements

✓	Description
General	

	Ensure Environmental reports are completed and forwarded to the Construction Manager and/or Chief Inspector, when necessary, these reports include (but are not limited to): • Water and/or contaminated soil sampling and analysis, as required • Hazardous goods report Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here
Daily	
	Complete ditching and excavation Environmental Inspection progress reports, including (but not limited to): • Work completed to date, including: o A record of soil horizons o Locations of all drain tiles, irrigation pipes, etc., not on drawings, but crossed by the trench line o Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters o A record of any observations, events, and violations using a daily log, camera, and other technology • Documenting compliance with Project permit conditions o Updating the company-specific environmental commitment tracking system All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

7.6.8 References – Ditching and Excavation

Note to user: The reference information provided in Table 66 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 66: List of References – Ditching and Excavation

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Pipeline Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures

7.7 Welding

7.7.1 Overview

Welding during pipeline construction is performed to join lengths of pipe together as the Construction crew moves along the pipeline right of way (ROW). Welding is a process that uses fusion to join two or more materials together to become a manufactured or fabricated item. In the pipeline industry, the arc welding process is used to join pipe to pipe, and pipe to components together to form a pipeline.

A Welding Inspector is responsible for ensuring crews follow appropriate methods during welding operations. Welding requires specialized expertise, not just for the execution of the work but also inspection of the work. Therefore, welding inspection should only be performed by a Welding Inspector who has been qualified (e.g., American Welding Society Certified Welding Inspector) and has been specifically assigned this task. The Environmental Inspector (EI) supports the Welding Inspector by ensuring welding operations do not have an adverse effect on the environment.

The EI's responsibilities during welding include, but are not limited to:

- Monitor for adherence to requests for specified gaps in welded pipe sections to allow passage of wildlife, livestock, or the movement of farm equipment
- Maintaining the ROW by ensuring appropriate disposal of welding waste

7.7.2 Inputs

As part of preparing for Environmental Inspection during welding, the EI will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 68.

7.7.3 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the welding process are identified in a series of checklists as detailed in Table 67.

Table 67: Monitoring Requirements for Welding

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 69
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 70
General	• Identify general items that should be monitored throughout the welding process	Table 71
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 72

Item	Description	Reference
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 73
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 74

7.7.4 Outputs

The EI is required to report on workmanship and progress on a periodic basis by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for welding appear in Table 75.

Detailed Checklists – Welding

7.7.5 Typical Input Requirements for Welding Environmental Inspection

Table 68: Information Requirements for Welding

✓	Description
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to welding, such as: • Alignment Drawings
	Permits related to: • Environmental Conditions and/or Commitments • Road Use
	Owner Company specific Safety Plan, including (but not limited to): • Requirements for Personal Protective Equipment (PPE) • Emergency Medical Services (EMS)
	Project-specific Environmental Protection Plan (EPP), detailing welding requirements
	Other project-specific Plans, which may include: • Worksite Welding Plan

7.7.6 Best Practice for Environmental Inspection During Typical Welding Operations

Table 69: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Pipeline Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work

✓	Description
	Ensure timber / swamp mats are used if ground conditions are unstable and low-ground pressure equipment cannot be used
	Inspect the open trench and pipe for debris or trapped animals and ensure removal before commencing work

Table 70: Safety Concerns for Welding

✓	Description
	During periods of high fire hazards, ensure welding crews have sufficient fire suppression capability during welding activities

Table 71: Typical Monitoring Requirements – General

✓	Description
	There are no incremental monitoring requirements for general Environmental Inspection beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 72: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
	Ensure welding is done prior to trenching at locations prone to sloughing, when feasible
	Recommend minimizing the length of time the trench is left open during welding to minimize trench sloughing and interference with wildlife, livestock, and Landowners
	Ensure the continued use of end caps to prevent wildlife from becoming confined or trapped in the pipe
	Monitor for adherence to requests for specified gaps in welded pipe sections to allow passage of wildlife, livestock, or the movement of farm equipment
	Ensure proper disposal of welding-related debris (e.g., bevel shavings, weld rod ends)
	Ensure proper fire watches and fire suppression equipment are on-site during dry conditions or in elevated fire danger areas
	Ensure erosion and sediment controls are properly installed, maintained, and replaced as necessary in accordance with Project plans and permit conditions

Table 73: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
	There are no incremental specific monitoring requirements for watercourses, wetlands, and aquatic life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 74: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	There are no incremental specific monitoring requirements for air and noise pollution life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

7.7.7 Typical Outputs for Welding

Table 75: Typical Reporting Requirements

✓	Description
General	
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here
Daily	
	Complete welding Environmental Inspection progress reports, including (but not limited to): • Work completed to date, including: o Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters o A record of any observations, events, and violations using a daily log, camera, and other technology • Documenting compliance with Project permit conditions, which includes: o Updating the Environmental Commitment Tracking Tool All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

7.7.8 References – Welding

Note to user: The reference information provided in Table 76 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 76: List of References – Welding

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Pipeline Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures

7.8 Coating

7.8.1 Overview

Coating of the pipeline provides a protective barrier against damage to the pipe (e.g., corrosion, scrapes). The majority of the coating operation occurs in a centralized plant; however, since individual pipe joints are welded together during the construction process, the (girth) weld area requires coating in the field.

A Coating Inspector is responsible for ensuring crews follow appropriate methods during coating operations. Coating requires specialized expertise, not just for the execution of the work but also inspection of the work. Therefore, coating inspection should only be performed by a Coating Inspector who has been qualified (e.g., AMPP (formerly NACE) CIP Level 2) and has been specifically assigned this task. The Environmental Inspector (EI) supports the Coating Inspector by ensuring coating operations do not have an adverse effect on the environment.

The EI's responsibilities during coating include, but are not limited to:

- Ensure drips, spills, and/or overspray from coating operations are captured and cleaned up properly
- Unused materials are stored, handled, and disposed of appropriately
- Maintain the ROW by ensuring that debris from grit blasting operations is contained and disposed of properly (if non-environmentally friendly blast media is used) and waste from coating operations is cleaned up and disposed of properly

7.8.2 Inputs

As part of preparing for Environmental Inspection during Coating, the EI will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 78.

7.8.3 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the coating process are identified in a series of checklists as detailed in Table 77.

Table 77: Monitoring Requirements for Coating

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 79
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 80

Item	Description	Reference
General	• Identifies general items that should be monitored throughout the coating process	Table 81
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 82
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 83
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 84

7.8.4 Outputs

The EI is required to report on workmanship and progress on a periodic basis by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for coating appear in Table 85.

Detailed Checklists – Coating

7.8.5 Typical Input Requirements for Coating Environmental Inspection

Table 78: Information Requirements for Coating

✓	Description
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to coating, such as: • Alignment Drawings • Manufacturer Supplied Information (e.g., storage and handling requirements) • Safety Data Sheet (SDS) for coating material and blasting material
	Permits related to: • Environmental Conditions and/or Commitments • Road Use • Safe Work
	Owner Company specific Safety Plan, including (but not limited to): • Requirements for Personal Protective Equipment (PPE) • Emergency Medical Services (EMS)
	Project-specific Environmental Protection Plan (EPP), detailing coating requirements
	Other project-specific Plans, which may include: • Worksite Coating Plan

7.8.6 Best Practice for Environmental Inspection During Typical Coating Operations

Table 79: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Pipeline Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Ensure timber / swamp mats are used if ground conditions are unstable and low-ground pressure equipment cannot be used

Table 80: Safety Concerns for Coating

✓	Description
	Verify protection is in place to prevent blast media from entering valves, pipes, fittings and appurtenances, wetlands, and waterways, or mixing with native soil material

Table 81: Typical Monitoring Requirements – General

✓	Description
	Monitor for spills associated with coating materials and ensure the clean-up of any spills is completed

Table 82: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
	Recommend minimizing the length of time the trench is left open during coating to minimize trench sloughing and interference with wildlife, livestock, and Landowners
	Review site-specific requirements for blast media including the method of containing, collecting, and disposing of debris from grit blasting operations (if non-environmentally friendly blast media is used)
	Ensure effective measures are in place to block overspray when using spray or paint-on coatings where required by EPP
	General housekeeping of coating-related debris (e.g., gloves, brushes, rollers, containers, overspray) including proper disposal of waste products

Table 83: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
	There are no incremental specific monitoring requirements for watercourses, wetlands, and aquatic life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 84: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	Document quantities of blast media usage as per air quality thresholds in relevant permits

7.8.7 Typical Outputs for Coating

Table 85: Typical Reporting Requirements

✓	Description
General	
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here
Daily	

	Complete coating Environmental Inspection progress reports, including (but not limited to):
	• Work completed to date, including:
	  ○ Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters
	  ○ A record of any observations, events, and violations using a daily log, camera, and other technology
	• Documenting compliance with Project permit conditions, which includes:
	  ○ Updating the Environmental Commitment Tracking Tool
	  ○ Records related to blast media usage
	All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

7.8.8 References – Coating

Note to user: The reference information provided in Table 86 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 86: List of References – Coating

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Pipeline Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures

7.9 Lowering-In

7.9.1 Overview

Lowering-in refers to preparing the trench base (if required, due to the presence of rock or stones, construction debris, or water in the trench), picking the pipe up from its temporary supports off the right of way (ROW), and placing it into an excavated trench after welding, non-destructive examination (NDE) of the coating of pipe joints, and completing any associated coating repairs.

A Lowering-in Inspector, sometimes referred to as a General or Craft Inspector, is responsible for ensuring crews follow appropriate methods during lowering-in operations. The Environmental Inspector (EI) supports the Lowering-in Inspector by ensuring lowering-in operations do not have an adverse effect on the environment.

The EI's responsibilities during lowering-in include, but are not limited to:

- Assisting in planning for any activities to occur in sequence in a timely manner to limit the duration of an open trench
- Review applicable JSA prior to commencement of work
- Ensuring topsoil or rock is not used to pad the pipe
- Ensuring erosion controls are in place and maintained, preventing erosion, sedimentation, and contamination of adjacent lands, wetlands, and watercourses during lowering-in activities

7.9.2 Inputs

As part of preparing for Environmental Inspection during Lowering-In, the EI will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 88.

7.9.3 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the lowering-in process are identified in a series of checklists as detailed in Table 87.

Table 87: Monitoring Requirements for Lowering-in

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 89
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 90
General	• Identify general items that should be monitored throughout the lowering-in process	Table 91
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 92

Item	Description	Reference
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 93
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 94

7.9.4 Outputs

The EI is required to report on workmanship and progress on a periodic basis by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for lowering-in appear in Table 95.

Detailed Checklists – Lowering-In

7.9.5 Typical Input Requirements for Lowering-In Environmental Inspection

Table 88: Information Requirements for Lowering-In

✓	Description
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to lowering-in, such as: • Alignment Drawings • Access Road Drawings or Route Sheets • Line List (e.g., special concerns for each Landowner) • Typical Drawings (e.g., trench configurations, trench breaker design)
	Contracts and agreements related to: • Road Use
	Permits related to: • Environmental conditions and/or commitments (e.g., discharge permits for trench dewatering activities) • Road Use
	Owner Company specific Safety Plan, including (but not limited to): • Job Safety Analysis • Requirements for Personal Protective Equipment (PPE) • Emergency Medical Services (EMS)
	Project-specific Environmental Protection Plan (EPP), detailing lowering-in requirements
	Other project-specific Plans, which may include: • Relevant Contingency Plans (e.g., inadvertent return during HDD operations) • Stormwater Management Plan • Erosion and Sediment Control Plan

7.9.6 Best Practice for Environmental Inspection During Typical Lowering-In Operations

Table 89: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Pipeline Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Inspect the open trench and pipe for trapped animals and ensure removal before commencing work
	Ensure timber / swamp mats are used if ground conditions are unstable and low-ground pressure equipment cannot be used
Seasonal (Winter) Conditions	
	Ensure that snow and ice in the ditch is removed before lowering-in commences

Table 90: Safety Concerns for Lowering-in

✓	Description
	There are no incremental specific Safety Concerns beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 91: Typical Monitoring Requirements – General

✓	Description
	Ensure removal and proper disposal of construction-related debris (e.g., skids, pipe supports) to prepare the site for clean-up and prevent objects or debris from damaging the pipe during backfill

Table 92: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
	Recommend minimizing the length of time the trench is left open to minimize trench sloughing and interference with wildlife, livestock, and Landowners
	Recommend the use of end caps to prevent wildlife from becoming confined or trapped in the pipe
	Ensure topsoil or rock is not used as a padding material
	Ensure that trench dewatering, if necessary, is discharged to an appropriate area (i.e. upland, well-vegetated area) or to an appropriate energy dispersion device

Table 93: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
Trench Dewatering	
	Please refer to section 7.6.6 Best Practice for Typical Ditching and Excavation Operations, Table 62, for inspection requirements for Trench Dewatering

✓	Description
Trench Drainage	
	Ensure all features (e.g., drain tiles) are pre-located per alignment drawings
	Ensure drain tiles are not damaged or lost during lowering-in operations
	Ensure drain tiles are properly repaired in accordance with Project permits / approvals, plans, and Landowner commitments
	Account for mats and ensure that all are recovered
	Ensure trench breaks are installed and removed appropriately

Table 94: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	There are no incremental specific monitoring requirements for air and noise pollution life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

7.9.7 Typical Outputs for Lowering-in

Table 95: Typical Reporting Requirements

✓	Description
General	
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here
Daily	

	Complete lowering-in Environmental Inspection progress reports, including (but not limited to):
	• Work completed to date, including:
	  ○ Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters
	  ○ A record of any observations, events, and violations using a daily log, camera, and other technology
	• Documenting compliance with Project permit conditions, which includes:
	  ○ Updating the Environmental Commitment Tracking Tool
	All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

7.9.8 References – Lowering-in

Note to user: The reference information provided in Table 96 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 96: List of References – Lowering-in

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Pipeline Construction Inspectors

Document No.	Type	Title
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures

7.10 Backfilling

7.10.1 Overview

Backfilling refers to refilling the trench with the previously excavated or new fill subsoil once the pipe section has been lowered into the trench. As backfilling operations begin, the soil is returned to the trench in reverse order, with the subsoil put back first, followed by the topsoil. This ensures that the topsoil is returned to its original position.

A General or Craft Inspector is responsible for ensuring crews follow appropriate methods during backfilling operations. The Environmental Inspector (EI) supports the General Inspector by ensuring backfilling operations do not have an adverse effect on the environment.

The EI's responsibilities during backfilling include, but are not limited to:

- Ensuring both the trench and backfill material are free of debris that could damage the pipe
- Ensuring soil integrity is maintained by preventing excessive soil mixing or compaction
- Ensuring backfill material is suitable and placed in an environmentally responsible manner
- Ensuring excess soil is disposed of or distributed appropriately
- Ensuring adequate erosion protection, both in the trench and on the surface

7.10.2 Inputs

As part of preparing for Environmental Inspection during Backfilling, the EI will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 98.

7.10.3 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the backfilling process are identified in a series of checklists as detailed in Table 97.

Table 97: Monitoring Requirements for Backfilling

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 99
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 100
General	• Identify general items that should be monitored throughout the backfilling process	Table 101
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 102
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 103
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 104
Trenchless Crossings	• Specific consideration relating to trenchless crossings that should be monitored throughout the backfilling process	Table 105

7.10.4 Outputs

The EI is required to report on workmanship and progress on a periodic basis by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for backfilling appear in Table 106.

Detailed Checklists – Backfilling

7.10.5 Typical Input Requirements for Backfilling Environmental Inspection

Table 98: Information Requirements for Backfilling

✓	Description
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to backfilling, such as: • Alignment Drawings • Access Road Drawings or Route Sheets • Line List (e.g., special concerns for each Landowner) • Backfill Specifications
	Contracts and agreements related to: • Road Use • Regulatory Approvals
	Permits related to: • Environmental Conditions and/or Commitments • Road Use • Safe Work

✓	Description
	• Third Party Crossing Agreements
	Owner Company specific Safety Plan, including (but not limited to): • Requirements for Personal Protective Equipment (PPE) • Emergency Medical Services (EMS)
	Project-specific Environmental Protection Plan (EPP), detailing backfilling requirements
	Other project-specific Plans, which may include: • Referring to Project Documentation for Incremental Specific Requirements • Grading Plans • Stormwater Management Plan • Erosion and Sediment Control Plan • Unanticipated Discovery Plans

7.10.6 Best Practice for Environmental Inspection During Typical Backfilling Operations

Table 99: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Pipeline Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Ensure timber / swamp mats are used if ground conditions are unstable and low-ground pressure equipment cannot be used
	Prior to backfilling, ensure the trench has been inspected to make sure it is free of debris and wildlife

Table 100: Safety Concerns for Backfilling

✓	Description
	There are no incremental specific Safety Concerns beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 101: Typical Monitoring Requirements – General

✓	Description
	Recommend minimizing the length of time the trench is left open to minimize trench sloughing and interference with wildlife, livestock, and Landowners
	Ensure all backfilling activities are confined to the construction ROW
	Ensure that the right of way (ROW) is left in as close to original condition (e.g., elevation, cross drainage, soil horizons) as possible

Table 102: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
Backfill Material and Process	
	Ensure that the backfill material is soft and free from large rocks, stumps, or any other foreign material that can dent the pipe or scratch the external coating, as per Owner Company specifications
	Confirm that the Contractor uses only Owner Company-approved selected or imported backfill
	Ensure any additional backfill required is obtained from the appropriate land authority, as applicable
	Follow project or Owner Company-specific requirements in instances where the pre-construction grade cannot be restored
	Ensure that topsoil is never used as padding material or fill
	Check that contaminated backfill material is not placed in the trench and is disposed of properly
	Ensure larger rocks (i.e., sizes too large for backfill) are hauled away or stacked neatly along the ROW as specified in Owner Company-specifications, drawings, and Landowner agreements
	Ensure no machinery passes over the topsoil pile while backfilling spoil and prevent mixing of spoil with the topsoil pile
	Confirm that the Contractor is using auger or shaker bucket equipment for backfill where coarse fragments are encountered in trench materials
	Ensure proper equipment (i.e., with fine depth control) is used for the final pass of backfilling to reduce the risk of scalping
Final Backfilled Surface / Compaction	
	Confirm that the top-most specified depth of the backfilled trench and crown for cultivated land are similar to pre-existing conditions
	Ensure project or owner specifications are followed for feathering out excess spoil over salvaged area
	Ensure that the Contractor compacts the spoil in the trench so that the trench crown (berm) is no higher than specified by the Owner Company
	If possible, backfill and compact the trench in lifts in areas where no trench crown will be permitted (e.g., road shoulders, bar ditches, agricultural lands)
	Ensure soil compacting is carried out if specified in Owner Company or project-specifications, drawings, and line lists
	Continually observe for sinkholes along the ditch line
	Confirm that the Contractor will conduct a final clean-up when soils are dry and unfrozen for freehold and public lands; final clean-up should be delayed until spring when spoil can be adequately compacted in the trench and spoil and topsoil can be removed from the sod surface more accurately
Winter Construction	
	Ensure backfilling is completed prior to spring break-up
	If feasible, postpone compaction of frozen trench spoil till late spring or early summer
	If feasible, postpone feathering-out of excess spoil until after spring break-up
	Ensure solidified or frozen backfill is broken up with a screw auger, power dozer, or other approved equipment
	Ensure that any snow or ice is removed from the compacted layer prior to placement of subsequent layers
	Ensure that during winter construction, the Contractor leaves a trench crown (berm) over the trench to compensate for settlement upon thawing of frozen soils as indicated in Owner Company specifications, construction drawings, and agreements
	Ensure appropriate erosion control measures are in place for trench spoil and any recontoured slopes, when working with frozen soils during winter conditions

Table 103: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
Trench Water Considerations During Backfill	
	Ensure drain tiles are installed per Owner Company-specifications in areas where there is the potential for seepage into the trench
	Check that trench breakers are installed at the locations defined by the terrain and project specifications
	Confirm that the Contractor has installed and keyed in (i.e., embedded in the side of the ditch) trench breakers
	Ensure topsoil is not used as a trench breaker
	Ensure appropriate material (e.g., mix of bentonite and sand, or foam) is used for constructing trench breakers
Surface Water Drainage	
	Confirm that the Contractor has provided adequate water erosion protection (e.g., installing suitable geotextiles, earth-filled sacks, or rock riprap) where surface drainage crosses the trench line to prevent surface drainage from flowing down the trench line
	Ensure that overall drainage control measures are undertaken as advised by the line list
	Confirm that the Contractor re-contours graded portions of the ROW to match the surrounding landforms and drainage patterns
	Ensure that the Contractor leaves openings in the trench crown (berm) as required to allow for the natural drainage of surface water

Table 104: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	There are no incremental specific monitoring requirements for air and noise pollution life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 105: Typical Monitoring Requirements – Trenchless Crossings

✓	Description
	Verify the removal of mud tailing and extra materials being brought in for the entry and exit points

7.10.7 Typical Outputs for Backfilling

Table 106: Typical Reporting Requirements

✓	Description
General	
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here
Daily	
	Complete backfilling Environmental Inspection progress reports, including (but not limited to): • Work completed to date, including: ○ Locations of permanent trench breakers

	○ Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters ○ A record of any observations, events, and violations using a daily log, camera, and other technology • Documenting compliance with Project permit conditions, which includes: ○ Updating the Environmental Commitment Tracking Tool All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

7.10.8 References – Backfilling

Note to user: The reference information provided in Table 107 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 107: List of References – Backfilling

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Pipeline Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures

7.11 Cathodic Protection

7.11.1 Overview

Cathodic protection (CP) is a technique used to control corrosion of a pipeline's metal surface by making the pipeline the cathode of an electrochemical cell. In other words, CP is a simple method of protection where the pipeline is connected to a more easily corroded (sacrificial) metal (e.g., magnesium) which acts as the anode. The sacrificial metal then corrodes instead of the pipeline. However, for long pipelines, this passive galvanic cathodic protection is not adequate, and an external direct current (DC) electrical power source (rectifier) can be used to provide additional electrical current to protect the pipe.

A Maintenance (i.e., Integrity) Inspector, sometimes referred to as a General or Craft Inspector, is responsible for ensuring crews follow appropriate methods for installing cathodic protection on the pipeline. The Environmental Inspector (EI) supports the Maintenance Inspector by ensuring operations do not have an adverse effect on the environment.

The EI's responsibilities during cathodic protection activities include, but are not limited to:

- Ensuring cathodic protection installation has no adverse effects on the surrounding environment
- Ensuring a cathodic protection permit is included in EPP
- Reviewing potential environmental hazards associated with cathodic protection systems such as overhead DC power lines, deep well cathodic protection facilities, coke breeze installation fields, or other related cathodic protection installations, where applicable

7.11.2 Inputs

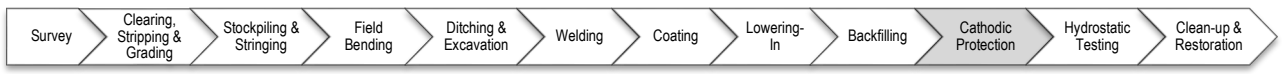
As part of preparing for Environmental Inspection during Cathodic Protection (CP) installation, the EI will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 109.

7.11.3 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the cathodic protection installation process are identified in a series of checklists as detailed in Table 108.

Table 108: Monitoring Requirements for Cathodic Protection

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 110



Item	Description	Reference
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 111
General	• Identify general items that should be monitored throughout the cathodic protection installation process	Table 112
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 113
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 114
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 115

7.11.4 Outputs

The EI is required to report on workmanship and progress on a periodic basis by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for cathodic protection installation appear in Table 116.

Detailed Checklists – CP

7.11.5 Typical Input Requirements for Cathodic Protection Environmental Inspection

Table 109: Information Requirements for Cathodic Protection

✓	Description
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to cathodic protection installation, such as: • Alignment Drawings • Access Road Drawings or Route Sheets • Line List (e.g., special concerns for each Landowner) • Locations and Types of Ground Beds and Anodes (e.g. test stations, rectifiers, AC mitigation stations)
	Contracts and agreements related to: • Road Use
	Permits related to: • Environmental Conditions and/or Commitments • Road Use • Well installation
	Owner Company specific Safety Plan, including (but not limited to): • Requirements for Personal Protective Equipment (PPE) • Emergency Medical Services (EMS)
	Project-specific Environmental Protection Plan (EPP)
	Other project-specific Plans, which may include:

✓	Description
	• Cathodic Protection and Installation • Fire Prevention / Fire Fighting

7.11.6 Best Practice for Environmental Inspection During Typical CP Operations

Table 110: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Pipeline Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work

Table 111: Safety Concerns for Cathodic Protection

✓	Description
	During periods of high fire hazards, ensure crews have sufficient fire suppression capability during cathodic protection installation

Table 112: Typical Monitoring Requirements – General

✓	Description
	Ensure all cathodic protection installation activities are confined to approved locations (i.e., the ROW or ground bed locations)
	Ensure removal and proper disposal of cathodic protection installation-related debris from the ROW
	Ensure that the ROW is left in as close-to-original condition as possible
	Ensure that all chemical agents (e.g., coke breeze, drilling fluid, tailings) are handled and disposed of in accordance with the SDS (if applicable) and relevant EPP

Table 113: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
	Ensure the location of ground beds have no adverse effect on the soil, vegetation, and terrestrial life
	Ensure the ground bed materials have no anticipated adverse effect on the surrounding soil, vegetation, and terrestrial life
	Confirm that the Contractor re-contours graded portions of the ROW or ground bed locations to match the surrounding landforms and drainage patterns

Table 114: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
	There are no incremental specific monitoring requirements for watercourses, wetlands, and terrestrial life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 115: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	There are no incremental specific monitoring requirements for air and noise pollution life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

7.11.7 Typical Outputs for CP

Table 116: Typical Reporting Requirements

✓	Description
General	
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here.
Daily	

	Complete cathodic protection Environmental Inspection progress reports, including (but not limited to):
	• Work completed to date, including:
	  ○ Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters
	  ○ A recording of any observations, events, and violations using a daily log, camera, and other technology
	• Documenting compliance with Project permit conditions, which includes:
	  ○ Updating the Environmental Commitment Tracking Tool
	All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

7.11.8 References – Cathodic Protection

Note to user: The reference information provided in Table 117 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 117: List of References – Cathodic Protection

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Pipeline Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		

Document No.	Type	Title
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures

7.12 Hydrostatic Testing

7.12.1 Overview

A hydrostatic test is a form of pressure testing used to confirm that the pipeline has acceptable strength and will not leak under operating conditions. Hydrostatic testing uses water (as opposed to air) to perform the test.

A Pressure Testing Inspector, sometimes referred to as a general or craft Inspector, is responsible for ensuring crews follow appropriate methods during hydrostatic testing. The Environmental Inspector (EI) supports the Pressure Testing Inspector by ensuring hydrostatic testing operations do not have an adverse effect on the environment.

The EI's responsibilities during hydrostatic testing include, but are not limited to:

- Permitting for test water withdrawal and discharge
- Monitoring test water withdrawal and discharge to ensure the activities adhere to the permit requirements and minimize the impact on the surrounding environment and sensitive species (i.e., aquatic species, erosion, or sediment accumulation in sensitive areas)
- Monitoring for leaks or ruptures appropriately to contain and mitigate impacts from inadvertent water discharge
- Cleaning, testing, and disposal of associated waste when testing existing pipelines
- Sampling and reporting for test water withdrawal and discharge as required

7.12.2 Inputs

As part of preparing for Environmental Inspection during hydrostatic testing, the EI will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 119.

7.12.3 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the hydrostatic testing process are identified in a series of checklists as detailed in Table 118.

Table 118: Monitoring Requirements for Hydrostatic Testing

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 120
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 121
General	• Identify general items that should be monitored throughout the hydrostatic testing process	Table 122

Item	Description	Reference
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 123
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 124
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 125

7.12.4 Outputs

The EI is required to report on workmanship and progress on a periodic basis by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for hydrostatic testing appear in Table 126.

Detailed Checklists – Hydrostatic Testing

7.12.5 Typical Input Requirements for Hydrostatic Testing Environmental Inspection

Table 119: Information Requirements for Hydrostatic Testing

✓	Description

	All designs, drawings, and specifications developed by the Owner Company and Contractors related to hydrostatic testing, such as:
	• Alignment Drawings
	• Access Road Drawings or Route Sheets
	• Line List (e.g., special concerns for each Landowner)
	• Drawings specific to hydrostatic test (including but not limited to):
	  ○ Temporary Launchers and Receivers
	  ○ Elevation Profiles
	• Dewatering Structures
	• Tabulated Test Pressures, Duration, and Radiography Requirements

	Contracts and agreements related to: • Environmental Assessments • Heritage Surveys
	Regulatory requirements for water withdrawal and discharge
	Permits related to: • Environmental Conditions and/or Commitments • Water Withdrawal and Discharge Commitments
	Owner Company specific Safety Plan, including (but not limited to): • Traffic Control Plan • Specified Minimum Setback Distance for Personnel and Testing Equipment • Requirements for Personal Protective Equipment (PPE)

✓	Description
	• Emergency Medical Services (EMS) • Emergency Contact List
	Project-specific Environmental Protection Plan (EPP), detailing hydrostatic testing requirements

	Other project-specific Plans, which may include:
	• Hydrostatic Test Plan, addressing (but not limited to) the following items:
	  ○ Site-specific safety and/or hazards and appropriate analysis
	  ○ Emergency Response Plan in the event of a rupture during the test
	  ○ Test water sourcing, filling, pressurizing, depressurizing, and dewatering
	  ○ The use of additives and associated requirements for testing, treatment, and discharge restrictions
	  ○ Hydrostatic testing warning signage
	  ○ Provision of protective berms around fuel storage used to supply fuel-driven line fill pumps (as required)
	  ○ Unanticipated Discovery Plans (contamination)
	• Stormwater Management Plan
	• Erosion and Sediment Control Plan
	• Reviewing plans for cleaning of the pipe prior to hydrostatic testing

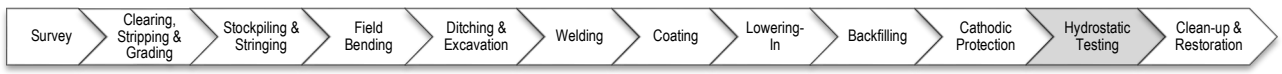
7.12.6 Best Practice for Environmental Inspection During Typical Hydrostatic Testing Operations

Table 120: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Planning for the use of additives that may restrict discharge, and ensuing treatment / disposal requirements • Duties of Inspector(s) • Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work • Confirming work schedule for 24-hour or overnight work • Sampling protocol training
	Check the signage and contact information at public access points to the right of way (ROW), and if required, temporarily restrict access points
	Ensure that test water withdrawal and disposal notifications, registrations, approvals, and/or permits are in place
	Ensure that the required water source, sites, volumes, and flow rates meet regulatory conditions
	Prior to and upon completion of a hydrostatic test, ensure that the local authorities are alerted if required
	Ensure the discharge sites are in approved locations

Table 121: Safety Concerns for Pressure Testing

✓	Description
	Familiarize yourself with safety zones around test heads / pigging launchers and receivers, and ensure they are maintained throughout the operation



✓	Description
	Avoid travel down the ROW in sections that are under active pressure testing

Table 122: Typical Monitoring Requirements – General

✓	Description
	Ensure all hydrostatic testing activities are confined to the ROW
	Ensure removal and proper disposal of hydrostatic testing-related debris from the ROW
	Ensure that the ROW is left in as close to original condition as possible following hydrostatic testing operations
	Ensure the specialized Pressure Testing (i.e., general) Inspector is engaged to identify additional environmental requirements

Table 123: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
	Ensure all stationary equipment (e.g., pumps, generators, fuel containers) have measures in place to prevent spills onto soils (e.g., secondary containment, polyethylene sheeting)

Table 124: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
	Ensure all stationary equipment (e.g., pumps, generators, fuel containers) within 100 ft of a watercourse or water body are in secondary containment
	Ensure all equipment to be used within specified distances from a watercourse or water body is clean and free of leaks and equipped with approved spill kits
	Ensure that appropriate containment is installed for receipt of any cleaning / drying pigs
	Ensure testing equipment has been properly cleaned to prevent the transfer of waterborne invasive / noxious species
Withdrawing Test Water	
	Ensure that the Contractor withdraws test water from locations approved in the water permit or the Environmental Protection Plan (EPP) and not from environmentally sensitive areas (e.g., wetlands or restricted riparian areas)
	Ensure water withdrawal sources have sufficient quantity and quality of water (e.g., avoid highly saline sources) for the pressure test
	Ensure proper use of screens to prevent entrapment of fish or wildlife and any debris during water withdrawal
	When withdrawing water from a fish-bearing waterbody, ensure applicable approvals are in place and instream-restricted activity periods are adhered to
	Confirm that the test water is collected and sent to the laboratory for testing so that results are available in a timely manner
	Confirm that a portable laboratory for testing the water quality is available (if required)
	Ensure water tanks are thoroughly clean inside when used for transporting test water
	Ensure the withdrawal rate adheres to the limits in the permit and project or Owner Company specifications; do not exceed permitted withdrawal rates without regulatory approval
	Ensure project or company specifications are adhered to when using additives (e.g., methanol) in the test water; if possible, minimize the use of additives
	Ensure all conditions outlined in applicable permits for water withdrawal are adhered to
Pressure Testing	

✓	Description
	Ensure contingency measures are adhered to when spills or leaks occur
Dewatering the Pipe	
	Ensure that the Contractor dewaters to locations approved in the water permit or the Environmental Protection Plan (EPP) and avoid dewatering to environmentally sensitive areas (e.g., wetlands)
	Ensure all conditions outlined in applicable permits for water discharge are adhered to including approved discharge rates and locations (e.g., direct discharge back to the source following testing, discharge into an energy dissipation structure located in a suitable upland location)
	Ensure test water withdrawn from one basin is not discharged into another drainage basin to prevent the transfer of aquatic organisms
	Ensure that the Contractor does not dewater until proper sampling is completed and a filtration unit is in place (if required)
	Ensure water with chemical additive is sampled and treated prior to discharging at approved location and/or sites
	Ensure that the Contractor installs an energy-absorbing diffuser at the discharge end of the dewatering line to prevent erosion, bottom scour, or damage to vegetation
Drying the Pipe	
	Ensure drying agents (e.g., methanol) are appropriately captured and disposed of at approved sites

Table 125: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	Monitor noise conditions during overnight work
	Ensure dust containment is in place as necessary (i.e. if drying with air)

7.12.7 Typical Outputs for Hydrostatic Testing

Table 126: Typical Reporting Requirements

✓	Description
General	
	Submit reporting for test water-withdrawal and discharge, if necessary
	Water and/or contaminated soil sampling and analysis, as required
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here
Daily	

	Complete hydrostatic testing Environmental Inspection progress reports, including (but not limited to):
	• Work completed to date, including:
	  ○ Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters
	  ○ A record of any observations, events, and violations using a daily log, camera, and other technology
	• Documenting compliance with Project permit conditions, which includes:
	  ○ Updating the Environmental Commitment Tracking Tool
	All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

7.12.8 References – Hydrostatic Testing

Note to user: The reference information provided in Table 127 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 127: List of References – Hydrostatic Testing

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Pipeline Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures

7.13 Clean-up and Restoration

7.13.1 Overview

Construction site clean-up is the final cleaning and removal of construction materials left over from the pipeline right of way (ROW) and surrounding area. All materials not native to the site are removed. Construction site clean-up is important to the Owner Company because it:

- Provides tangible examples of the Owner Company's attention to detail during construction
- Helps to ensure regulatory agencies and Landowners are satisfied
- Sets the stage for Landowner acquiescence, agreement, and support when approached for future projects

Clean-up work can be performed in phases depending on the location and season of construction. For example, during winter construction, the Contractor will perform the machine or initial clean-up immediately after the end of construction and before the spring breakup, then return to the site the following winter to do the final clean-up. This phase does not include post-construction monitoring, which takes place over multiple years following Clean-up and Restoration.

However, during summer construction, the Contractor will do both machine and final clean-up immediately after the end of construction and return to the site at a later date for additional restoration work (e.g., repairing a sunken ditch).

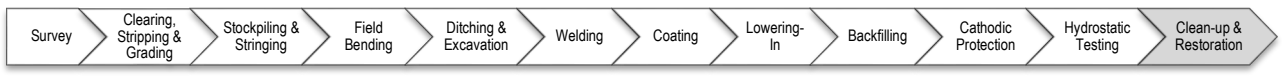
A Grading Inspector, sometimes referred to as a General or Craft Inspector, is responsible for ensuring crews follow appropriate methods during clean-up and restoration activities. The Environmental Inspector (EI) supports the Grading Inspector by ensuring clean-up and restoration operations do not have an adverse effect on the environment.

The EI's responsibilities during clean-up and restoration activities include, but are not limited to:

- Checking that soil compaction contingency measures have been implemented
- Checking that erosion and sedimentation control measures have been implemented correctly
- Ensuring replanting or reseeding of appropriate vegetation has occurred
- Ensuring appropriate disposal of construction-related debris
- Ensuring alignment with Project-specific restoration plans

7.13.2 Inputs

As part of preparing for Environmental Inspection during clean-up and restoration, the EI will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 129.



7.13.3 Execution

While the work is being executed, the EI is required to monitor workmanship and report on progress on a periodic basis. Typical items that the EI will monitor during the clean-up and restoration process are identified in a series of checklists as detailed in Table 128.

Table 128: Monitoring Requirements for Clean-up and Restoration

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 130
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 131
General	• Identify general items that should be monitored throughout the clean-up and restoration process	Table 132
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 133
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 134
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 135
Trenchless Crossings	• Specific consideration relating to trenchless crossings that should be monitored throughout the clean-up and restoration process	Table 136

7.13.4 Outputs

The EI is required to report on workmanship and progress on a periodic basis by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for clean-up and restoration appear in Table 137.

Detailed Checklists – Clean-up and Restoration

7.13.5 Typical Input Requirements for Clean-Up and Restoration Environmental Inspection

Table 129: Information Requirements for Clean-Up and Restoration

✓	Description
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to clean-up and restoration, such as: • Alignment Drawings • Access Road Drawings or Route Sheets

✓	Description
	• Grading Drawings • Line List (e.g., special concerns for each Landowner)
	Contracts and agreements related to: • Road Use • Crossing for Buried Facilities
	Permits related to: • Environmental Conditions and/or Commitments • Road Use • Watercourse Crossings including Wetlands • Restoration
	Owner Company specific Safety Plan, including (but not limited to): • Requirements for Personal Protective Equipment (PPE) • Procedures for working around overhead powerlines • Emergency Medical Services (EMS)
	Project-specific Environmental Protection Plan (EPP), detailing clean-up and restoration requirements
	Other project-specific Plans, which may include: • Restoration Plan • Grading Plan • Clean-up and ROW Restoration Plan • Heritage Sites • Stormwater Management Plan • Erosion and Sediment Control Plan • Unanticipated Discovery Plan

7.13.6 Best Practice for Environmental Inspection During Typical Clean-Up and Restoration Operations

Table 130: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Pipeline Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Ensure timber / swamp mats are used if ground conditions are unstable and low-ground pressure equipment can not be used
	Verify that seeding is planned to occur within the appropriate window

Table 131: Safety Concerns for Clean-up and Restoration

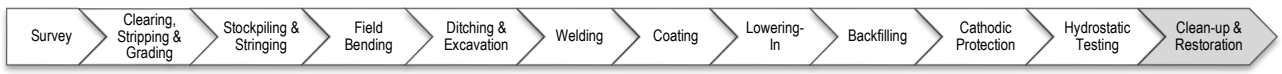
✓	Description
	Confirm that clean-up equipment heavier than allowed in the construction specifications do not operate over top of the pipeline

Table 132: Typical Monitoring Requirements – General

✓	Description
	Ensure no surplus construction or pipeline materials are left on the ROW (refer to contract documents to determine storage and/or disposal requirements)
	Ensure rock material from construction or excavation that was not reused is removed from the ROW and hauled to an Owner Company approved dump site or distributed within a specific portion of the ROW
	Ensure special restoration requirements of Landowners are adhered to
	Confirm the backfill crown is not blocking any drainage, access roads, recreational trails, or wildlife / livestock trails across the ROW and that sufficient gaps have been included to allow cross-drainage
	Confirm that the backfill crown has not been installed in actively tilled agricultural land or residential lawns
	Ensure that for winter construction, the ROW is stabilized after construction and during machine clean-up to prevent erosion during the spring thaw; final clean-up may be completed during the following construction season, either fall or winter, depending on ground conditions
	Confirm that the Contractor will conduct a final clean-up when soils are dry and unfrozen
Road Crossing	
	Confirm that all temporary access roads built during construction and not required for long-term monitoring are removed and reclaimed per contract requirements
	Ensure road surfaces, fences, gates, signs, etc. are replaced or restored per contract requirements
	Ensure road system drainage is repaired, modified, and/or replaced per contract requirements
Fencing	
	Ensure all temporary fences and barricades have been removed per Owner Company specifications
	Ensure that all fencing at compressors, sales / receipt meter stations, and valve locations has been restored or replaced

Table 133: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
Soil Compaction Contingency Measures	
	Ensure ROW locations occupied during construction are de-compacted to loosen subsoil before replacing the topsoil, if required
	Locate areas where soil compaction contingency measures apply, in consultation with Construction Manager
	Ensure appropriate contingency measures are implemented (e.g., provide alternate access to construction ROW, reduce traffic along construction ROW) where compaction is occurring, and topsoil was not salvaged on the ROW
	Ensure appropriate contingency measures are implemented (e.g., harrow the area to prepare a seed bed, straw crimp on erosion-prone soils) during clean-up and restoration where soil and/or sod compaction occurred
	Ensure that appropriate equipment is used to remove compaction
Topsoil Replacement	
	Ensure stones are removed from the topsoil and subsoil, if applicable
	Ensure the subsoil surface is smooth, uniform, and level for topsoil replacement



✓	Description
	Ensure topsoil is only handled when weather conditions permit (e.g., heavy rain may disrupt operations) and in accordance with Owner Company specifications / procedures and Landowner agreements
	Ensure all holes, ruts, and depressions are filled with subsoil
	Ensure topsoil has been replaced evenly throughout the work area to a depth comparable to pre-construction and off-ROW conditions
Erosion Control	
	Confirm all erosion-prone slopes are re-vegetated by seeding with approved mixes, erosion control matting, hydro-seeding, and/or hydro-mulching as per Owner Company-specifications and Landowner agreements
	Ensure that previously existing contours in the landscape are recreated
	Check the placement of erosion-control measures for compliance with the Owner Company-specifications
	Ensure water quality is maintained while applying erosion control at a watercourse
	Recommend stabilization and erosion controls appropriate for the wetland type and revegetation method (e.g. temporary stabilization reseeding)
Replanting and Reseeding	
	Ensure that ROW preparation is suitable for the application of fertilizers and seeds per Owner Company-specifications as well as Landowner agreements
	Confirm that the final soil surface is prepared adequately for seeding, taking into consideration soil conditions, weather conditions, ROW requirements, and surrounding land use
	Confirm and document all seed mixes, fertilizers, rates, equipment, and techniques of application have been approved by the Owner Company and Landowner agreements
	Ensure areas where soil stabilization is required (e.g., slopes, stream banks) have been seeded, fertilized, hydro-seeded, or sprayed with a tackifier (a soil adhesive) / mulch mixture
	Ensure trees and shrubs have been replanted or transplanted to meet the Owner Company-specifications and Landowner agreements
	Ensure all original vegetation, including seeds, sod, grass, shrubs, and trees are restored or replaced, including fertilizing per Owner Company-specifications and Landowner agreements, if required

Table 134: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
Terraces, Drainage, Diversion Berms, and Slope Protection	
	Check that the construction of terraces, berms, or cross ditches on the ROW, which divert surface runoff to adjacent vegetated areas or existing drainage systems, have been completed
	Check cross-drainage or watercourses for operability
	Repair and replace damaged / non-functional drain tiles
Watercourses and Crossings	
	Ensure wetland elevations and water crossings are restored to pre-construction conditions and erosion and sediment control measures are installed per Owner Company specifications, Landowner agreements, or as required
	Ensure riparian zones at creek and river crossings are stabilized by installing site-specific restoration features
	Ensure that project requirements are met for wetland vegetation and stabilization (e.g., wetland-specific seed mixes)

Table 135: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	There are no incremental specific monitoring requirements for air and noise pollution beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 136: Typical Monitoring Requirements – Trenchless Crossings

✓	Description
	Verify that mud tails are cleaned up to the restored state as per contract requirements

7.13.7 Typical Outputs for Clean-Up and Restoration

Table 137: Typical Reporting Requirements

✓	Description
General	
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here
Daily	
	Complete clean-up and restoration Environmental Inspection progress reports, including (but not limited to): • Daily progress of the Contractor's clean-up activities with starts and end chainages / station numbers of daily progress, including sections not cleaned up yet and why • Depth of replaced topsoil • Compaction depths • Starts / stops on any specialized compaction removal • Drain tile station locations • Location and type of sediment control measures retained • Seed mix and application rates for seeding and fertilizing • Work completed to date, including: o Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters o A record of any observations, events, and violations using a daily log, camera, and other technology • Documenting compliance with Project permit conditions, which includes: o Updating the Environmental Commitment Tracking Tool o Time-stamped pre- and post-restoration photos in addition to progress photos All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

7.13.8 References – Clean-Up and Restoration

Note to user: The reference information provided in Table 138 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 138: List of References – Clean-Up and Restoration

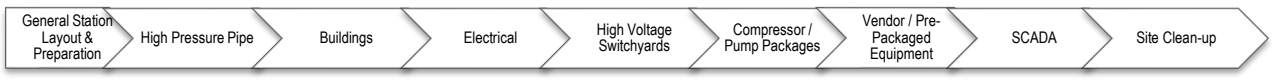
Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Pipeline Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures

8 PLANNING AND CONSTRUCTING FACILITIES

8.1 Overview

Planning and Constructing Facilities consists of the following major components and associated activities:

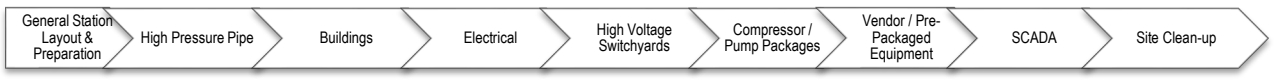
1. General Station Layout and Preparation (Section 8.2)
    - Survey
    - Clearing and Grading
    - Stormwater Management Facilities
    - Stockpiling and Material Handling
    - Trenching and Excavation
    - Foundations and Reinforced Concrete
    - Backfilling
2. High Pressure Pipe (Section 8.3)
    - Trenching and Excavation
    - Foundations and Reinforced Concrete
    - Structural Steel
    - Lifting and Setting
    - Welding and Joining
    - Coating / Painting
    - Hydrostatic Testing
    - Cathodic Protection
3. Buildings (Section 8.4)
    - Foundations and Reinforced Concrete
    - Structural Steel
    - Welding and Joining
    - Coating / Painting
    - Lifting and Setting
    - Utility Power (AC Electrical Systems)
    - Heating, Ventilation, and Air Conditioning (HVAC)
    - Fire Suppression and Domestic Systems
    - Building Lighting
4. Electrical (Section 8.5)
    - Alternating Current (AC) Electrical Systems
    - Electrical Controls and Instrumentation
    - Grounding
5. High Voltage Switchyards (Section 8.6)
    - Foundations and Reinforced Concrete
    - Structural Steel
    - Welding and Joining
    - Coating / Painting



- Lifting and Setting
- Switchgear

6. Compressor / Pump Packages (Section 8.7)
    - Foundations and Reinforced Concrete
    - High Pressure Pipe
    - Structural Steel
    - Lifting and Setting
    - Electrical Controls and Instrumentation
7. Vendor / Pre-packaged Equipment (Section 8.8)
    - Foundations and Reinforced Concrete
    - Lifting and Setting
8. Supervisory Control and Data Acquisition (SCADA) Systems (Section 8.9)
9. Site Clean-up (Section 8.10)

The relevant Environmental Inspection requirements are described in this section. Note that requirements and duties may be repeated throughout multiple stages; this redundancy is intended to reduce cross-referencing and ensure each phase is represented holistically and independently for ease of use.



8.2 General Station Layout and Preparation

8.2.1 Overview

General station layout and preparation consists of the following major items during the construction of a facility:

- Survey
- Clearing and Grading
- Stormwater Management Facilities
- Stockpiling and Material Handling
- Trenching and Excavation
- Foundations and Reinforced Concrete
- Backfilling

These items are presented within this section, roughly in the sequence of construction.

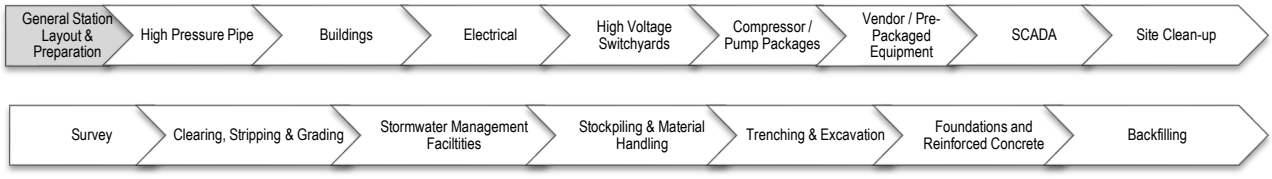
Survey

Surveying is an integral part of facilities construction and refers to the installation of visual reference points and markers (e.g., stakes, pins, lath, hubs) that will define the facility site limits and guide the construction of the facility according to the Issued for Construction (IFC) drawings. The references also mark the safe limits of facility work areas as well as sensitive environmental features and associated setbacks or buffers as outlined in the environmental protection plan (EPP) or equivalent. If the area for the approved facility is forested, Civil Surveyors are commonly the first to arrive to flag trees so Clearing Contractors can cut them down for facility construction.

The general Inspector is the technical liaison for survey information between the Construction Manager / Chief Inspector (or designate), Survey Contractor, and other on-site Contractors. The Environmental Inspector (EI) supports the general Inspector by ensuring surveying activities do not have an adverse effect on the environment, as well as ensuring environmental features are adequately marked.

The EI's responsibilities during surveying include, but are not limited to:

- Providing clear instructions and confirmation for surveying activities conducted in the vicinity of environmentally sensitive areas to reduce disturbance of site-specific environmental resources
- Identifying areas associated with special permit conditions (e.g., riparian areas, designated wetlands)
- Ensuring setbacks, buffers, and/or workspace reductions (neckdowns) are properly marked in the field



- Ensuring the proper signage / staking / flagging has been installed in accordance with the project environmental plans and commitments (e.g., waterbody and wetland signs, refueling restrictions, equipment cleaning locations, environmentally sensitive areas)

Clearing and Grading

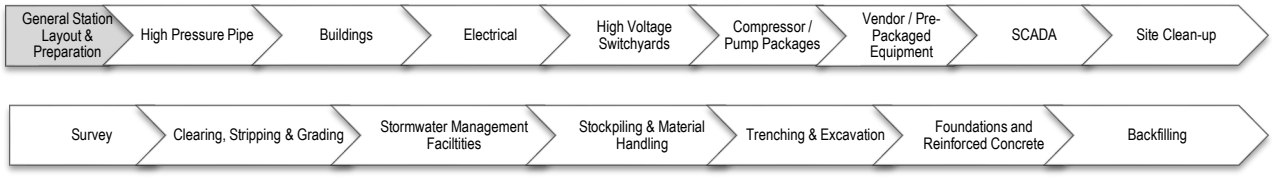
Clearing and grading is the next phase of facilities construction after surveying, where the facility site is prepared for the upcoming installation activities. This phase typically represents the highest gradient of disturbance to the environment, with the removal of trees, vegetation, and soil, requiring a high degree of oversight by the EI. Key steps of the clearing and grading process typically include:

- Clearing, which involves the cutting of trees and brush from the facility site limits and access roads
- Grubbing, which involves the removal of tree stumps and large roots from specific areas of the facility site limits
- Timber salvage, which involves the recovery and temporary storage of useful, merchantable timber from the facility site limits
- Unsalvageable timber and brush disposal, which involves the removal or elimination of on-site non-merchantable timber and brush by chipping, mulching, or burning
- Stripping, which involves the removal, segregation, and storage of topsoil for later redistribution
- Erosion control, which will be implemented immediately after clearing, unless otherwise specified, and soil erosion contingency measures
- Cut and fill activities for preliminary grading
- Fencing
- Preparation and maintenance of facility site access
- Line location of buried utilities (both Owner Company and foreign)
- In some cases, grade rock blasting, excavation, and removal may be required

A Grading Inspector, sometimes referred to as a General or Craft Inspector, is responsible for ensuring crews follow appropriate methods during clearing, stripping, and grading operations. The Environmental Inspector (EI) supports the Grading Inspector by ensuring clearing, stripping, and grading operations do not have an adverse effect on the environment.

The EI's responsibilities during clearing, stripping, and grading include, but are not limited to:

- Ensuring proper handling, salvage, and disposal of merchantable and non-merchantable timber as per project requirements



- Ensuring soil integrity is maintained by implementing proper soil handling segregation and handling techniques (e.g., prevent mixing of topsoil with subsoil)
- Maintaining limits of resource exclusion zones and designated threatened and endangered species habitat

Stormwater Management Facilities

Stormwater management facilities, including site sewer / septic systems, are typically installed after clearing and grading of the facility site. They essentially manage the surface flow of water within the facility site in order to:

- Contain excess rain and ground water from impervious surfaces (e.g., sidewalks)
- Manage and control snow melt
- Contain sedimentation on-site
- Minimize erosion
- Minimize flooding on adjacent property
- Minimize turbidity to nearby watercourses

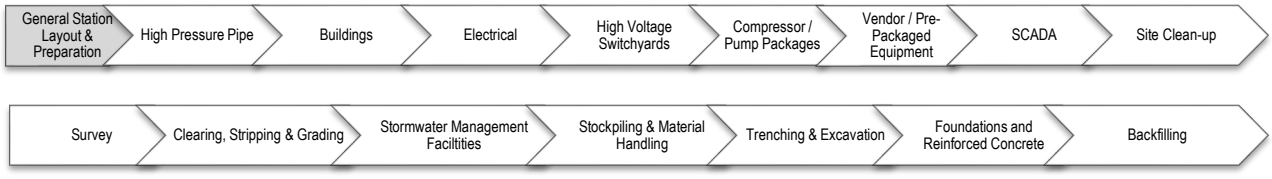
The bulk of the inspection requirements are focused on the Civil discipline. There are no Environmental Inspector's (EI) responsibilities for the civil components of stormwater management. However, an EI is responsible for compliance with stormwater management permits during construction activities. Those inspection requirements can be found in the A Practical Guide for Environmental Construction Inspectors – Foundational Information.

Stockpiling and Material Handling

A Stockpiling and Material Handling Inspector, sometimes referred to as a General or Craft Inspector, is responsible for ensuring crews follow appropriate methods during stockpiling and material handling operations. The Environmental Inspector (EI) supports the Stockpiling and Material Handling Inspector by ensuring stockpiling and material handling operations do not have an adverse effect on the environment.

The EI's responsibilities during stockpiling and material handling include, but are not limited to:

- Monitoring the general setup of the stockpiling yard to ensure erosion and sediment controls are properly installed and maintained in accordance with project plans and permit requirements
- Ensuring access roads are clear for use when needed and no damage is done to the facility site due to heavy equipment passing
- Monitoring the facility site following rain / snow melt conditions and restricting construction activities in select locations during wet weather conditions
- Ensuring the working area is maintained and cleaned up regularly



Trenching and Excavation

Trenching and excavation is the next phase of facilities construction, and typically involves excavation of a trench within the facility for pipe, conduit / cable, ground wire installation, and foundations or pipe supports. Subsurface facilities must first be located and exposed prior to any mechanical excavation taking place. Generally, this is done with hydrovac equipment, and special conditions must be addressed concerning the disposal of the hydrovac slurry, especially in contaminated soils.

There may be a need to remove accumulations of water from the partially or fully excavated trench as outlined in the Stormwater Management Plan.

A Grading Inspector, sometimes referred to as a General or Craft Inspector, is responsible for ensuring crews follow appropriate methods during trenching and excavation. The Environmental Inspector (EI) supports the Grading Inspector by ensuring trenching and excavation operations do not have an adverse effect on the environment.

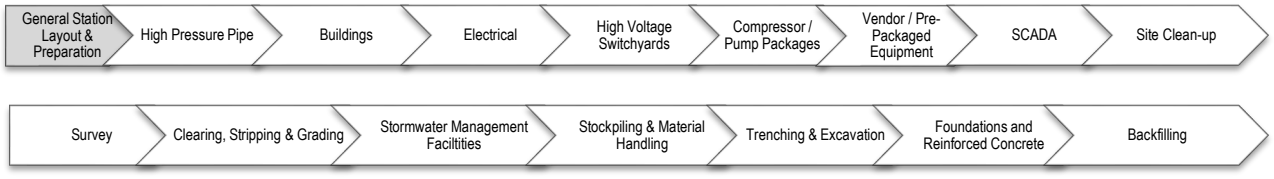
The EI's responsibilities during trenching and excavation include, but are not limited to:

- Ensuring appropriate measures (e.g., hauling equipment and material on the facility site) are taken to prevent the mixing of soil and topsoil-subsoil compaction
- Ensuring fencing is placed to prevent livestock and wildlife from entering in accordance with Landowner agreements
- Ensuring proper procedures are followed for areas of concern (e.g., high water table, brownfield sites, agricultural areas)
- Ensuring measures (e.g., discharging water to approved sites) are taken to prevent erosion, sedimentation, or contamination of adjacent lands, wetlands, and watercourses during trench dewatering

Foundations and Reinforced Concrete

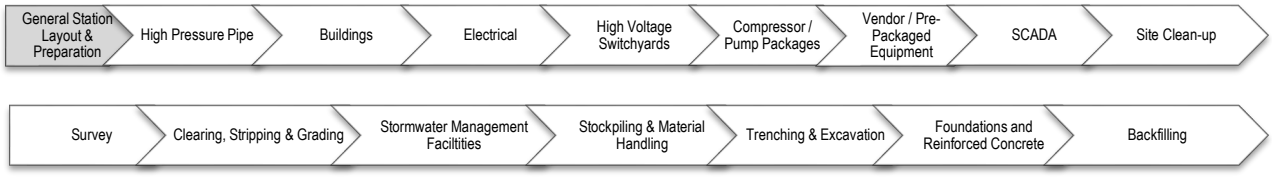
Foundations and reinforced concrete are typically installed as part of the construction stage after trenching and excavation activities are completed. At this point, the general Inspector should continuously monitor that the following items are properly performed:

- Pile installation
- Formwork erection
- Reinforcing steel placement
- Concrete pouring and testing
- Handling and disposal of chemical agents (e.g. form release agents, blasting media)



- Concrete washouts
- Dust management during drilling or cutting

There are no incremental specific EI responsibilities for Foundations and Reinforced Concrete beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.



Backfilling

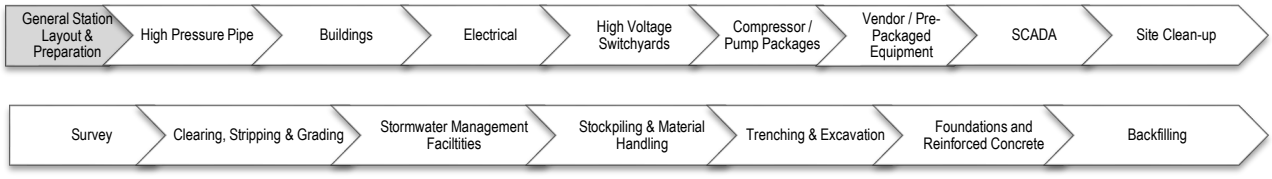
Backfilling refers to refilling the trench with the previously excavated or new fill subsoil once the foundations have cured, and the pipe sections or assemblies are in place. The General / Craft Inspector should continuously monitor for the following:

- Backfill material is suitable and placed in the trench in such a way that ensures the pipe and coating are not damaged
- Coating damage is repaired per Owner Company specifications prior to backfilling
- Compaction requirements are met

A General or Craft Inspector is responsible for ensuring crews follow appropriate methods during backfilling operations. The Environmental Inspector (EI) supports the General / Craft Inspector by ensuring backfilling operations do not have an adverse effect on the environment.

The EI's responsibilities during backfilling include, but are not limited to:

- Ensuring adequate erosion protection, both in the trench and on the surface



8.2.2 Survey

8.2.2.1 Inputs

As part of preparing for Environmental Inspection during surveying, the Environmental Inspector (EI) will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 140.

8.2.2.2 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the surveying are identified in a series of checklists as detailed in Table 139.

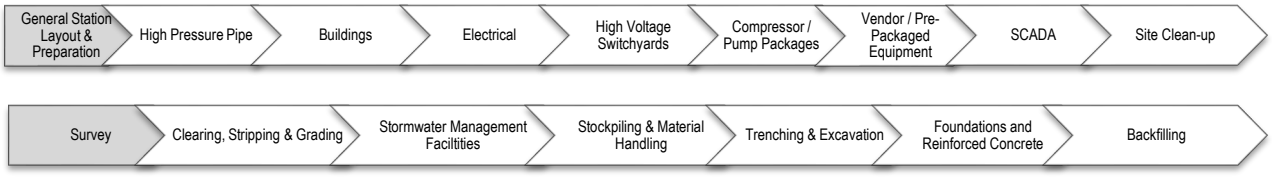
Table 139: Monitoring Requirements for Surveying

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 141
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 142
General	• Identify general items that should be monitored throughout the surveying process	Table 143
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 144
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 145
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 146

8.2.2.3 Outputs

The EI is required to report on environmentally relevant workmanship and progress on a periodic basis (e.g., daily, weekly) by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for survey inspection appear in Table 147.

Detailed Checklists – Surveying



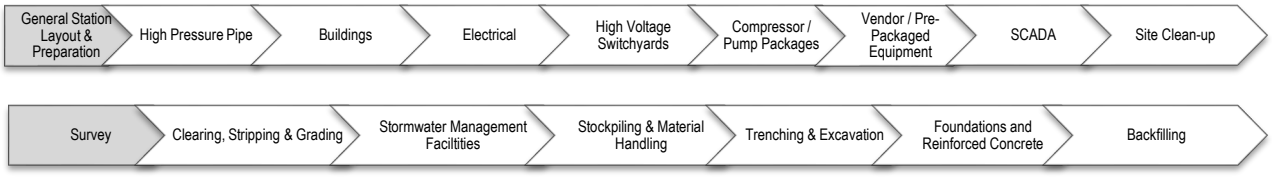
8.2.2.4 Typical Input Requirements for General Survey Inspection

Table 140: Information Requirements for Surveying

✓	Description

	All designs, drawings, and specifications developed by the Owner Company and Contractors related to surveying, such as:
	• Issued for Construction (IFC) Drawings, including
	  ○ Access road drawings
	  ○ Line list (e.g., special concerns for each Landowner)
	  ○ Civil, mechanical, structural, and electrical drawings
	• GPS or other datum coordinates and elevations for construction control points and benchmarks
	• Site and Appurtenance Surveys
	• Boundary Surveys
	• Building Structure Surveys
	• Construction Surveys
	  ○ Brownfield as-builts
	• Environmental Studies

	Contracts and agreements related to: • Environmental Resources • Road Use • Crossing for Buried Facilities • Construction Survey • Landowner and/or Regulatory Requirements • Landowner and/or Regulatory Approvals • Landowner Agreements • Third Party Crossing Agreements • Jurisdictional Agencies • Temporary Workspace Agreements
	Owner Company specific Safety Plan, including (but not limited to): • Traffic Control Plan • Requirements for Personal Protective Equipment (PPE) • Emergency Medical Services (EMS)
	Project-specific Environmental Protection Plan (EPP) or equivalent, detailing surveying requirements
	Other project-specific Plans, which may include: • Fire Prevention / Firefighting Plan • Survey Plans • Environmental Impact Statements (EIS) or Environmental Assessments Reports • Environmental Measures, Policies, and Plans • Appropriate Federal, State, and Local Permits • Unanticipated Discovery Plan
	Owner Company-specific Pre-Construction Consideration related to: • Weather Conditions • Environmental Resources (e.g., soils, vegetation, watercourse crossings, wetlands) • Wildlife and Aquatic Resources • Agricultural Activities



	• Historic Sites, Culturally Significant Sites, and Sensitive Landscapes • As-built Data for Existing Facilities • Ground Disturbance Documentation

8.2.2.5 Best Practice for Environmental Inspection During Typical Surveying Operations

Table 141: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental and cultural concerns • Duties of Inspector(s) • Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Locate and flag environmentally and culturally sensitive sites
	Assist pioneer crews (i.e., first crews at the site), if necessary, at the commencement of any on-site work including hydrovacing and signage installation for access

Table 142: Safety Concerns for Surveying

✓	Description
	Communicate known environmental hazards (e.g., invasive species, biomonitors, contaminated soil, poison ivy) during JSA activities

Table 143: Typical Monitoring Requirements – General

✓	Description
	Monitor daily activities for compliance with all environmental requirements
	Ensure construction activities are contained inside the approved ROW, designated access roads, and ancillary sites
	Assist surveyors in staking any pre-determined environmentally sensitive or archaeological sites
	Ensure a photographic record is made of all sensitive features to be protected or restored
	Adhere to Owner Company and project-specific requirements for the storage and disposal of hydrovac slurry
	Verify that stakes, marks, and flags are maintained throughout construction, if feasible, and communicate with the Surveying Contractor when any need to be re-established
	Ensure a topographical survey is properly performed to obtain-sufficient data to completely define any drainage areas

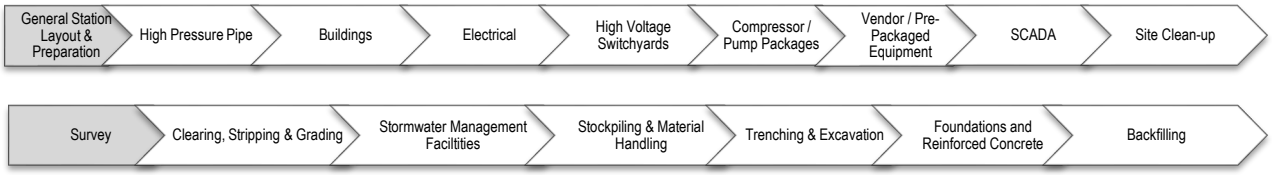


Table 144: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
	Ensure setback requirements for rare vegetative crops and/or threatened and endangered species are adhered to
	Confirm the accuracy of flagged environmentally sensitive areas, including sensitive species habitats, culturally sensitive areas, ornamental trees, windbreaks, or specialty shrubs, in consultation with survey crews
	Ensure that any locations with crop, crop disease, or weed infestations are flagged, staked, and clearly marked with signage
	Ensure nest surveys have been completed within the facility site limits, temporary workspaces (TWS), and access roads where/when applicable
	Ensure any exclusion zones (e.g., rare species, threatened and endangered species habitat) are appropriately flagged
	Ensure there are flags, stakes, and clearly marked signage at any locations requiring special soil-handling techniques
	Ensure that taller stakes are installed in high crop areas or snow to ensure visibility, and hub staking is used in livestock pastures
	Ensure that flagging is placed more frequently in heavier vegetated, treed areas, and at project workspace neckdowns to provide better visibility for Clearing Equipment Operators

Table 145: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
	Ensure setback requirements for wetlands and/or water bodies are adhered to
	Ensure that the riparian buffer zone is staked and flagged in accordance with project requirements
	Ensure that temporary workspaces (TWS) do not encroach within the vegetated buffers of watercourses and wetlands
	Ensure vehicles do not ford watercourses, unless permitted
	Ensure vehicle maintenance, refueling buffers, and equipment storage locations are well-marked
	Ensure drainages are staked and flagged in the fall prior to heavy snowfall to avoid flooding or erosion problems during spring break-up

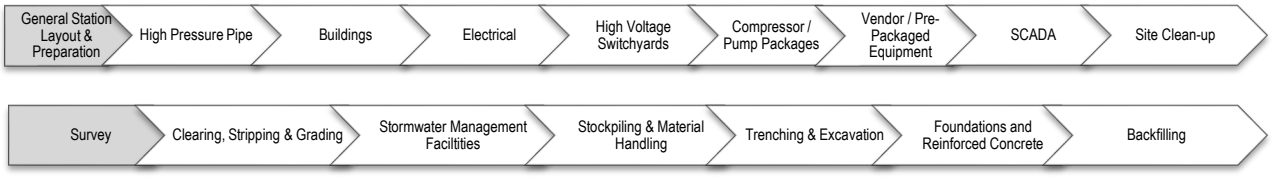
Table 146: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	There are no incremental specific monitoring requirements for air and noise pollution life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

8.2.2.6 Typical Outputs for Surveying

Table 147: Typical Reporting Requirements

✓	Description
General	
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here



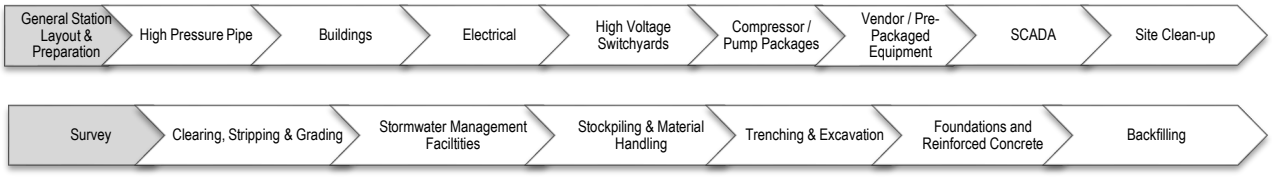
Daily	
	Complete daily surveying Environmental Inspection Progress reports, including (but not limited to): • Work completed to date, including: o Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters o A record of any observations, events, and violations using a daily log, camera, and other technology • Documenting compliance with Project permit conditions, which includes: o Updating the company-specific environmental commitment tracking system o Location of non-jurisdictional drains All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

8.2.2.7 References – Surveying

Note to user: The reference information provided in Table 148 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 148: List of References – Surveying

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Facilities Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures



8.2.3 Clearing, Stripping, and Grading

8.2.3.1 Inputs

As part of preparing for Environmental Inspection during Clearing, Stripping, and Grading, the Environmental Inspector (EI) will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 150.

8.2.3.2 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the clearing, stripping, and grading activities are identified in a series of checklists as detailed in Table 149.

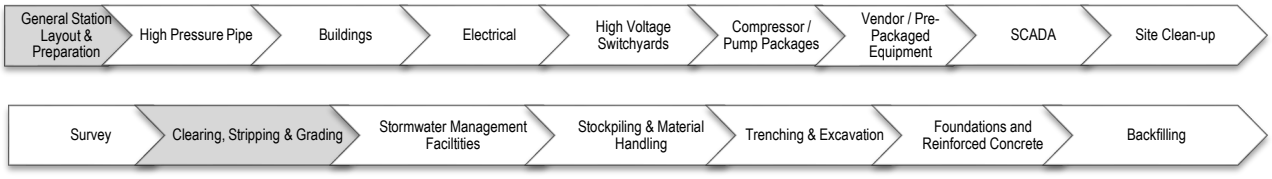
Table 149: Monitoring Requirements for Clearing, Stripping, and Grading

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 151
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 152
General	• Identify general items that should be monitored throughout the clearing, stripping, and grading process	Table 153
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 154
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 155
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 156

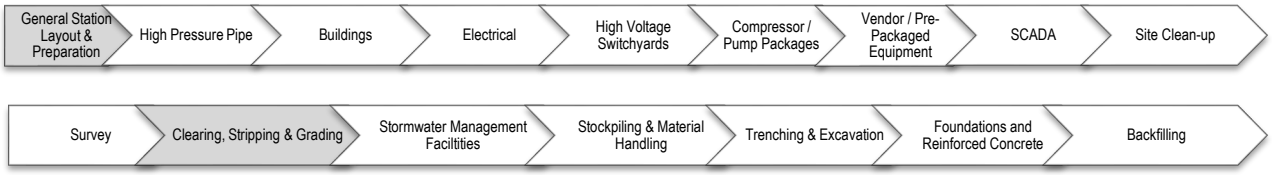
8.2.3.3 Typical Input Requirements for Clearing, Stripping, and Grading Environmental Inspection

Table 150: Information Requirements for Clearing, Stripping, and Grading

✓	Description
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to clearing, stripping, and grading, such as: • Issued for Construction (IFC) Drawings, including ○ Access Road Drawings



✓	Description
	○ Grading Drawings ○ Stormwater Management Plans ○ Civil, Mechanical, Structural, and Electrical Drawings ○ Brownfield As-Builts • Construction Surveys • Line List (e.g., special concerns for each Landowner) • Drawings related to Facility Site Limits (both permanent and temporary) • Commissioned Field and Environmental Studies • Unanticipated Discovery Plans
	Contracts and agreements related to: • Clearing • Grading (if required) • Road Use • Crossing for Buried Facilities • Timber Salvage (Landowner, Forestry Management, Public Land Holder) • Construction Survey • Fencing
	Permits related to: • Safe Work • Third Party Crossing Agreements
	Owner Company-specific Safety Plan, including (but not limited to): • Requirements for Personal Protective Equipment (PPE) • Emergency Medical Services (EMS) • Blasting Safety
	Project-specific Environmental Protection Plan (EPP) or equivalent, detailing clearing, stripping, and grading requirements
	Other project-specific Plans, which may include: • Access Road Plans • Blasting Plan • Pre-Construction Grade Plan • Burn Plan • Timber Salvage Plan • Fire Prevention / Firefighting Plan • Heritage Sites • Soil Surveys • Environmental Impact Statements (EIS) or Environmental Assessments Reports • Environmental Measures, Policies, and Plans • Compliance Documents • Erosion and Sediment Control • Spill Prevention, Control, and Counter Measure Plan
	Owner Company-specific Pre-Construction Consideration related to: • Weather Conditions • Wildlife and Aquatic Resources • Wetlands



✓	Description
	• Agricultural Activities • Historic Sites, Culturally Significant Sites, and Sensitive Landscapes • Contaminated Media and Building Materials

8.2.3.4 Best Practice for Environmental Inspection During Typical Clearing, Stripping, and Grading Operations

Table 151: Prior to Commencing Work

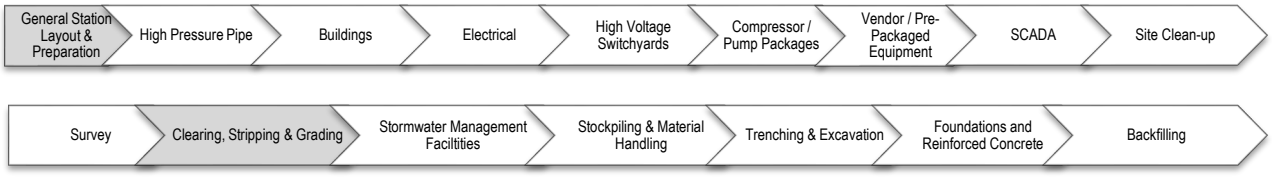
✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Identify environmental issues for consideration in the development of the pre-construction Grade Plan
	Ensure timber / swamp mats are used if ground conditions are unstable and low-ground pressure equipment cannot be used
	Ensure that restricted areas (e.g. significant biological or ecological resources) identified in the Environmental Protection Plan (EPP), or equivalent are marked and protected within the facility site limits, temporary workspaces (TWS), and access roads by an approved method
	Ensure the well water monitoring plan is adhered to, when required
	Ensure stormwater management plans are in place
	Ensure stakes and signage are installed, visible, and intact

Table 152: Safety Concerns for Clearing, Stripping, and Grading

✓	Description
	Ensure burning activities adhere to applicable time of year restrictions, Clearing Index, and/or any other Burn Permit conditions where required

Table 153: Typical Monitoring Requirements – General

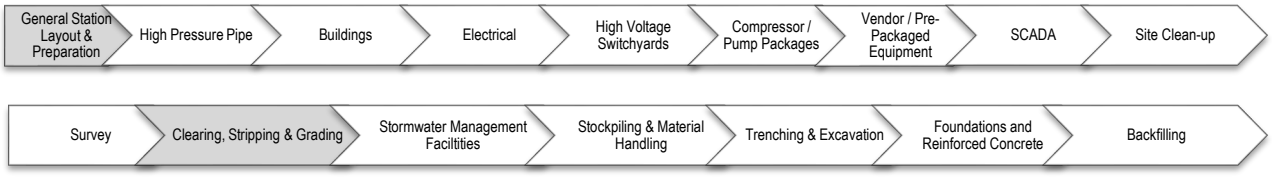
✓	Description
	Ensure clearing, stripping, and grading operations are limited to the approved facility site limits and approved work areas
	Monitor for adherence to conditions noted in all environmental approvals and permits issued
	Ensure mitigative measures for permafrost are adhered to (e.g., minimizing grading activities)
	Ensure appropriate measures are implemented when artifacts are unearthed



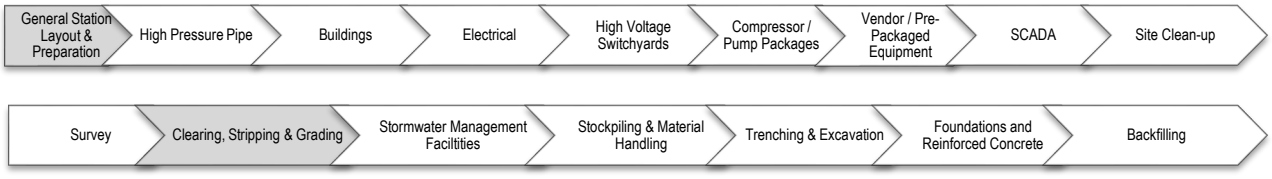
✓	Description
	Provide input on environmental considerations when additional clearing, stripping, and grading may be required
	Ensure any temporary workspace (TWS) for storage of excavated material, grubbing, or salvageable timber has been constructed as per the EPP or equivalent
	Verify that the Contractor picks up and properly disposes of any fly-rock from blasting activities
	Monitor temporary fencing requirements
	Ensure a watch person is present at open gates to control livestock (if required)
	Communicate known environmental hazards (e.g., invasive species, biomonitors, contaminated soil, poison ivy) during JSA activities

Table 154: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
Clearing Trees and Brush	
	Ensure any marked trees or shrubs which need to be salvaged are stored properly to prevent drying out before replanting
	Ensure trees, shrubs, and tall grasses are cleared prior to the onset of migratory bird or species-specific time of year restrictions (TOYR)
	Ensure adherence to operator or project-specific measures for any trees containing biological resources (e.g. active nests, dens, or burrows)
	Ensure proper equipment is used to minimize terrain disturbance during non-frozen conditions when clearing non-merchantable timber
	Ensure that on land with a significant slope in any direction (per criteria defined by the Owner Company in contract documents), removal of brush and trees is minimized, and root systems are left intact to prevent slope erosion
	Ensure cuts are treated per contract requirements where branches are removed from a standing tree outside the ROW (if required)
	Ensure the Contractor refrains from skidding timber through partially thawed and/or muddy ground
	Monitor for proper placement of all removed trees and brush from and adjacent to the facility site limits
	Ensure the Contractor clears wetlands, water bodies, and riparian vegetation areas using approved Owner Company procedures as per the Environmental Protection Plan (EPP) or equivalent
	Ensure methods are used to minimize clearing debris from falling into a watercourse and if it occurs, ensure debris is removed immediately
Grubbing	
	Ensure appropriate surface erosion control measures are implemented immediately after clearing and prior to commencing grubbing unless otherwise specified
	Ensure natural surface drainage can be re-established or installed where appropriate
	Ensure proper equipment (e.g., brush rake attachment) is used for grubbing to preserve topsoil
	Restrict grubbing near the facility site limits, as specified by the Owner Company, where possible
	Suspend grubbing when weather conditions promote sedimentation



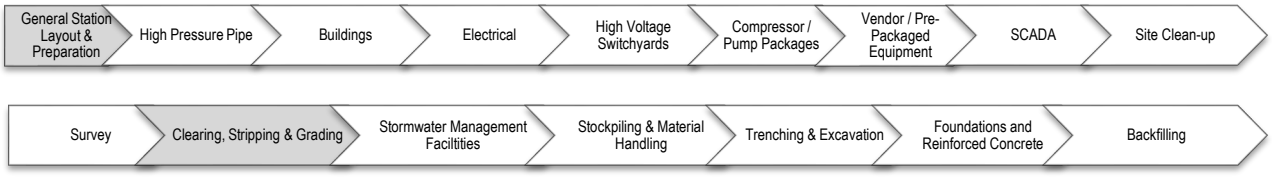
✓	Description
	Ensure adherence to specific requirements for grubbing near watercourses and/or wetlands
	Ensure grubbing in wet areas is minimized to prevent bog holes
Timber Salvage and Storage	
	Ensure timber is salvaged in accordance with Timber Salvage Plan or other project-specific requirements (e.g. Landowner agreements)
	Consult the Timber Salvage Plan regarding any merchantable timber that appears to not meet specifications, then notify the Construction Manager / Chief Inspector (or designate) and Clearing Contractor for a decision on how to proceed
	Ensure stacked timber is not located in reforested areas or grade areas, unless otherwise approved
	Ensure materials retained for chip and/or mulch material and the location of use is in accordance with the regulatory requirements
	Ensure adherence to any specific requirements associated with cutting and removal near watercourses
	Ensure the Contractor refrains from skidding timber through watercourses, water bodies, or wetlands
	Ensure timber stockpile sites are located away from watercourses
Timber and Brush Disposal	
	Ensure proper burn permits are in place
	Ensure burning activities comply with the Burn Plan, permit stipulations, Landowner requirements, and Environmental Protection Plan (EPP) or equivalent
	Ensure burn locations are only on top of mineral soils and not on topsoil, in peat, or wetland areas (the Contractor may have to strip surface organics and replace them after burning)
	Ensure burn piles are located away from any existing aboveground facility to allow for sufficient space for stacking and working
	Ensure every burn pile is marked using a global positioning system (GPS) and relevant inspectors know the locations of all burn piles
	Ensure continuous (24/7) monitoring during any controlled burn
	Ensure fires are completely extinguished once the burn pile is consumed
	Ensure that all residual materials from burning are disposed of as per contract documents and/or Owner Company or project specifications
	Ensure no unburned timber or brush, which can mix with spoil materials, is in the disposal residue
	If burning is not permitted, confirm chipping or mulching is conducted as per contract specifications
	Ensure chips, woody debris, or mulch are not piled in a mineral wetland, unless approved by the regulatory authority
	Ensure appropriate regulatory approval and waivers are in place before disposing of merchantable timber
	Ensure the Clearing Contractor hauls away all timber and brush from the facility site that cannot be processed by the above means
Topsoil Stripping and Storage	
	Ensure topsoil is stripped from areas to be filled or graded in accordance with environmental specifications
	Ensure adherence to project specifications for topsoil stripping (e.g., depth of topsoil stripped) unless appropriate approval is received
	Ensure topsoil is stored within the facility site limits, and is stored in a manner that prevents mixing of topsoil with subsoil



✓	Description
	Ensure the topsoil pile has been stabilized in accordance with project-specific permit conditions, company commitments, and Landowner agreements using mulch, tackifiers, temporary seeding, or similar measures
	Ensure project-specific soil surveys are used to identify soil characteristics and contingency measures are adhered to
	Ensure adherence to Operator or Project-specific mitigative measures for procedures relating to clubroot disease, weed infestations, and other crop diseases
	Suspend topsoil stripping during high winds and adverse weather (e.g., heavy rain)
Topsoil Stripping – Frozen Soil Conditions	
	Ensure there is snow cover present over the soil stripping area and remove snow immediately prior to stripping activities
	Ensure mulching of frozen topsoil when necessary
	Ensure adherence to project specifications for storing stripped topsoil on frozen grounds
Erosion Control and Soil Erosion Contingency Measures	
	Ensure temporary and/or permanent erosion and/or sediment control structures (e.g., silt fences, sediment traps, drainage ditches) have been constructed in alignment with the EPP or equivalent
	Ensure construction activities are suspended during wet weather to avoid negative impacts on the facility site, if it is a requirement of the EPP
	Ensure all the necessary materials, equipment, and personnel are correct and available for installation and maintenance of erosion control
Tackification	
	Ensure permits are in place prior to application of a tackifier and applied in alignment with the EPP or equivalent
	Ensure all ground preparations (e.g., restoration) activities are completed before applying a tackifier
	Ensure any revegetation (e.g., seed application) takes place prior to tackification
	Ensure the application of the tackifier adheres to site specifications and manufacturer requirements
	Ensure all products applied are biodegradable and have been approved by the Owner Company
Grading	
	Ensure appropriate erosion control measures are in place prior to grading
	Monitor and reduce disturbance to natural drainage channels and avoid blocking any existing channels during grading
	Ensure graded materials, or materials displaced to accommodate grading, are stored according to Owner or project-specific requirements
	Implement appropriate mitigative measures for wet and/or thawed soils, when needed

Table 155: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
General	
	Ensure timely notice is given to all agreed-to parties before starting work near a creek, river, or watercourse
Grading Near Watercourses	
	Ensure grading in the vicinity of watercourses is per Owner Company-specifications and Environmental Protection Plan (EPP) requirements or equivalent



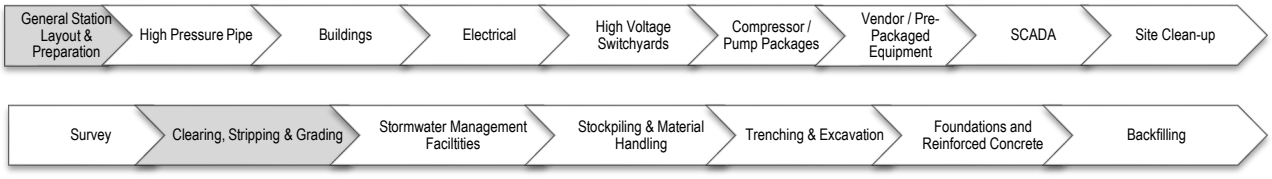
✓	Description
	Ensure project- or operator-specific mitigative measures are implemented for grading in riparian areas and buffer zones
	Ensure grading close to watercourses and wetlands occurs just prior to construction
	Ensure vehicle crossings are in place to prevent grading equipment from operating directly in watercourses
	Ensure erosion and sediment controls are properly installed, maintained, and replaced as necessary

Table 156: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	Ensure burning activities adhere to the air quality index where required

8.2.3.1 Outputs

The EI is required to report on workmanship and progress on a periodic basis (e.g., daily, weekly) by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for clearing, stripping, and grading appear in Table 157.



8.2.3.2 Typical Outputs for Clearing, Stripping, and Grading

Table 157: Typical Reporting Requirements

✓	Description
General	
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here
Daily	

	Complete clearing, stripping, and grading Environmental Inspection progress reports, including (but not limited to):
	• Work completed to date, including:
	  ○ Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters
	  ○ A record of any observations, events, and violations using a daily log, camera, and other technology
	• Documenting compliance with Project permit conditions and Landowner agreements
	  ○ Updating the company-specific environmental commitment tracking
	All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

8.2.3.3 References – Clearing, Stripping, and Grading

Note to user: The reference information provided in Table 158 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

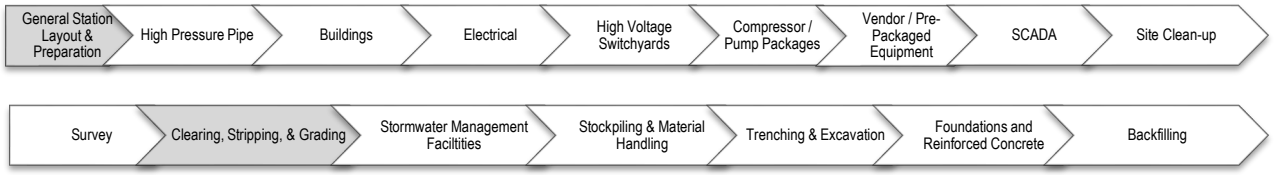
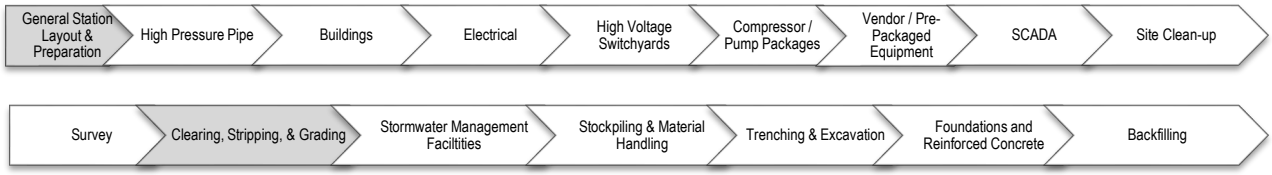


Table 158: List of References – Clearing, Stripping, and Grading

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Facilities Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures



8.2.4 Stockpiling and Material Handling

8.2.4.1 Inputs

As part of preparing for Environmental Inspection during Stockpiling and Material Handling, the Environmental Inspector (EI) will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 160.

8.2.4.2 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the Stockpiling and Material Handling are identified in a series of checklists as detailed in Table 159.

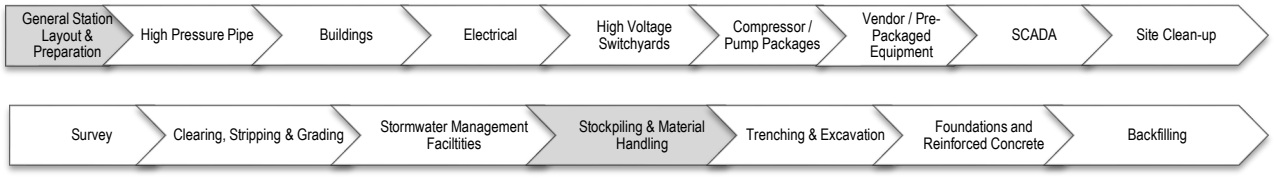
Table 159: Monitoring Requirements for Stockpiling and Material Handling

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 161
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 162
General	• Identify general items that should be monitored throughout the Stockpiling and Material Handling process	Table 163
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 164
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 165
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 166

8.2.4.3 Outputs

The EI is required to report on workmanship and progress on a periodic basis (e.g., daily, weekly) by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for Stockpiling and Material Handling appear in Table 167.

Detailed Checklists – Stockpiling and Material Handling



8.2.4.4 Typical Input Requirements for Stockpiling and Material Handling Inspection

Table 160: Information Requirements for Stockpiling and Material Handling

✓	Description
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to stockpiling and material handling, such as: • Issued for Construction (IFC) Drawings
	Contracts and agreements related to: • Materials Storage and Preservation
	Owner Company-specific Safety Plan, including (but not limited to): • Equipment Transport • Equipment Loading / Unloading • Equipment and Materials Storage • Handling of Materials
	Project-specific Environmental Protection Plan (EPP) or equivalent, detailing stockpiling and material handling requirements
	Other project-specific Plans, which may include • Traffic Control Plan • Stormwater Management • Unanticipated Discovery Plans

8.2.4.5 Best Practice for Environmental Inspection During Typical Stockpiling and Material Handling Operations

Table 161: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Ensure timber / swamp mats are used if ground conditions are unstable and low-ground pressure equipment cannot be used
	Ensure stormwater management plans are in place

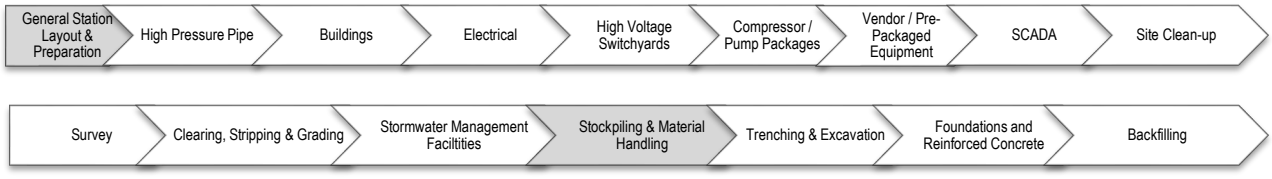


Table 162: Safety Concerns for Stockpiling and Material Handling

✓	Description
	Monitor for individuals standing between a suspended load and equipment or pipe
	Ensure that workers are not standing under or near a suspended load
	Ensure individuals stand clear, the load is level, and materials are prevented from movement when metal banding is cut loose, or other tie-down means are loosened from the load
	Ensure individuals stand clear of lifting slings or vacuum lifters while the Equipment Operator is lifting and placing pipe joints
	Monitor and be aware of other vehicles moving in the lay down or warehousing area

Table 163: Typical Monitoring Requirements – General

✓	Description
	Ensure banding from carriers and any other refused items are hauled away to acceptable disposal site; burial at railway sidings or stockpile sites is not permitted
	Ensure appropriate material is used to stabilize the construction site for vehicle traffic
	Ensure the work area is cleaned up in accordance with Owner / Operator project-specifications
	Ensure hazardous and other regulated materials are stored and labeled appropriately

Table 164: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

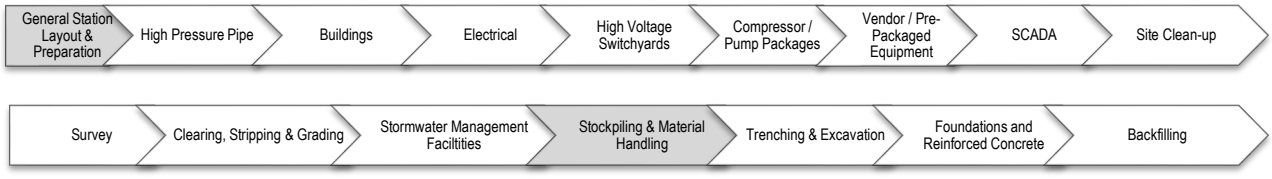
✓	Description
	Prevent heavy trucks from accessing the construction site where topsoil has not been salvaged or wet conditions may result in deep rutting / soil compaction
	Check that all the pipe joints have end caps (as required by Owner Company-specifications)
	Verify that irrigation systems, if applicable, remain operational per Landowner agreements

Table 165: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
	Ensure the location of the stockpile yard is a sufficient distance away from water bodies and regulated buffer zones

Table 166: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	There are no incremental specific monitoring requirements for air and noise pollution life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information



8.2.4.6 Typical Outputs for Stockpiling and Material Handling

Table 167: Typical Reporting Requirements

✓	Description
General	
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here
Daily	

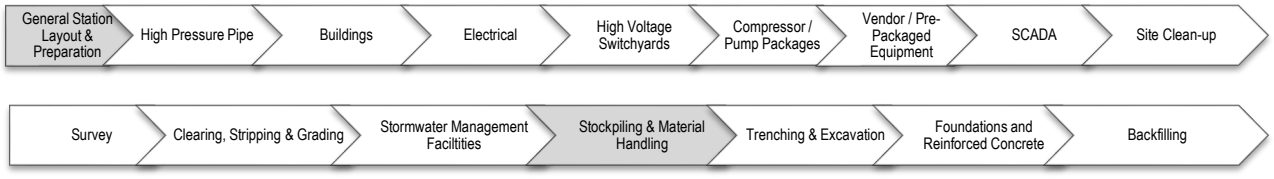
	Complete stockpiling and stringing Environmental Inspection progress reports, including (but not limited to):
	• Work completed to date, including:
	  o Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters
	  o A record of any observations, events, and violations using a daily log, camera, and other technology
	• Documenting compliance with Project permit conditions, which includes:
	  o Updating the company-specific environmental commitment tracking system
	All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

8.2.4.7 References – Stockpiling and Material Handling

Note to user: The reference information provided in Table 168 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 168: List of References – Stockpiling and Material Handling

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Facilities Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures



8.2.5 Trenching and Excavation

8.2.5.1 Inputs

As part of preparing for Environmental Inspection during Trenching and Excavation, the Environmental Inspector (EI) will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 170.

8.2.5.2 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the Trenching and Excavation process are identified in a series of checklists as detailed in Table 169.

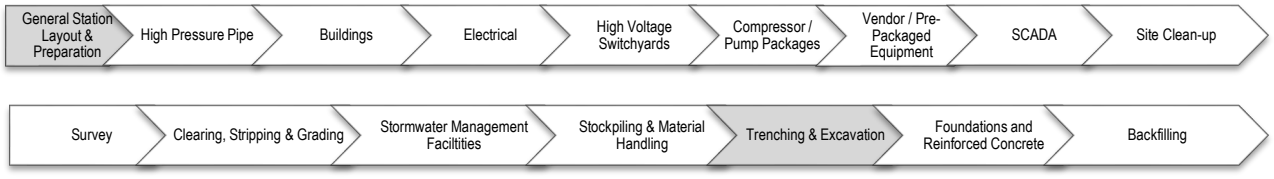
Table 169: Monitoring Requirements for Trenching and Excavation

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 171
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 172
General	• Identify general items that should be monitored throughout the Trenching and Excavation process	Table 173
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 174
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 175
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 176

8.2.5.3 Outputs

The EI is required to report on workmanship and progress on a periodic basis (e.g., daily, weekly) by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for Trenching and Excavation appear in Table 177.

Detailed Checklists – Trenching and Excavation



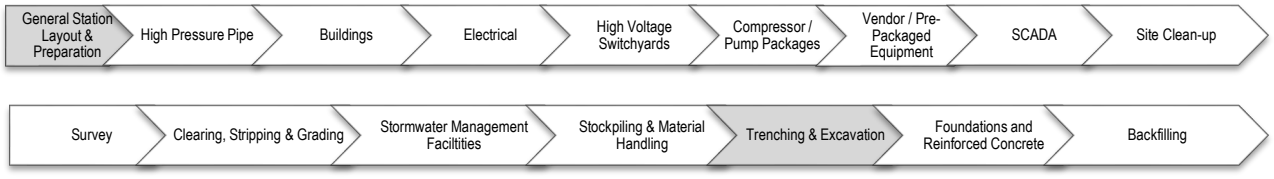
8.2.5.4 Typical Input Requirements for Trenching and Excavation Inspection

Table 170: Information Requirements for Trenching and Excavation

✓	Description

	All designs, drawings, and specifications developed by the Owner Company and Contractors related to trenching and excavation, such as:
	• Issued for Construction (IFC) Drawings, including
	  ○ Access Road Drawings
	  ○ Line List (e.g., special concerns for each Landowner)
	  ○ Underground Conduit / Cable Routing Plan
	  ○ Grounding Plan
	• Trenching Specifications and Procedures
	• Topsoil Segregation Requirements
	• Blasting Specification (if required)
	• Ground Disturbance Documentation

	Contracts and agreements related to: • Road Use • Construction Survey
	Permits related to: • Safe Work • Third Party Crossing Agreements • Confined Space Entry
	Owner Company specific Safety Plan, including (but not limited to): • Excavation Plan • Traffic Control Plan • Requirements for Personal Protective Equipment (PPE) • Emergency Medical Services (EMS)
	Project-specific Environmental Protection Plan (EPP), detailing trenching and excavation requirements
	Other project-specific Plans, which may include: • Blasting Plan • Fire Prevention / Firefighting Plan • Engineered Shoring Plans (as required) • Dewatering Plans (as required) • Environmental Impact Statements (EIS) or Environmental Assessments Reports • Environmental Measures, Policies, and Plans • Compliance Documents • Stormwater Management Plan • Erosion and Sediment Control Plan • Unanticipated Discovery Plans • Cultural Plan



✓	Description
	• Restoration Plan
	Owner Company specific Pre-Construction Consideration related to: • Weather Conditions • Agricultural Activities • Historic sites, culturally significant sites, and sensitive landscapes

8.2.5.5 Best Practice for Environmental Inspection During Typical Trenching and Excavation Operations

Table 171: Prior to Commencing Work

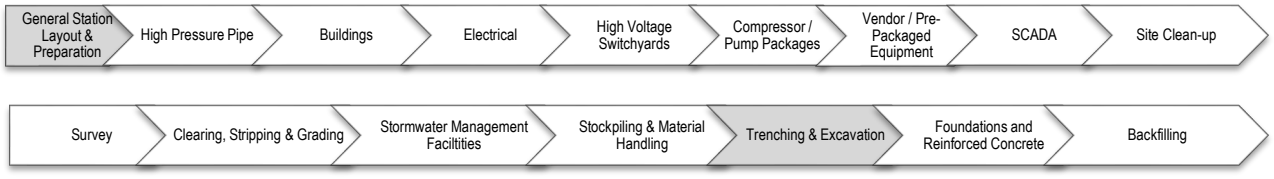
✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Inspect temporary erosion control structures, and ensure damage is repaired prior to commencing trenching and excavation operations
	Verify exclusion zones are established
	Work area: • Check that warning signs and temporary fencing are installed on open excavations close to public accesses • Inspect the open trench for trapped animals before commencing work
	Ensure an approved plan is in place to manage the disposal of hydrovac slurry

Table 172: Safety Concerns for Trenching and Excavation

✓	Description
	There are no incremental specific Safety Concerns beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 173: Typical Monitoring Requirements – General

✓	Description
	Ensure that if a machine strikes, contacts, is bogged down, slides into, or rests on top of a pipeline facility, work is stopped immediately, and the Construction Manager / Chief Inspector (or designate) is notified; the machine is not to be moved or extricated without Owner Company approval



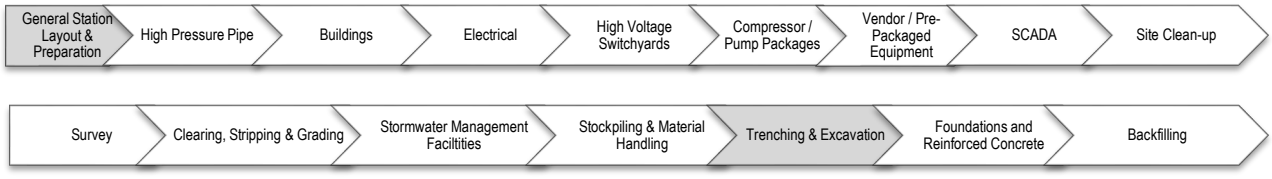
✓	Description
	Immediately suspend trenching activity and notify the Construction Manager / Chief Inspector (or designate) if any historic sites or resources are discovered
	Verify that the Contractor picks up and properly disposes of any fly-rock from blasting activities

Table 174: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
Trench Excavation	
	Recommend minimizing the length of time the trench is left open to minimize trench sloughing
	Ensure trenching activities are suspended in areas where non-salvaged topsoil is sloughing into the trench
	Monitor and record trenching and spoil pile segregation for subsoils with variable horizons
	Ensure appropriate operator or project specifications are followed for trenching when using the Three-Soils-Handling technique
	Ensure separation between topsoil and subsoil is maintained when special soil handling techniques (e.g., Three-Lift Soils Handling) are being used
	Confirm that the trench will be excavated to the specified clearance at all crossings (i.e., road, ditch, culvert, cable, water main, sewer) or any other obstruction as directed by the Owner Company-specifications
	Monitor for locations where available workspace is insufficient to allow compliance with safety and environmental requirements; escalate to Construction Manager / Chief Inspector (or designate) when identified

Table 175: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
Trench Excavation	
	Ensure appropriate operator-or-project-specifications are followed when trenching occurs near watercourses and wetlands
	Ensure that the Contractor will not leave a trench open for extended periods; in particular, monitor for: • Large accumulations of water • Snow and ice accumulation in the open excavation • Contaminated soil
Trench Dewatering	
	Check or test the trench water for contamination (e.g., hydrocarbon sheen, high salinity) before dewatering the trench and ensure mitigative measures are implemented, if necessary, to avoid the contamination of adjacent lands, wetlands, and/or watercourses
	Ensure equipment (e.g., pumps, generators) have suitable containment to prevent spills and are appropriately located (e.g., above the normal high-water mark of watercourses and wetlands)
	Ensure trench water is pumped to an approved site (i.e., well-vegetated upland area) and/or into an appropriate sediment filtering device to avoid erosion or sedimentation of adjacent lands, wetlands, or watercourses



✓	Description
	Ensure the pump flow rate is managed to avoid erosion or sedimentation of adjacent lands, wetlands, or watercourses; mitigative measures (e.g., flow dissipaters on outlets) may be required to minimize ground erosion at the discharge location
	Ensure pump intake is suspended above the bottom of the excavation to minimize sediment transport and discharge
	Ensure appropriate disposal of waste products (e.g., used geotextile bags) from trench dewatering activities
Ditch Plugs and Sub-drains / Drain Tiles	

	Ditch plugs and sub-drains may be constructed based on construction drawings; however, in some cases, the quantity and their location are best determined in the field after the trench is excavated. Monitor for:
	• Specific terrain features / drainage patterns, including:
	  ○ Groundwater flowing or seeping from the bottom or sides of the trench; a sub-drain (drain tile) may be required immediately downhill of the discharge point to collect the water and divert it off the facility site
	  ○ Locations where water can enter the trench and flow downhill through the backfill

	Ensure Owner Company-specifications are met or exceeded for erosion control (e.g., a sack breaker may be installed as an alternative to ditch plugs if a ditch plug is difficult to install)
	On slopes, confirm that the Contractor has installed and keyed in trench breakers and sub-drains in the trench per Owner Company-drawings and specifications or as required
	If drain tiles are installed or cut: • Ensure the location is marked • Confirm ends are capped to prevent clogging from dirt or debris • Ensure temporary repairs are installed to maintain drainage and prevent water from discharging into the excavated ditch • Ensure permanent repairs are completed to match or exceed pre-construction conditions and performance • Ensure permanent repairs are conducted in accordance with project-specific plans, permits / approvals, and Landowner agreements

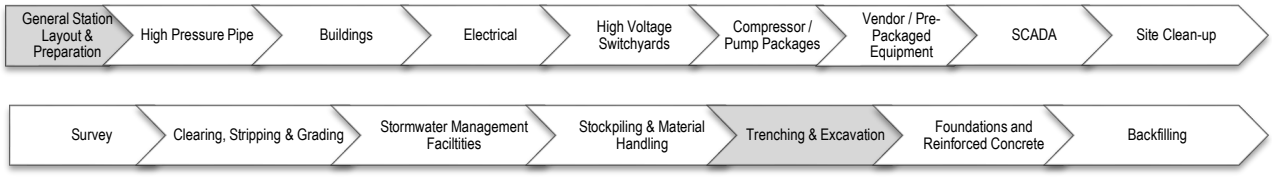
Table 176: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	Adhere to relevant time of day restrictions for relevant activities (e.g., pile driving)

8.2.5.6 Typical Outputs for Trenching and Excavation

Table 177: Typical Reporting Requirements

✓	Description
General	
	Ensure Environmental reports are completed and forwarded to the Construction Manager and/or Chief Inspector, when necessary, these reports include (but are not limited to): • Water and/or contaminated soil sampling and analysis, as required • Hazardous goods report



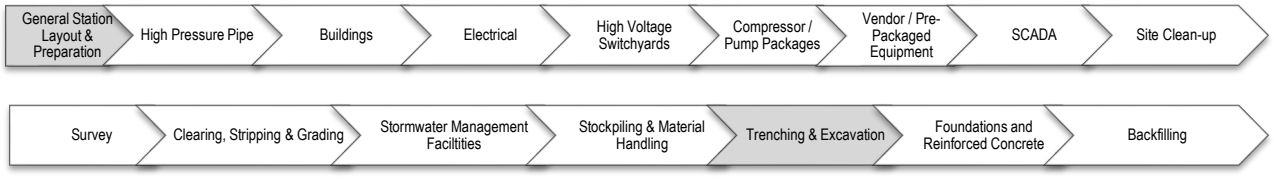
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here
Daily	
	Complete trenching and excavation Environmental Inspection progress reports, including (but not limited to): • Work completed to date, including: o A record of soil horizons o Locations of all drain tiles, irrigation pipes, etc., not on drawings, but crossed by the trench line o Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters o A record of any observations, events, and violations using a daily log, camera, and other technology • Documenting compliance with Project permit conditions o Updating the company-specific environmental commitment tracking system All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

8.2.5.7 References – Trenching and Excavation

Note to user: The reference information provided in Table 178 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 178: List of References – Trenching and Excavation

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Facilities Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures



8.2.6 Backfilling

8.2.6.1 Inputs

As part of preparing for Environmental Inspection during Backfilling, the Environmental Inspector (EI) will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 180.

8.2.6.2 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the Backfilling process are identified in a series of checklists as detailed in Table 179.

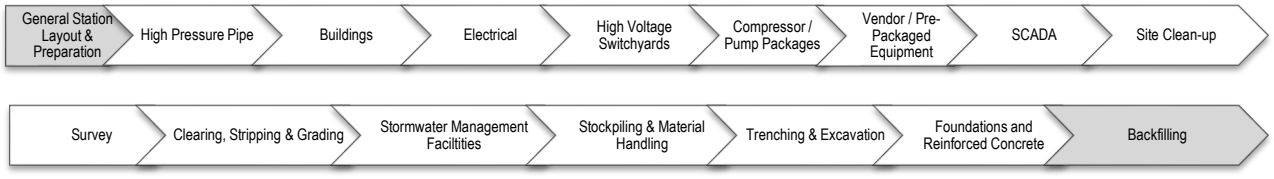
Table 179: Monitoring Requirements for Backfilling

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 181
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 182
General	• Identify general items that should be monitored throughout the Backfilling process	Table 183
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 184
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 185
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 186

8.2.6.3 Outputs

The EI is required to report on workmanship and progress on a periodic basis (e.g., daily, weekly) by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for Backfilling appear in Table 187.

Detailed Checklists – Backfilling



8.2.6.4 Typical Input Requirements for Backfilling Inspection

Table 180: Information Requirements for Backfilling

✓	Description

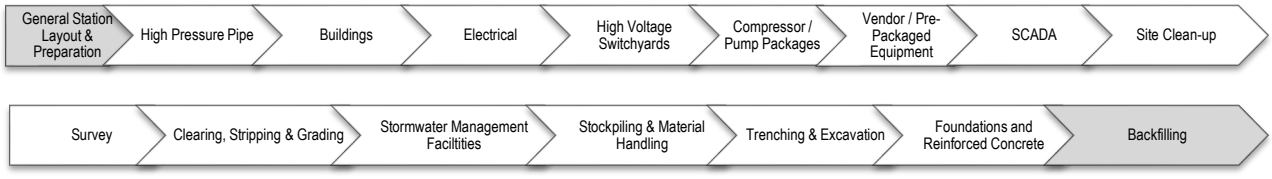
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to backfilling, such as:
	• Issued for Construction (IFC) Drawings, including
	  ○ Access Road Drawings
	  ○ Line List (e.g., special concerns for each Landowner) as they relate to temporary construction
	  ○ Civil and mechanical drawings
	• Backfill Specifications

	Contracts and agreements related to: • Road Use • Regulatory Approvals
	Permits related to: • Safe Work • Third Party Crossing Agreements • Confined Space Entry (as applicable)
	Owner Company specific Safety Plan, including (but not limited to): • Requirements for Personal Protective Equipment (PPE) • Emergency Medical Services (EMS)
	Project-specific Environmental Protection Plan (EPP) or equivalent, detailing backfilling requirements
	Other project-specific Plans, which may include: • Refer to project documentation for incremental specific requirements • Grading Plans • Stormwater Management Plan • Erosion and Sediment Control Plan • Unanticipated Discovery Plans

8.2.6.5 Best Practice for Environmental Inspection During Typical Backfilling Operations

Table 181: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Contractor's tailgate meetings (as required)



✓	Description
	• Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Ensure timber / swamp mats are used if ground conditions are unstable and low-ground pressure equipment cannot be used
	Prior to backfilling, ensure the trench has been inspected to make sure it is free of debris and wildlife

Table 182: Safety Concerns for Backfilling

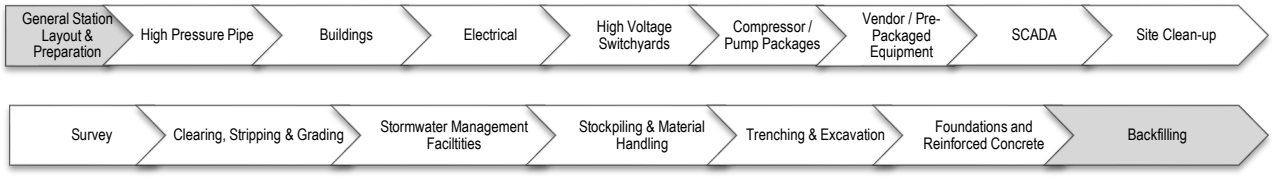
✓	Description
	There are no incremental specific Safety Concerns beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 183: Typical Monitoring Requirements – General

✓	Description
	Recommend minimizing the length of time the trench is left open to minimize trench sloughing
	Ensure all backfilling activities are confined to the facility site limits
	Ensure the facility site is left in as close to original condition (e.g., soil horizon, cross-section, elevation, cross drainage) as possible, or as per the Civil Grading Plan
	Ensure the correct backfilling sequence is used by the contractor
	Ensure that topsoil is never used as padding material or fill

Table 184: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
Backfill Material and Process	
	Ensure that the backfill material is soft, free from large rocks, stumps, frozen material, or any other foreign material that can dent the pipe or scratch the external coating
	Confirm that the Contractor uses only Owner Company-approved select / imported backfill
	Ensure any additional backfill required is obtained from the appropriate land authority, if applicable
	Follow project or Owner Company-specific requirements in instances where the pre-construction grade cannot be restored
	Check that contaminated backfill material is handled and disposed of according to relevant permits
	Ensure larger rocks (i.e., sizes too large for backfill) are hauled away or stacked neatly along the facility site limits as specified in Owner Company specifications, drawings, and Landowner agreements
	Ensure no machinery passes over the topsoil pile while backfilling spoil and prevent mixing of spoil with the topsoil pile
	Confirm that the Contractor is using auger / shaker bucket equipment for backfill where coarse fragments are encountered in trench materials
Final Backfilled Surface / Compaction	



✓	Description
	Ensure project or owner specifications are followed for feathering out excess spoil over salvaged area
	Ensure that the Contractor compacts the spoil in the trench so that the trench crown (berm) is no higher than specified by the Owner Company
	If possible, backfill and compact the trench in lifts in areas where no trench crown will be permitted
	Continually observe for sinkholes along the trench line
	Confirm that the Contractor will conduct a final clean-up when soils are dry and unfrozen; final clean-up should be delayed until spring when spoil can be adequately compacted in the trench and spoil and topsoil can be removed from the sod surface more accurately
Winter Construction	
	Ensure backfilling is completed prior to spring break-up
	If feasible, postpone compaction of frozen trench spoil till late spring or early summer
	If feasible, postpone feathering-out of excess spoil until after spring break-up
	Ensure solidified or frozen backfill is broken up with a screw auger, power dozer, or other approved equipment
	Ensure that any snow or ice is removed from the compacted layer prior to placement of subsequent layers
	Ensure appropriate erosion control measures are in place for trench spoil and any recontoured slopes, when working with frozen soils during winter conditions

Table 185: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
Trench Water Considerations During Backfill	
	Ensure drain tiles are installed per Owner Company specifications in areas where there is the potential for seepage into the trench
	Check that trench breakers are installed at the locations defined by the terrain and project specifications
	Confirm that the Contractor has installed and keyed in (i.e., embedded in the side of the ditch) trench breakers
	Ensure topsoil is not used as a trench breaker
	Ensure appropriate material (e.g., mix of bentonite and sand, or foam) is used for constructing trench breakers
Surface Water Drainage	
	Confirm that the Contractor has provided adequate water erosion protection (e.g., installing suitable geotextiles, earth-filled sacks, or rock riprap) where surface drainage crosses the trench line to prevent surface drainage from flowing down the trench line
	Ensure that overall drainage control measures are undertaken as advised by the line list
	Confirm that the Contractor re-contours graded portions of the facility as per IFC Drawings

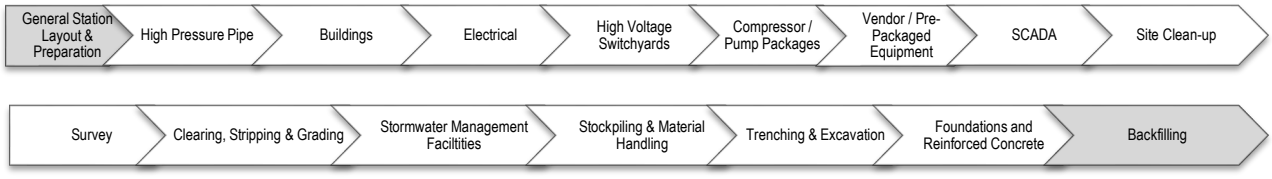


Table 186: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	There are no incremental specific monitoring requirements for air and noise pollution life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

8.2.6.6 Typical Outputs for Backfilling

Table 187: Typical Reporting Requirements

✓	Description
General	
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here
Daily	

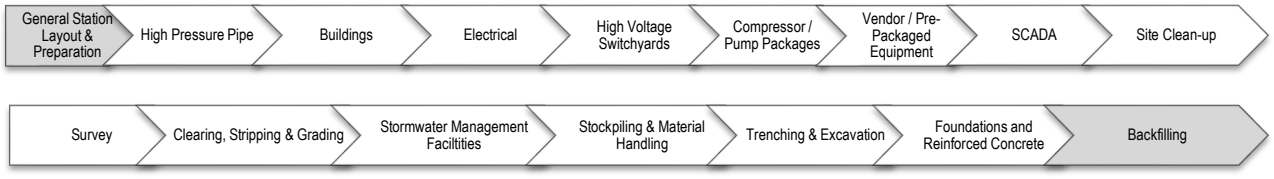
	Complete backfilling Environmental Inspection progress reports, including (but not limited to):
	• Work completed to date, including:
	  ○ Locations of permanent trench breakers
	  ○ Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters
	  ○ A record of any observations, events, and violations using a daily log, camera, and other technology
	• Documenting compliance with Project permit conditions, which includes:
	  ○ Updating the Environmental Commitment Tracking Tool
	All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

8.2.6.7 References – Backfilling

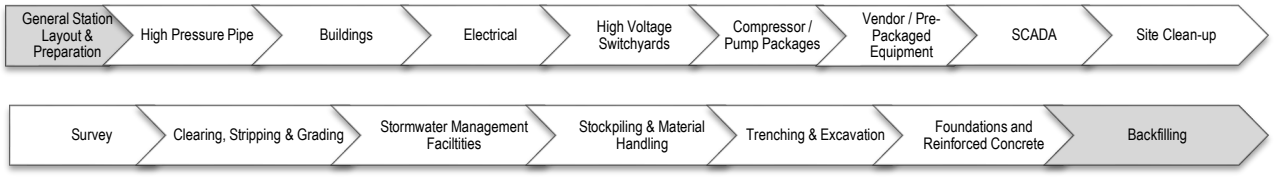
Note to user: The reference information provided in Table 188 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 188: List of References – Backfilling

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Facilities Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan



Document No.	Type	Title
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures



8.3 High Pressure Pipe

8.3.1 Overview

High pressure pipe and piping components are used for the transportation of hydrocarbons in gaseous or liquid form within a facility. High pressure pipe may also be used for power gas systems (e.g., gas-powered valve actuators) and supply feed to utility gas or fuel gas systems for gas turbines (if present). Components of these systems include, but are not limited to, inlet gas filter separators, blowdown, condensate, inlet piping, flow meters, pressure regulating devices, and scraper traps.

Construction of high-pressure pipe consists of the following major items during the construction of a facility:

- Trenching and Excavation
- Foundations and Reinforced Concrete
- Structural Steel
- Lifting and Setting
- Welding and Joining
- Coating / Painting
- Hydrostatic Testing
- Cathodic Protection

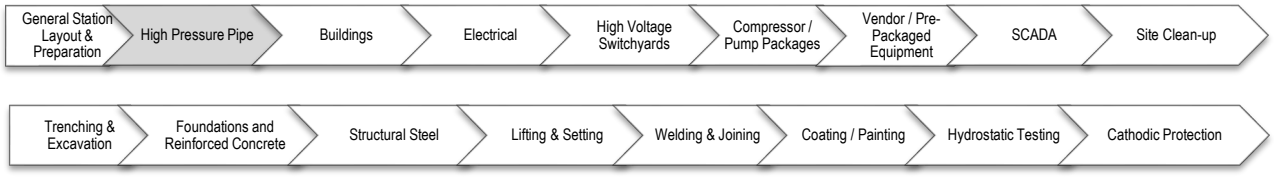
These items are presented within this section, roughly in the sequence of construction.

Foundations and Reinforced Concrete

Foundations and reinforced concrete are typically installed as part of the construction stage after trenching and excavation activities are completed. At this point, the general Inspector should continuously monitor that the following items are properly performed:

- Pile installation
- Formwork erection
- Reinforcing steel placement
- Concrete pouring and testing
- Handling and disposal of chemical agents (e.g. form release agents, blasting media)
- Concrete washouts
- Dust management during drilling or cutting

There are no incremental specific Environmental Inspector (EI) responsibilities for Foundations and Reinforced Concrete beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.



Structural Steel

Pipe racks are considered to be structural steel and need to be installed prior to the lifting and setting of high-pressure pipe. At this point, associated joints and connections of structural steel are also inspected.

There are no incremental specific EI responsibilities for Structural Steel beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.

Lifting and Setting

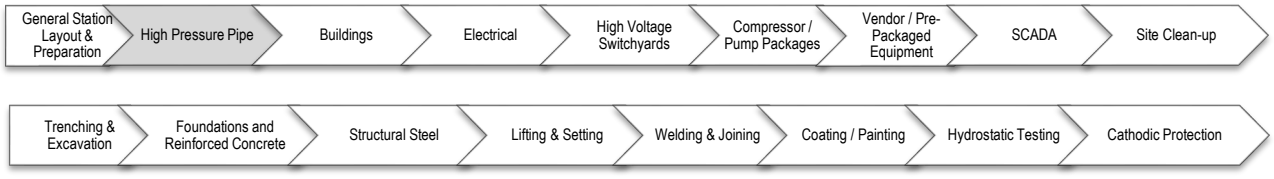
Lifting and setting involves the placement of pipe sections, assemblies, and other large components onto foundations, pipe supports, pipe racks, or into excavations. This activity requires specialized lifting equipment, trained Operators, and pre-planning.

There may be a need to remove accumulations of water from the partially or fully excavated trench as outlined in the Stormwater Management Plan. Please refer to A Practical Guide for Environmental Construction Inspectors – Ditching and Excavation, for EI responsibilities for trench dewatering. There are no incremental EI responsibilities for this construction activity, beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.

Welding and Joining

Welding is a process that uses fusion to join two or more materials together to become a manufactured or fabricated item. Welding during facilities construction is performed to join pipe, fittings, and valves together along with structural steel. In some cases, flanges are used to join lengths of pipe (e.g., needed for electrical isolation). These bolted joints require particular attention to ensure additional stresses are not imposed on the pipe.

A Welding Inspector is responsible for ensuring crews follow appropriate methods during welding operations. Welding requires specialized expertise, not just for the execution of the work but also inspection of the work. Therefore, welding inspection should only be performed by a Welding Inspector who has been qualified (e.g., American Welding Society Certified Welding Inspector) and has been specifically assigned this task. The Welding Inspector is typically responsible for joining activities as well. The Environmental Inspector (EI) supports the Welding Inspector by ensuring welding and joining operations do not have an adverse effect on the environment.



The EI's responsibilities during welding and joining include, but are not limited to:

- Maintaining the facility site by ensuring appropriate disposal of welding waste

Coating / Painting

Coating of the pipe sections, structural steel, and equipment assemblies provides a protective barrier against damage (e.g., corrosion). The majority of the coating operations will occur when the pipe is fabricated.

A Coating Inspector is responsible for ensuring crews follow appropriate methods during coating / painting operations. Coating requires specialized expertise, not just for the execution of the work but also for the inspection of the work. Therefore, coating inspection should only be performed by a Coating Inspector who has been qualified (e.g., AMPP (formerly NACE) CIP Level 2) and has been specifically assigned this task. The Environmental Inspector supports the Coating Inspector by ensuring coating / painting operations do not have an adverse effect on the environment.

The EI's responsibilities during coating include, but are not limited to:

- Ensure drips, spills, and/or overspray from coating operations are captured and cleaned up properly
- Maintain the ROW by ensuring that debris from grit blasting operations is contained and disposed of properly (if non-environmentally friendly blast media is used), and waste from coating operations is cleaned up and disposed of properly

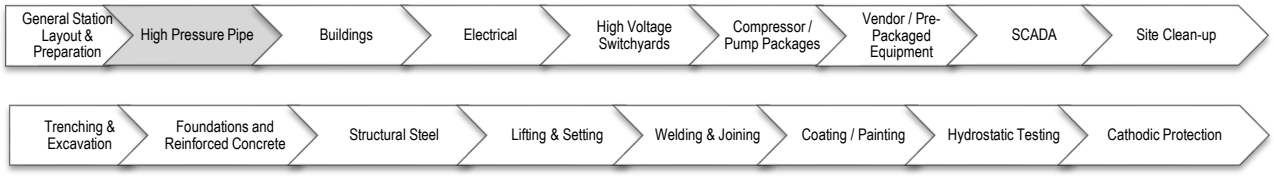
Hydrostatic Testing

A hydrostatic test is a form of pressure testing used to confirm that the pipe has acceptable strength and will not leak under operating conditions. Hydrostatic testing uses water or nitrogen to perform the test.

A Pressure Testing Inspector, sometimes referred to as a General or Craft Inspector, is responsible for ensuring crews follow appropriate methods during hydrostatic testing. The Environmental Inspector supports the Pressure Testing Inspector by ensuring hydrostatic testing operations do not have an adverse effect on the environment.

The EI's responsibilities during hydrostatic testing include, but are not limited to:

- Permitting for test water withdrawal and discharge



- Monitoring test water withdrawal and discharge to ensure the activities adhere to the permit requirements and minimize the impact on the surrounding environment and sensitive species (i.e., aquatic life, erosion, or sediment accumulation in sensitive areas)
- Monitoring for leaks or ruptures to contain and mitigate impacts from inadvertent water discharge
- Cleaning, testing, and disposal of associated waste when testing existing pipelines
- Sampling and reporting for test water withdrawal and discharge, as required

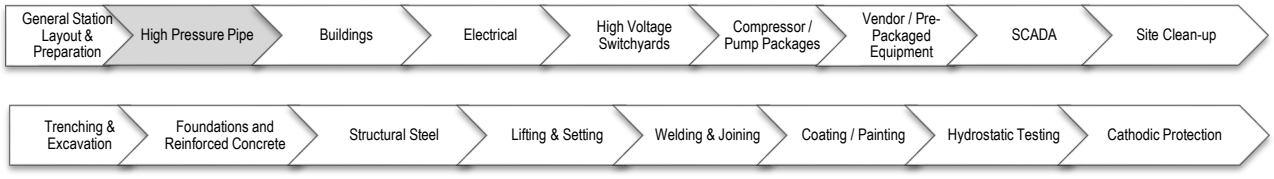
Cathodic Protection

Cathodic protection (CP) is a technique used to control corrosion of a pipeline's metal surface by making the pipeline the cathode of an electrochemical cell. In other words, CP is a simple method of protection where the pipeline is connected to a more easily corroded (sacrificial) metal (e.g., magnesium) which acts as the anode. The sacrificial metal then corrodes instead of the pipeline. However, for long pipelines, this passive galvanic cathodic protection is not adequate, and an external direct current (DC) electrical power source (rectifier) can be used to provide additional electrical current to protect the pipe.

A Maintenance (i.e., Integrity) Inspector, sometimes referred to as a General or Craft Inspector, is responsible for ensuring crews follow appropriate methods for installing cathodic protection on the pipeline. The Environmental Inspector supports the Maintenance Inspector by ensuring operations do not have an adverse effect on the environment.

The EI's responsibilities during cathodic protection activities include, but are not limited to:

- Ensuring cathodic protection installation has no adverse effects on the surrounding environment
- Ensuring a cathodic protection permit is included in EPP
- Reviewing potential environmental hazards associated with cathodic protection systems such as overhead DC power lines, deep well cathodic protection facilities, coke breeze installation fields, or other related cathodic protection installations, where applicable



8.3.2 Welding and Joining

8.3.2.1 Inputs

As part of preparing for Environmental Inspection during welding and joining, the Environmental Inspector (EI) will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company-technical specifications as identified in Table 190.

8.3.2.2 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the welding and joining process are identified in a series of checklists as detailed in Table 189.

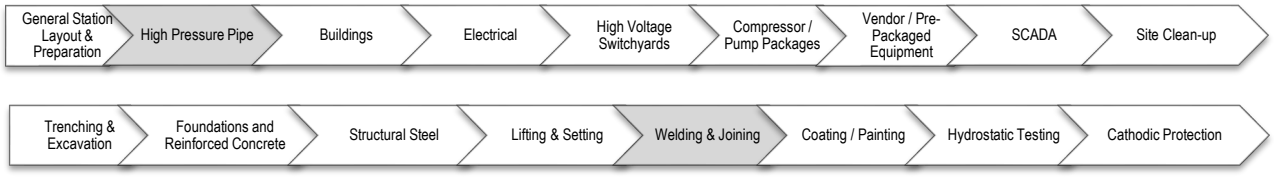
Table 189: Monitoring Requirements for Welding and Joining

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 191
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 192
General	• Identify general items that should be monitored throughout the welding and joining process	Table 193
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 194
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 195
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 196

8.3.2.3 Outputs

The EI is required to report on workmanship and progress on a periodic basis (e.g., daily, weekly) by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for welding and joining appear in Table 197.

Detailed Checklists – Welding and Joining



8.3.2.4 Typical Input Requirements for Welding and Joining Environmental Inspection

Table 190: Information Requirements for Welding and Joining

✓	Description
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to welding and joining, such as: • Issued for Construction (IFC) Drawings, including: ○ Piping and Instrumentation Diagrams (P&IDs)
	Owner Company-specific Safety Plan, including (but not limited to): • Requirements for Personal Protective Equipment (PPE) • Emergency Medical Services (EMS)
	Project-specific Environmental Protection Plan (EPP) or equivalent, detailing welding and joining requirements
	Other project-specific Plans, which may include: • Worksite Welding and Joining Plan

8.3.2.5 Best Practice for Environmental Inspection During Typical Welding and Joining Operations

Table 191: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Ensure timber / swamp mats are used if ground conditions are unstable and low-ground pressure equipment cannot be used
	Inspect the open trench and pipe for debris or trapped animals and ensure removal before commencing work

Table 192: Safety Concerns for Welding

✓	Description
	During periods of high fire hazards, ensure welding crews have sufficient fire suppression capability during welding activities

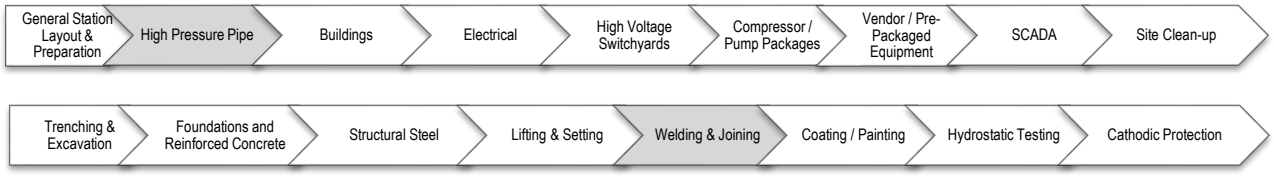


Table 193: Typical Monitoring Requirements – General

✓	Description
	There are no incremental monitoring requirements for general Environmental Inspection beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 194: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
	Ensure welding and joining are done prior to trenching at locations prone to sloughing, when feasible
	Recommend minimizing the length of time the trench is left open during welding and joining to minimize trench sloughing
	Ensure the continued use of end caps to prevent wildlife from becoming confined or trapped in the pipe
	Ensure proper disposal of welding and joining related debris (e.g., bevel shavings, weld rod ends)
	Ensure proper fire watches and fire suppression equipment are on-site during dry conditions or in elevated fire danger areas
	Ensure erosion and sediment controls are properly maintained, and replaced as necessary in accordance with Project plans and permit conditions

Table 195: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
	There are no incremental specific monitoring requirements for watercourses, wetlands, and aquatic life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

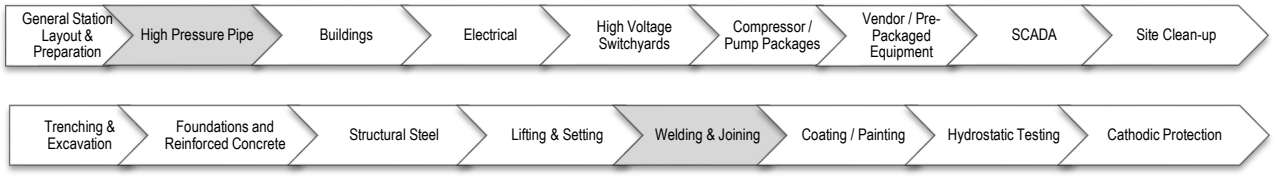
Table 196: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	There are no incremental specific monitoring requirements for air and noise pollution life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

8.3.2.6 Typical Outputs for Welding and Joining

Table 197: Typical Reporting Requirements

✓	Description
General	
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here.
Daily	
	Complete welding and joining Environmental Inspection progress reports, including (but not limited to): • Work completed to date, including: ○ Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters.



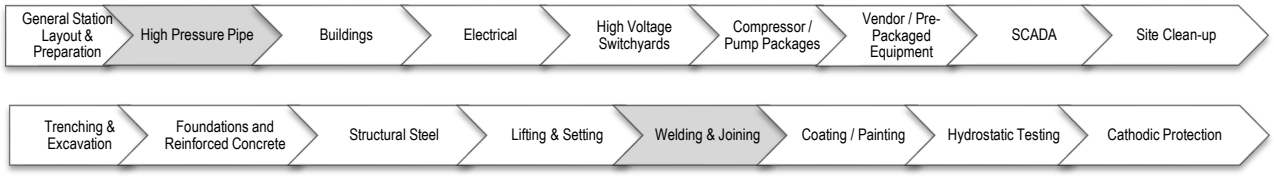
	○ A record of any observations, events, and violations using a daily log, camera, and other technology • Documenting compliance with Project permit conditions, which includes: ○ Updating the Environmental Commitment Tracking Tool All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

8.3.2.7 References – Welding and Joining

Note to user: The reference information provided in Table 198 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 198: List of References – Welding and Joining

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Facilities Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures



8.3.3 Coating / Painting

8.3.3.1 Inputs

As part of preparing for Environmental Inspection during coating / painting, the Environmental Inspector (EI) will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 200.

8.3.3.2 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the coating / painting process are identified in a series of checklists as detailed in Table 199.

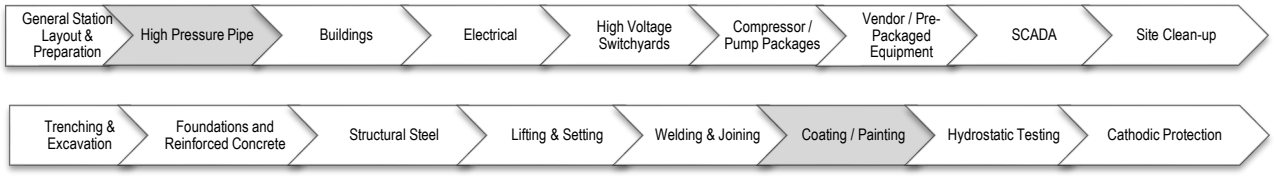
Table 199: Monitoring Requirements for Coating / Painting

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 201
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 202
General	• Identify general items that should be monitored throughout the coating / painting process	Table 203
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 204
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 205
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 206

8.3.3.3 Outputs

The EI is required to report on workmanship and progress on a periodic basis (e.g., daily, weekly) by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for coating / painting appear in Table 207.

Detailed Checklists – Coating / Painting



8.3.3.4 Typical Input Requirements for Coating / Painting Environmental Inspection

Table 200: Information Requirements for Coating / Painting

✓	Description
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to coating / painting, such as: • Coating / Painting Procedures • Coating / Painting Specifications • Manufacturer-supplied Information (e.g., storage and handling requirements) • Safety Data Sheet (SDS) for Coating, Painting, Blasting, and Preparation Materials
	Contracts and agreements related to: • Coating / Painting Application • Handling and Disposal of Waste
	Owner Company specific Safety Plan, including (but not limited to): • Requirements for Personal Protective Equipment (PPE) • Emergency Medical Services (EMS)
	Project-specific Environmental Protection Plan (EPP) or equivalent, detailing coating / painting requirements
	Other project-specific Plans, which may include: • Worksite Coating / Painting Plan • Unanticipated Discovery Plan

8.3.3.5 Best Practice for Environmental Inspection During Typical Coating / Painting Operations

Table 201: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Ensure timber / swamp mats are used if ground conditions are unstable and low-ground pressure equipment cannot be used

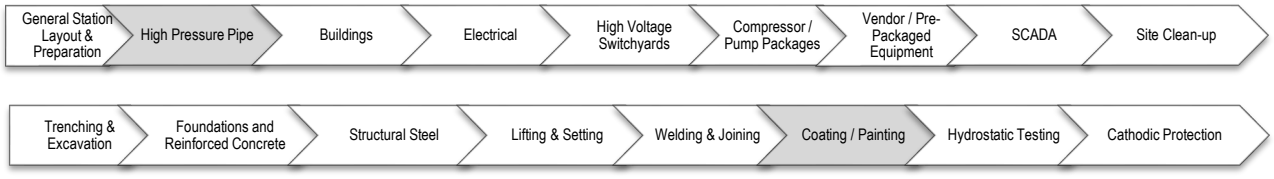


Table 202: Safety Concerns for Coating / Painting

✓	Description
	Verify protection is in place to prevent blast media from entering valves, pipe, fittings and appurtenances, wetlands, waterways, or mixing with native soil material
	Ensure plans are in place for the handling, labeling, storage, and disposal of contaminated and/or hazardous materials (e.g., lead-containing coatings removed from existing facilities)

Table 203: Typical Monitoring Requirements – General

✓	Description
	Monitor for spills associated with coating / painting materials and ensure clean-up of any spills is completed
	Ensure that coating and painting related materials and debris (e.g., gloves, brushes, rollers, containers, overspray barriers) including hazardous waste products are handled, stored, labeled, and disposed of appropriately

Table 204: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
	Review site-specific requirements for blast media including the method of containing, collecting, and disposing of debris from grit blasting operations (if non-environmentally friendly blast media is used)
	Ensure effective measures are in place to block overspray when using spray or paint-on coatings where required by EPP
	General housekeeping of coating-related debris (e.g., gloves, brushes, rollers, containers, overspray) including proper disposal of waste products

Table 205: Typical Monitoring Requirements for Watercourses, Wetlands and Aquatic Life

✓	Description
	There are no incremental specific monitoring requirements for watercourses, wetlands, and aquatic life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

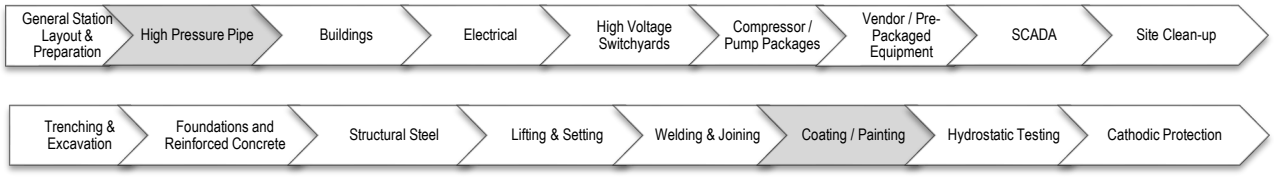
Table 206: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	Ensure that mitigation measures are in place to manage fugitive dust, particulates, and VOCs from open –to- air blasting and painting activities

8.3.3.6 Typical Outputs for Coating / Painting

Table 207: Typical Reporting Requirements

✓	Description
General	



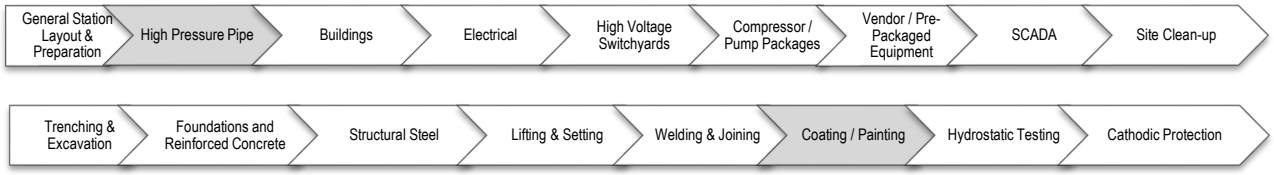
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here
Daily	
	Complete coating / painting Environmental Inspection progress reports, including (but not limited to): • Work completed to date, including: o Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters o A record of any observations, events, and violations using a daily log, camera, and other technology • Documenting compliance with Project permit conditions, which includes: o Updating the Environmental Commitment Tracking Tool All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

8.3.3.7 References – Coating / Painting

Note to user: The reference information provided in Table 208 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 208: List of References – Coating / Painting

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Facilities Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures



8.3.4 Hydrostatic Testing

8.3.4.1 Inputs

As part of preparing for Environmental Inspection during hydrostatic testing, the Environmental Inspector (EI) will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 210.

8.3.4.2 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the hydrostatic testing process are identified in a series of checklists as detailed in Table 209.

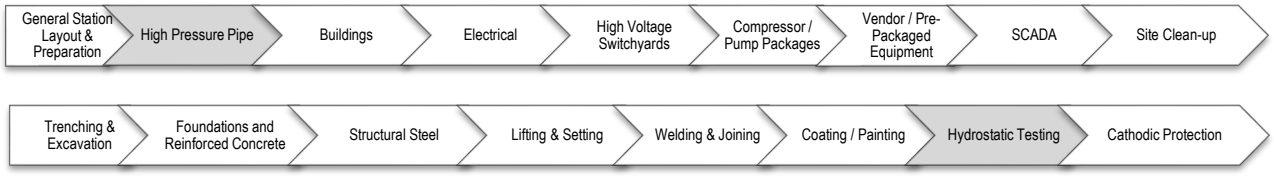
Table 209: Monitoring Requirements for Hydrostatic Testing

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 211
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 212
General	• Identify general items that should be monitored throughout the hydrostatic testing process	Table 213
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 214
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 215
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 216

8.3.4.3 Outputs

The EI is required to report on workmanship and progress on a periodic basis (e.g., daily, weekly) by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for hydrostatic testing appear in Table 217.

Detailed Checklists – Hydrostatic Testing



8.3.4.4 Typical Input Requirements for Hydrostatic Testing Environmental Inspection

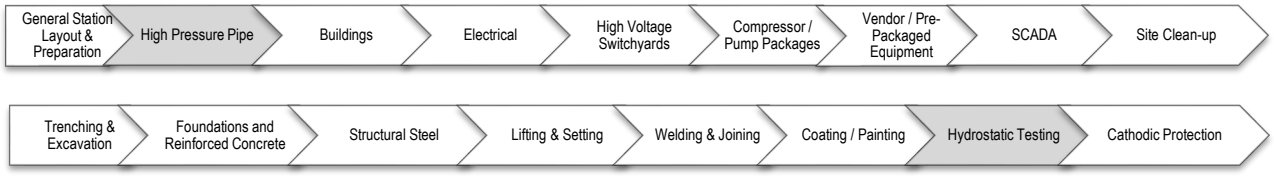
Table 210: Information Requirements for Hydrostatic Testing

✓	Description

	All designs, drawings, and specifications developed by the Owner Company and Contractors related to hydrostatic testing, such as:
	• Issued for Construction (IFC) Drawings, including:
	  ○ Piping and Instrumentation Diagrams (P&IDs)
	  ○ Isometric Drawings
	  ○ Line List (e.g., special concerns for each Landowner) as applicable to temporary construction
	  ○ For Facility Piping, tabulated test pressures, duration, and radiography requirements
	• Pipeline Facility Drawings
	• Drawings Specific to Hydrostatic Test
	  ○ Ensure dewatering structures are appropriately sized and monitored appropriately

	Contracts and agreements related to: • Road Use • Construction Survey • Environmental Reports • Cultural Surveys
	Permits related to: • Environmental conditions and/or commitments • Water Withdrawal and Discharge Commitments
	Owner Company-specific Safety Plan, including (but not limited to): • Traffic Control Plan • Specified Minimum Setback Distance for Personnel and Testing Equipment • Requirements for Personal Protective Equipment (PPE) • Emergency Medical Services (EMS) • Emergency Contact List
	Project-specific Environmental Protection Plan (EPP) or equivalent, detailing hydrostatic testing requirements

	Other project-specific Plans, which may include:
	• Hydrostatic Test Plan addressing (but not limited to) the following items:
	  ○ Site-specific safety and/or hazards and appropriate analysis
	  ○ Emergency Response Plan in the event of a rupture during the test
	  ○ Test water sourcing, filling, pressurizing, depressurizing, and dewatering
	  ○ Hydrostatic testing warning signage
	  ○ Provision of protective berms around fuel storage used to supply fuel-driven line fill pumps (as required)
	  ○ Sampling protocol
	• Stormwater Management Plan
	• Erosion and Sediment Control Plan



8.3.4.5 Best Practice for Environmental Inspection During Typical Hydrostatic Testing Operations

Table 211: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work • Company-specific sampling protocol
	Check the signage and contact information at public access points to the facility site, and if required, temporarily restrict access points
	Ensure stormwater management plans are in place
	Ensure that test water withdrawal and disposal notifications, registrations, approvals, and/or permits are in place
	Ensure that the required water source volumes and flow rates meet regulatory conditions
	Prior to and upon completion of a hydrostatic test, ensure that the local authorities are alerted, if required
	Ensure permits are reviewed before additives are added to the water
	Ensure final discharge sites have been approved

Table 212: Safety Concerns for Pressure Testing

✓	Description
	Familiarize yourself with safety zones around test heads / pigging launchers and receivers and ensure they are maintained throughout the operation
	Avoid travel in the facility site in sections that are under active pressure testing

Table 213: Typical Monitoring Requirements – General

✓	Description
	Ensure all hydrostatic testing activities are confined to the facility site or approved workspace (e.g., at the discharge site)
	Ensure removal and proper disposal of hydrostatic testing-related debris from the facility site
	Ensure that the facility site is left in as close to original condition as possible following hydrostatic testing operations

Table 214: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
	Ensure all stationary equipment (e.g., pumps, generators, fuel containers) have measures in place to prevent spills onto soils (e.g., secondary containment, polyethylene sheeting)

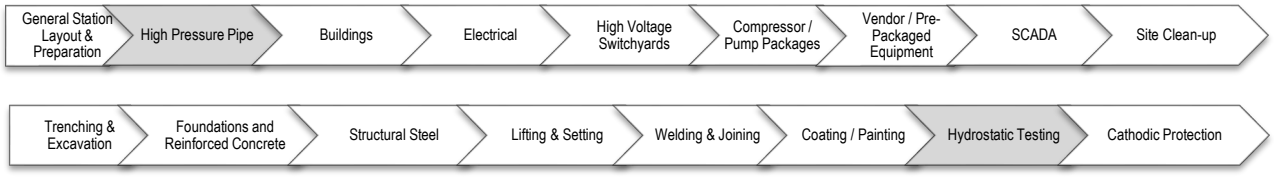
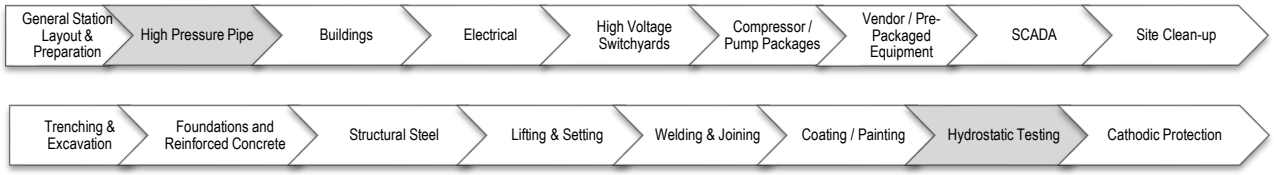


Table 215: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
	Ensure all stationary equipment (e.g., pumps, generators, fuel containers) within specified distances from a watercourse or water body are in secondary containment
	Ensure all equipment to be used within specified distances from a watercourse or water body is clean and free of leaks, and equipped with approved spill kits
	Ensure that appropriate containment is installed for receipt of any cleaning / drying pigs
	Ensure testing equipment has been properly cleaned to prevent the transfer of waterborne invasive / noxious species
Withdrawing Test Water	
	Ensure that the Contractor withdraws test water from locations approved in the water permit or the Environmental Protection Plan (EPP) or equivalent and not from environmentally sensitive areas to the extent practical
	Ensure water withdrawal sources have sufficient quantity and quality of water (e.g., avoid highly saline sources) for the pressure test
	Ensure proper use of screens to prevent entrapment of fish or wildlife and any debris during water withdrawal
	When withdrawing water from a fish-bearing waterbody, ensure applicable approvals are in place and instream restricted activity periods are adhered to
	Confirm that the test water is collected and sent to the laboratory for testing so that results are available in a timely manner
	Confirm that a portable laboratory for testing the water quality is available (if required)
	Ensure water tanks are thoroughly clean inside when used for transporting test water
	Ensure the withdrawal rate adheres to the limits in the permit and project or Owner Company specifications; do not exceed permitted withdrawal rates without regulatory approval
	Ensure project or company specifications are adhered to when using additives (e.g., methanol) in the test water; if possible, minimize the use of additives
	Ensure all conditions outlined in applicable permits for water withdrawal are adhered to
Pressure Testing	
	Ensure contingency measures are adhered to when spills or leaks occur
Dewatering the Pipe	
	Ensure that the Contractor dewaters to locations approved in the water permit, the Environmental Protection Plan (EPP), or equivalent, and avoid dewatering to environmentally sensitive areas (e.g., steep slopes) to the extent practical
	Ensure all conditions outlined in applicable permits for water discharge are adhered to including approved discharge rates and locations (e.g., direct discharge back to the source following testing, discharge into an energy dissipation structure located in a suitable upland location)
	Ensure test water withdrawn from one basin is not discharged into another drainage basin to prevent the transfer of aquatic organisms
	Ensure that the Contractor does not dewater until proper sampling is completed and a filtration unit is in place (if required)
	Ensure water with chemical additive is sampled and treated prior to discharging at approved location and/or sites
	Ensure that the Contractor installs an energy-absorbing diffuser at the discharge end of the dewatering line to prevent erosion, bottom scour, or damage to vegetation



✓	Description
Drying the Pipe	
	Ensure drying agents (e.g., methanol) are appropriately contained, captured, and disposed of at approved sites

Table 216: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	Maintain compressors for evaporative drying at appropriate decibel levels respective to applicable time of day restrictions
	Ensure dust containment is in place as necessary (i.e. if drying with air)

8.3.4.6 Typical Outputs for Hydrostatic Testing

Table 217: Typical Reporting Requirements

✓	Description
General	
	Submit reporting for test water withdrawal and discharge, if necessary
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here
Daily	

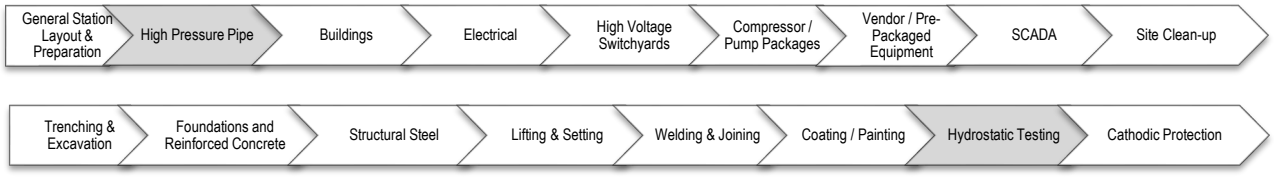
	Complete hydrostatic testing Environmental Inspection progress reports, including (but not limited to):
	• Work completed to date, including:
	  ○ Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters
	  ○ A record of any observations, events, and violations using a daily log, camera, and other technology
	• Documenting compliance with Project permit conditions, which includes:
	  ○ Updating the Environmental Commitment Tracking Tool
	All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

8.3.4.7 References – Hydrostatic Testing

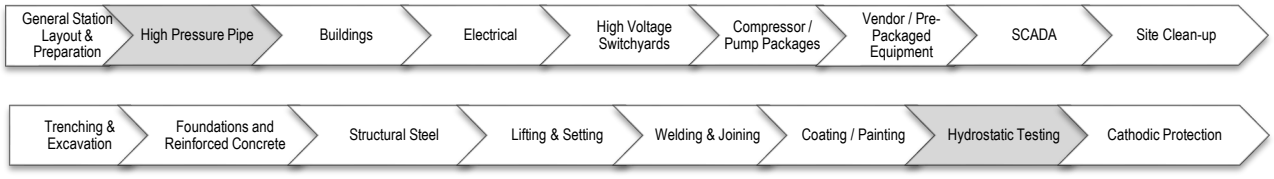
Note to user: The reference information provided in Table 218 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 218: List of References – Hydrostatic Testing

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		



Document No.	Type	Title
N/A	Practical Guide	A Practical Guide for Pipeline Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures



8.3.5 Cathodic Protection

8.3.5.1 Inputs

As part of preparing for Environmental Inspection during Cathodic Protection (CP) installation, the Environmental Inspector (EI) will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 220.

8.3.5.2 Execution

While the work is being executed, the EI is required to monitor workmanship and construction progress. Typical items that the EI will monitor for during the cathodic protection installation process are identified in a series of checklists as detailed in Table 219.

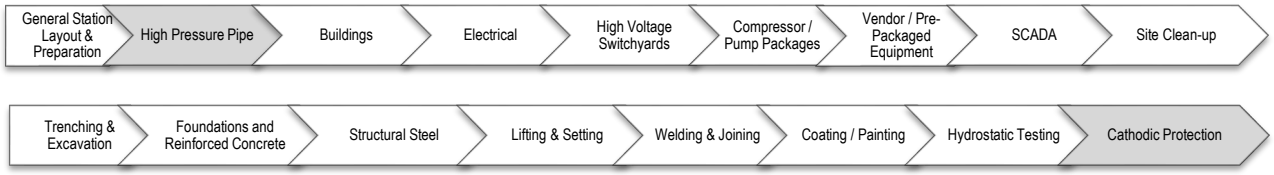
Table 219: Monitoring Requirements for Cathodic Protection

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 221
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 222
General	• Identify general items that should be monitored throughout the cathodic protection installation process	Table 223
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 224
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 225
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 226

8.3.5.3 Outputs

The EI is required to report on workmanship and progress on a periodic basis (e.g., daily, weekly) by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for cathodic protection installation appear in Table 227.

Detailed Checklists – CP



8.3.5.4 Typical Input Requirements for Cathodic Protection Environmental Inspection

Table 220: Information Requirements for Cathodic Protection

✓	Description

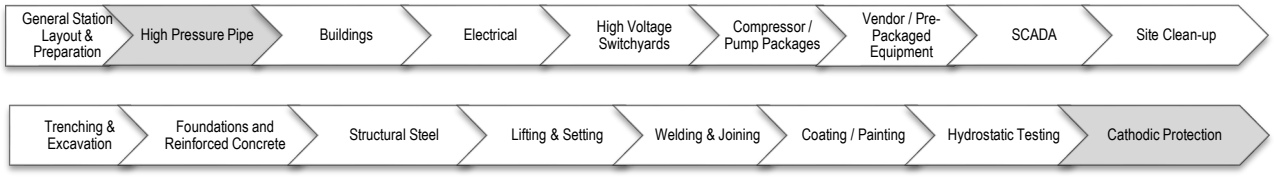
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to cathodic protection installation, such as:
	• Issued for Construction (IFC) Drawings, including:
	  ○ Access Road Drawings
	  ○ Line List (e.g., special concerns for each Landowner)
	  ○ Ground Bed Installation Details
	  ○ Rectifier Installation Details
	  ○ Isolation Kit Installation Details
	• Locations and Types of Ground Beds and Anodes

	Contracts and agreements related to: • Road Use
	Permits related to: • Environmental Conditions and/or Commitments • Road Use • Wells
	Owner Company specific Safety Plan, including (but not limited to): • Traffic Control Plan • Requirements for Personal Protective Equipment (PPE) • Emergency Medical Services (EMS)
	Project-specific Environmental Protection Plan (EPP) or equivalent
	Other project-specific Plans, which may include: • Cathodic Protection and Installation • Fire Prevention / Fire Fighting

8.3.5.5 Best Practice for Environmental Inspection During Typical CP Operations

Table 221: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Contractor's tailgate meetings (as required)



✓	Description
	• Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Review potential environmental hazards associated with cathodic protection systems such as overhead DC power lines, deep well cathodic protection facilities, coke breeze installation fields, or other related cathodic protection installations, where applicable

Table 222: Safety Concerns for Cathodic Protection

✓	Description
	During periods of high fire hazards, ensure crews have sufficient fire suppression capability during cathodic protection installation

Table 223: Typical Monitoring Requirements – General

✓	Description
	Ensure all cathodic protection installation activities are confined to the facility site or approved ground bed locations
	Ensure removal and proper disposal of cathodic protection installation-related debris from the facility site
	Ensure that the facility site is left in as close to original condition as possible

Table 224: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

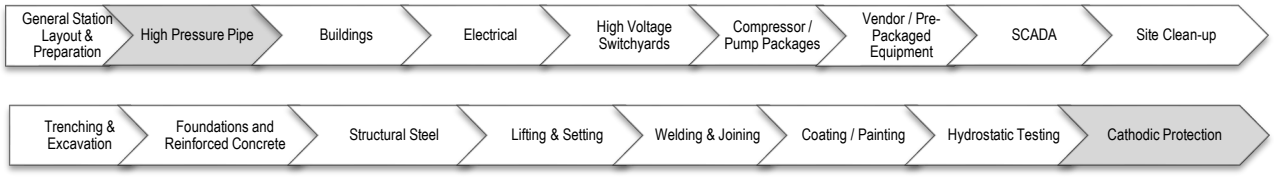
✓	Description
	Ensure the location of ground beds have no adverse effect on the soil, vegetation, and terrestrial life
	Ensure the ground bed materials have no anticipated adverse effect on the surrounding soil, vegetation, and terrestrial life
	Confirm that the Contractor re-contours graded portions of the facility site or ground bed locations to match the surrounding landforms and drainage patterns, if required

Table 225: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
	There are no incremental specific monitoring requirements for watercourses, wetlands, and terrestrial life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 226: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	There are no incremental specific monitoring requirements for air and noise pollution life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information



8.3.5.6 Typical Outputs for CP

Table 227: Typical Reporting Requirements

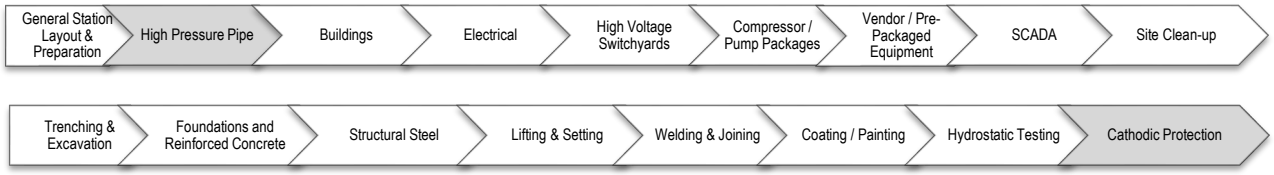
✓	Description
General	
	Please refer to A Practical Guide for Environmental Construction Inspector – Foundational Information for additional reporting requirements beyond those identified here.
Daily	
	Complete cathodic protection Environmental Inspection progress reports, including (but not limited to): • Work completed to date, including: o Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters o A record of any observations, events, and violations using a daily log, camera, and other technology • Documenting compliance with Project permit conditions, which includes: o Updating the Environmental Commitment Tracking Tool All reports along with any punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

8.3.5.7 References – Cathodic Protection

Note to user: The reference information provided in Table 228 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 228: List of References – Cathodic Protection

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Pipeline Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures



8.4 Buildings

8.4.1 Overview

Buildings, in the context of a facility, include all of the structures on the site regardless of whether they are used to house equipment or personnel.

Construction of buildings consists of the following major items during the construction of a facility:

- Foundations and Reinforced Concrete
- Structural Steel
- Welding and Joining (refer to Section 8.3.2)
- Coating / Painting (refer to Section 8.3.3)
- Lifting and Setting
- Utility Power (AC Electrical Systems)
- Heating, Ventilation, and Air Conditioning (HVAC)
- Fire Suppression and Domestic Systems
- Building Lighting

These items are presented within this section, roughly in the sequence of construction.

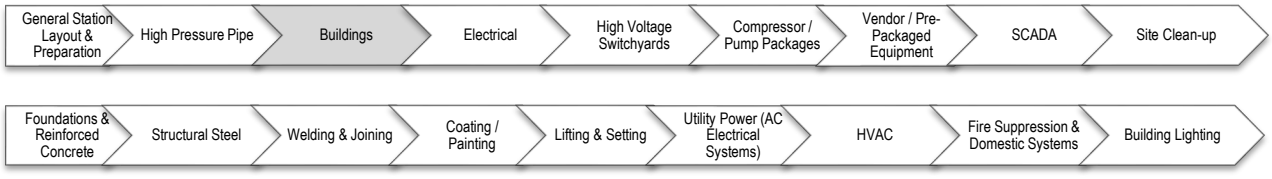
Foundations and Reinforced Concrete

Foundations and reinforced concrete are typically installed as part of the construction stage after trenching and excavation activities are completed. At this point, the General Inspector should continuously monitor that the following items are properly performed:

- Pile installation
- Formwork erection
- Reinforcing steel placement
- Concrete pouring and testing

There are no incremental specific Environmental Inspector (EI) responsibilities for Foundations and Reinforced Concrete beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information. However, there may be EI responsibilities related to containment, treatment, and disposal of waste from concrete washouts.

Structural Steel



All buildings within a facility, regardless of function, have a structural component that is typically constructed of steel. At this stage, the steel structure is erected along with the building envelope (i.e., external cladding), as well as vent bracing. The joints and connections associated with structural steel are also inspected.

There are no incremental specific EI responsibilities for Structural Steel beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.

Lifting and Setting

Lifting and setting involves the placement of prefabricated buildings and structural steel onto foundations or into excavations. This activity requires specialized lifting equipment, trained Operators, and pre-planning.

There are no incremental specific EI responsibilities for Lifting and Setting beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.

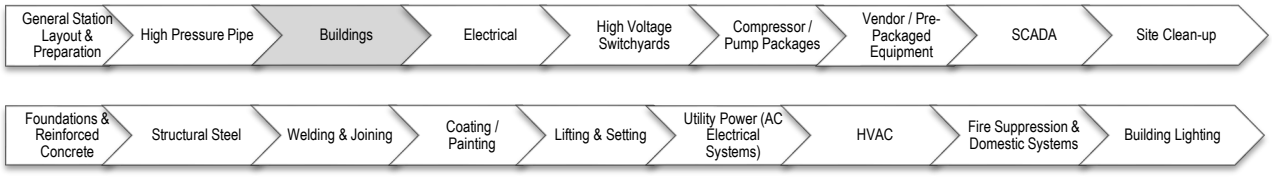
Alternating Current (AC) Electrical Systems

AC electrical systems (e.g., utility power) include but are not limited to the following main components:

- Distribution Panels
- Transformers
- Motor Control Centers (MCCs)
- Automatic Transfer Switches
- Uninterruptible Power Supply (UPS)
- Motors
- Standby Generators
- Lighting

There are no incremental specific EI responsibilities for Alternating Current (AC) Electrical Systems beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information. However, EI responsibilities may be related to material storage, labeling, and monitoring for contaminants (e.g., leaks from transformers or motors).

Heating, Ventilation, and Air Conditioning (HVAC)



HVAC systems are installed to provide an appropriate environment (e.g., temperature, air quality) for both workers and equipment within a facility. The bulk of the inspection activity is focused on the Mechanical discipline; however, EI responsibilities may exist during commissioning activities where refrigerant venting is a risk.

There are no incremental specific EI responsibilities for HVAC beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.

Fire Suppression and Domestic Systems

Fire suppression and domestic systems are typically some of the last items installed during building construction. Fire suppression systems are installed in order to extinguish or prevent the spread of potential fires in buildings, with the bulk of the inspection activity focused on the electrical discipline.

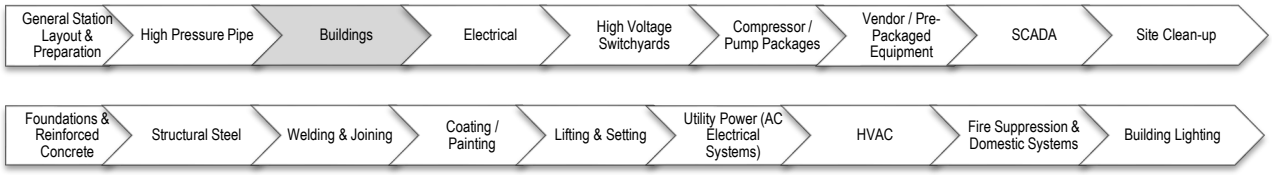
Domestic systems include domestic water and sanitary sewer systems within buildings, with the bulk of the inspection activity focused on the Mechanical discipline. Domestic water is water supplied to buildings for indoor and outdoor use. Sanitary sewer systems essentially contain the building's sanitary drain line, holding and processing tanks, and field percolation system (if required).

There are no incremental specific EI responsibilities for Fire Suppression and Domestic Systems beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.

Building Lighting

Building and yard lighting provide adequate illumination to perform tasks safely in hazardous and non-hazardous environments. If the failure of normal lighting poses a hazard to personnel or interferes with plant operations, emergency lighting is provided. The bulk of the inspection activity is focused on the electrical discipline. However, the Environmental Inspector may have direct involvement with the disposal of old lighting materials such as fluorescent bulbs.

There are no incremental specific EI responsibilities for Building Lighting beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.



8.5 Electrical

8.5.1 Overview

Low-voltage electrical systems and controls are typically installed as part of the construction stage after the erection of buildings and their components.

Electrical installation consists of the following major items during the construction of a facility:

- Alternating Current (AC) Electrical Systems
- Electrical Controls and Instrumentation
- Grounding

Alternating Current (AC) Electrical Systems

AC electrical systems (e.g., utility power) include but are not limited to the following main components:

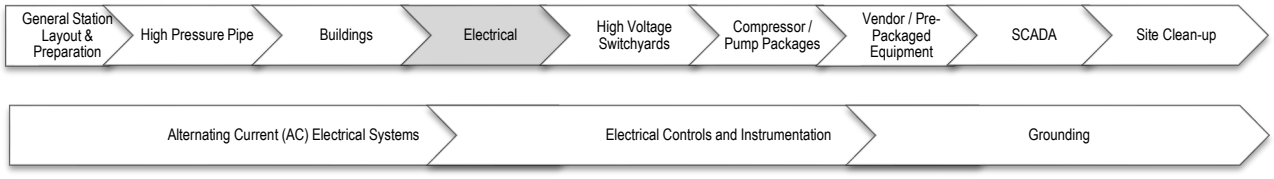
- Distribution Panels
- Transformers
- Motor Control Centers (MCCs)
- Automatic Transfer Switches
- Uninterruptible Power Supply (UPS)
- Motors
- Standby Generators
- Lighting

There are no incremental specific Environmental Inspector (EI) responsibilities for Alternating Current (AC) Electrical Systems beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.

Electrical Controls and Instrumentation

All facilities have varying levels of electrical controls and instrumentation. Most controls are electrical in nature, both AC and DC, and may also include pneumatics such as compressed air or natural gas. Electrical controls and instrumentation are vital components used in Supervisory Control and Data Acquisition (SCADA) and/or Human-Machine Interface (HMI) systems.

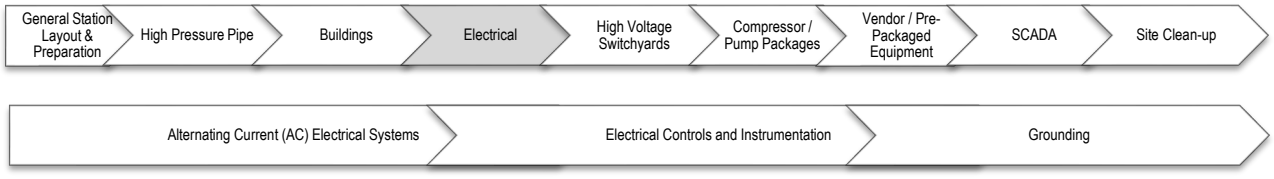
There are no incremental specific EI responsibilities for Electrical Controls and Instrumentation beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.



Grounding

Grounding is a safety measure where electrically operated equipment is connected to the earth as a means of reducing electrical hazards to workers due to potentially dangerous conditions (e.g., short circuits). The station grounding system consists of the existing station grounding and any additional grounding loops.

There are no incremental specific EI responsibilities for Grounding beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.



8.6 High Voltage Switchyards

8.6.1 Overview

High voltage switchyards are used to step down high voltage power to an appropriate voltage for use within the facility.

Construction of high voltage switchyards consists of the following major items during the construction of a facility:

- Foundations and Reinforced Concrete
- Structural Steel
- Welding and Joining (refer to Section 8.3.2)
- Coating / Painting (refer to Section 8.3.3)
- Lifting and Setting
- Switchgear

These items are presented within this section, roughly in sequence of construction.

Foundations and Reinforced Concrete

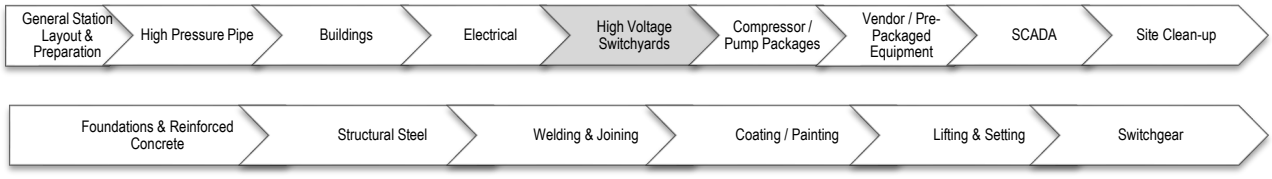
Foundations and reinforced concrete are typically installed as part of the construction stage after trenching and excavation activities are completed. At this point, the General Inspector should continuously monitor that the following items are properly performed:

- Pile installation
- Formwork erection
- Reinforcing steel placement
- Concrete pouring and testing

There are no incremental specific Environmental Inspector (EI) responsibilities for Foundations and Reinforced Concrete beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.

Structural Steel

Depending on the nature of the facility, high voltage switchyards may use equipment that requires structural support. Structural steel is typically installed as part of the construction stage prior to the lifting and setting of equipment. At this point, associated joints and connections of structural steel are also inspected.



There are no incremental specific EI responsibilities for Structural Steel beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.

Lifting and Setting

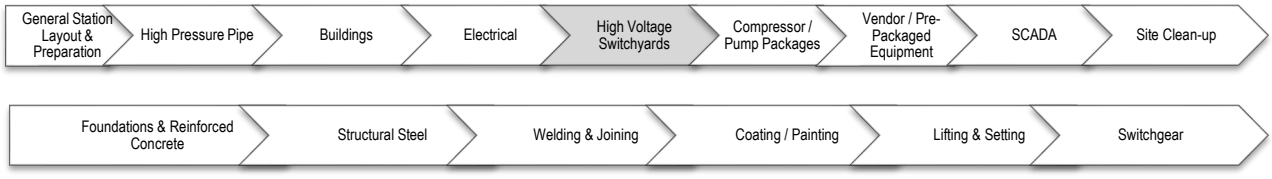
Lifting and setting involves the placement of equipment onto foundations or into excavations. This activity requires specialized lifting equipment, trained Operators, and pre-planning.

There are no incremental specific EI responsibilities for Lifting and Setting beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.

Switchgear

Switchgear is a generic term for the combination of electrical components (e.g., fuses, circuit breakers, switches, control panels, relays, transformers) that are used to control, protect, and isolate electrical equipment.

There are no incremental specific EI responsibilities for Switchgear beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.



8.7 Compressor / Pump Packages

8.7.1 Overview

Compressors (for gaseous products) and pumps (for liquid products) are devices that are used to increase the pressure of the product so that it flows down the pipe.

Installation of compressor and pump packages consists of the following major items during the construction of a facility:

- Foundations and Reinforced Concrete
- High Pressure Pipe (refer to Section 8.3)
- Structural Steel
- Lifting and Setting
- Electrical Controls and Instrumentation
- Installation of permanent containment berms and storage facilities for hazardous materials

Note that connections to compressor / pump packages are within the scope of this document; however, connections for components within these packages are typically inspected by the Vendor and therefore outside the scope of this document.

Containment Berms and Hazardous Materials Storage

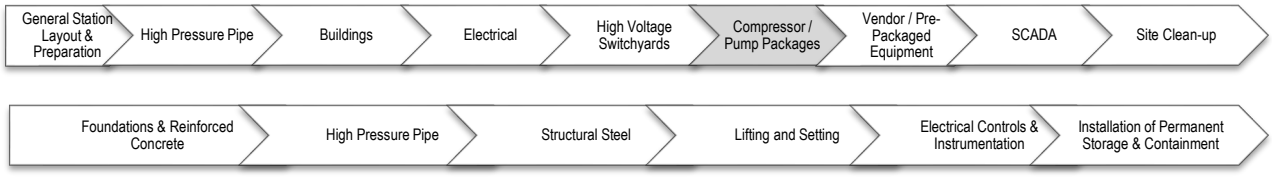
These may be concrete or earthen berms used to contain any product from the facilities that may inadvertently escape during normal operations. Berms or storage facilities may be required for the handling and storage of hazardous materials / fluids required for the compressor or pump packages.

There are no incremental specific Environmental Inspector (EI) responsibilities for containment berms and hazardous material storage beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.

Foundations and Reinforced Concrete

Foundations and reinforced concrete are typically installed as part of the construction stage after trenching and excavation activities are completed. At this point, the General Inspector should continuously monitor that the following items are properly performed:

- Pile installation
- Formwork erection
- Reinforcing steel placement



- Concrete pouring and testing

There are no incremental specific EI responsibilities for Foundations and Reinforced Concrete beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.

Structural Steel

All buildings within a facility, regardless of function, have a structural component that is typically constructed of steel. At this stage, the steel structure is erected along with the building envelope (i.e., external cladding), as well as vent bracing. The joints and connections associated with structural steel are also inspected.

There are no incremental specific EI responsibilities for Structural Steel beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.

Lifting and Setting

Lifting and setting involves the placement of compressor / pump packages onto foundations and leveling equipment, including all package connections. This activity requires specialized lifting equipment, trained Operators, and pre-planning.

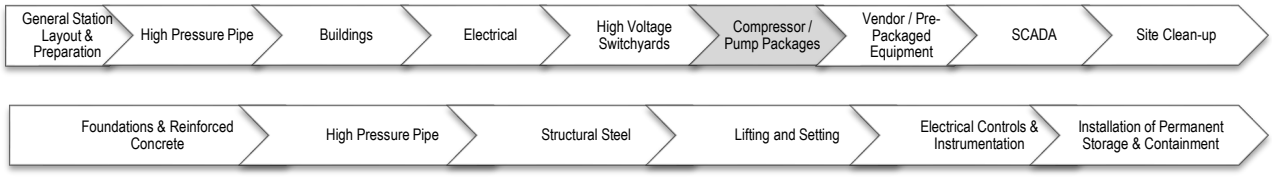
Compressor and pump packages are specialized items with long lead times. Proper attention and care must be given during the lifting and setting phase to ensure that the equipment is not damaged, which may cause delays to the project.

There are no incremental specific EI responsibilities for Lifting and Setting beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.

Electrical Controls and Instrumentation

All facilities have varying levels of electrical controls and instrumentation. Most controls are electrical in nature, both AC and DC, and may also include pneumatics such as compressed air or natural gas. Electrical controls and instrumentation are vital components used in Supervisory Control and Data Acquisition (SCADA) and/or Human-Machine Interface (HMI) systems.

There are no incremental specific EI responsibilities for Electrical Controls and Instrumentation beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.



8.8 Vendor / Pre-Packaged Equipment

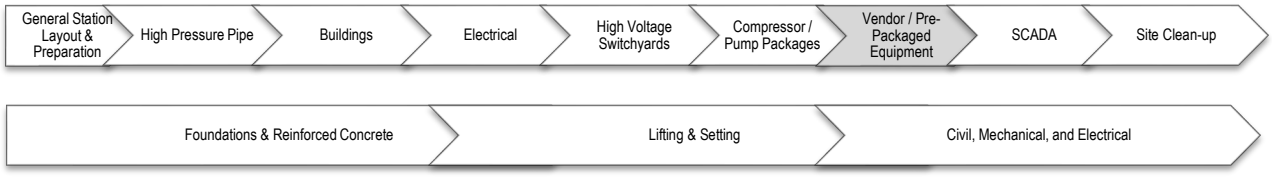
8.8.1 Overview

Vendor / pre-packaged equipment is installed to support the primary compressor or pump package. Installation of vendor / pre-packaged equipment consists of the following major items during the construction of a facility:

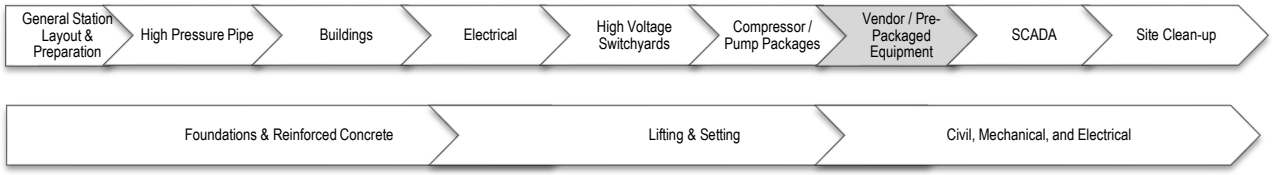
- Foundations and Reinforced Concrete
- Lifting and Setting
- Civil, Mechanical, and Electrical

These packages may include the following:

- Air Filter Systems: These systems pre-treat the air used in combustion in the primary driver (e.g., gas turbine, reciprocating engine) to remove particulate matter and/or liquids
- Exhaust Systems: These systems are used to silence the exhaust on compression equipment and may also be used to treat (e.g., remove carbon dioxide) or monitor the exhaust gases for composition (e.g., Continuous Emission Monitoring System [CEMS])
- Air Cooling Systems: Air coolers are used to reduce the temperature of natural gas that has been heated in the compression process
- Compressed Air Systems: Compressed air systems are used for instrumentation control systems or cooling; these systems include but are not limited to the air compressors, air dryer, and compressed air treatment, including associated equipment and piping
- Lubricating Oil Systems: These systems are used for the lubrication and cooling of rotating equipment, and are commonly used in gas turbine and compressor applications
- Fire Water Pumps: Fire water pumps are required at industrial locations, in accordance with the relevant code requirements; tankage may be required to store fire water and fuel to be able to operate without utility power
- Auxiliary Power Units (APU): These systems are automated power systems that will automatically start to provide power to critical systems for a specified amount of time in the event of the loss of utility power
- Valves and Actuators: Valves are used to assist with the isolation of pipe sections or to control product flow in a pipe or within a facility; actuators are used to control the position of these valves (typically required for large diameter valves) and the focus of this document is on the large diameter valves and associated actuators used to manage product flow
- Control Piping: These systems are usually a specialized form of a compressed air system or a natural gas system that are used to operate valve actuators remotely



There are no incremental specific Environmental Inspector (EI) responsibilities for vendor and pre-packaged systems beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.



8.9 Supervisory Control and Data Acquisition (SCADA) Systems

8.9.1 Overview

SCADA systems include emergency shutdown systems, security systems, station controls, Human-Machine Interface (HMI) systems, and all related components, including the Programmable Logic Controller (PLC) System, associated panels, networking, communication, and the interfaces to other systems, as applicable. In most cases, this may also involve a backup control center.

Note that oversight of the installation of SCADA systems is typically undertaken by Operations personnel and is therefore outside of the scope of this document; however, emergency shutdown systems are within the scope of this document.

Emergency shutdown systems include emergency shutdown piping and all of the associated equipment, such as panels.

There are no incremental specific Environmental Inspector (EI) responsibilities for SCADA systems beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information.

8.10 Site Clean-up

8.10.1 Overview

Construction site clean-up is the final cleaning and removal of construction materials and equipment from the facility site. This also involves establishing the final grade, detailing of the surface (e.g., yard gravel, curbs, sidewalks, permanent stormwater controls), and completion of any outstanding construction deficiencies.

Clean-up work can be performed in phases depending on the location and season of construction. For example, during winter construction, the Contractor will perform the machine or initial clean-up immediately after the end of construction and before the spring break-up, then return to the site the following winter to do the final clean-up.

However, during summer construction, the Contractor will do both machine and final clean-up immediately after the end of construction and return to the site at a later date for additional restoration work (e.g., repairing a sunken trench).

A General or Craft Inspector is responsible for ensuring crews follow appropriate methods during site clean-up. The Environmental Inspector (EI) supports the Grading Inspector by ensuring site clean-up activities do not have an adverse effect on the environment.

The EI's responsibilities during site clean-up include, but are not limited to:

- Ensuring the appropriate disposal of construction-related debris and unused hazardous materials
- Reviewing the facility and developing a punch list of any outstanding issues related to compliance
- Removing remaining temporary erosion and sediment controls when appropriate
- Ensuring conformance with project-specific restoration plans

8.10.1.1 Inputs

As part of preparing for Environmental Inspection during site clean-up, the EI will continually familiarize themselves with relevant aspects of key documents, drawings, and Owner / Operator Company technical specifications as identified in Table 230.

8.10.1.2 Execution

While the work is being executed, the EI is required to monitor workmanship and report on progress on a periodic basis. Typical items that the EI will monitor for during the site clean-up process are identified in a series of checklists as detailed in Table 229.

Table 229: Monitoring Requirements for Site Clean-up

Item	Description	Reference
Prior to Commencing Work	• On a daily basis, ensure that key issues that have been identified are detailed and addressed	Table 231
Safety	• Monitor the operations for adherence to relevant Owner Company and project-specific safety requirements	Table 232
General	• Identify general items that should be monitored throughout the site clean-up process	Table 233
Soil, Vegetation, and Terrestrial Life	• Specific considerations relating to land and terrestrial life that are incremental and are particularly sensitive to construction activity	Table 234
Watercourses, Wetlands, and Aquatic Life	• Specific considerations relating to bodies of water and aquatic life that are incremental and particularly sensitive to construction activity	Table 235
Air and Noise Pollution	• Specific considerations relating to the atmosphere that are particularly sensitive to construction activity	Table 236

8.10.1.3 Outputs

The EI is required to report on workmanship and progress on a periodic basis (e.g., daily, weekly) by completing various reports on each workday and at the end of the week. Report requirements and reporting processes are Owner Company and project-specific; however, best practices for reporting requirements for site clean-up appear in Table 237.

Detailed Checklists – Site Clean-up

8.10.1.4 Typical Input Requirements for Site Clean-Up Environmental Inspection

Table 230: Information Requirements for Site Clean-Up

✓	Description

	All designs, drawings, and specifications developed by the Owner Company and Contractors related to site clean-up, such as:
	• Issued for Construction (IFC) Drawings, including
	  ○ Access Road Drawings
	  ○ Grading Drawings
	  ○ Line List (e.g., special concerns for each Landowner)
	  ○ Surface Treatment Drawings (e.g., surface gravel placement)
	  ○ Fencing Drawings

	Contracts and agreements related to: • Road Use • Crossing for Buried Facilities
	Owner Company specific Safety Plan, including (but not limited to):

✓	Description
	• Traffic Control Plan • Requirements for Personal Protective Equipment (PPE) • Procedures for Working around Overhead Powerlines • Emergency Medical Services (EMS)
	Project-specific Environmental Protection Plan (EPP) or equivalent, detailing site clean-up requirements
	Other project-specific Plans, which may include: • Grading Plan • Stormwater Management Plan • Erosion and Sediment Control Plan

8.10.1.5 Best Practice for Environmental Inspection During Typical Site Clean-Up Operations

Table 231: Prior to Commencing Work

✓	Description
	Participate in daily meetings to address: • Job safety and/or hazard identification issues • Environmental concerns • Duties of Inspector(s) • Contractor's tailgate meetings (as required) • Ad-hoc meetings with Contractors to discuss and clarify questions or concerns regarding potential environmental impacts from planned daily work
	Ensure timber / swamp mats are used if ground conditions are unstable and low-ground pressure equipment cannot be used

Table 232: Safety Concerns for Site Clean-up

✓	Description
	There are no incremental specific Safety Concerns beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 233: Typical Monitoring Requirements – General

✓	Description
	Ensure no surplus construction materials are left on the facility site (refer to contract documents to determine which materials will be stored and which will be scrapped)
	Ensure rock material from construction or excavation that was not reused is removed from the facility site and hauled to an Owner Company approved dump site or distributed within a specific portion of the facility site
	Confirm that clean-up equipment heavier than allowed in the construction specifications does not operate over top of underground infrastructure

✓	Description
	Ensure that for winter construction, the facility site is stabilized after construction and during machine clean-up to prevent erosion during the spring thaw; final clean-up may be completed during the following construction season, either fall or winter, depending on ground conditions
	Confirm that the Contractor will conduct the final clean-up when soils are dry and unfrozen
	Test and dispose of existing coatings and piping appropriately
Road Access	
	Confirm that all temporary access roads built during construction and not required for long-term monitoring are removed and reclaimed per contract requirements
	Ensure road surfaces, fences, gates, signs, etc., are replaced, restored, or installed (for permanent access roads) per contract requirements
	Ensure road system drainage is repaired, modified, and/or replaced per contract requirements
Fencing	
	Ensure all temporary fences and barricades have been removed
	Ensure that all fencing at the compressor, sales / receipt meter stations, and valve locations has been restored or replaced

Table 234: Typical Monitoring Requirements for Soil, Vegetation, and Terrestrial Life

✓	Description
Erosion Control	
	Confirm all erosion-prone slopes are re-vegetated by seeding with approved mixes, erosion control matting, hydro-seeding, and/or hydro-mulching as per Owner Company-specifications and Landowner agreements
	Check the placement of permanent erosion control measures, or remove temporary erosion control measures, in compliance with Owner Company specifications
	Verify final grade and drainage requirements as per the IFC
Replanting and Reseeding	
	Confirm that the final soil surface is prepared adequately for seeding, taking into consideration soil conditions, weather conditions, facility requirements, and surrounding land use
	Confirm all seed mixes, fertilizers, rates, equipment, and techniques of application have been approved by Owner Company and Landowner agreements

Table 235: Typical Monitoring Requirements for Watercourses, Wetlands, and Aquatic Life

✓	Description
	There are no incremental specific monitoring requirements for watercourses, wetlands, and aquatic life beyond those identified in A Practical Guide for Environmental Construction Inspectors – Foundational Information

Table 236: Typical Monitoring Requirements for Air and Noise Pollution

✓	Description
	Install permanent noise mitigation as applicable (e.g., trees)

8.10.1.6 Typical Outputs for Site Clean-Up

Table 237: Typical Reporting Requirements

✓	Description
General	
	All designs, drawings, and specifications developed by the Owner Company and Contractors related to site clean-up, such as: • Stormwater management as-builts
Daily	
	Complete site clean-up and restoration Environmental Inspection progress reports, including (but not limited to): • Daily progress of the Contractor's clean-up activities • Drain tile locations, if applicable • Time stamped post construction photos • Work completed to date, including: o Information regarding milepost and/or stationing, weather, and any agency or Landowner encounters o A record of any observations, events, and violations using a daily log, camera, and other technology • Documenting compliance with Project permit conditions, which includes: o Updating the Environmental Commitment Tracking Tool All reports along with punch list items are forwarded to the Construction Manager and/or Chief Inspector, as required

8.10.1.7 References – Site Clean-Up

Note to user: The reference information provided in Table 238 is intended as a guide only (i.e., the list is not exhaustive); documents of this nature are updated frequently and it remains the responsibility of the user to ensure that the correct and most current documents are referenced as appropriate.

Table 238: List of References – Site Clean-Up

Document No.	Type	Title
Energy Connections Canada (formerly CEPA Foundation) and The INGAA Foundation Inc.		
N/A	Practical Guide	A Practical Guide for Pipeline Construction Inspectors
The INGAA Foundation Inc.		
N/A	Best Practices	Environmental Inspector Guidance Recommended Qualifications and Best Practices
Federal Energy Regulatory Commission (FERC)		
N/A	Standard	Upland Erosion Control, Revegetation, and Maintenance Plan
N/A	Standard	Wetland and Waterbody Construction and Mitigation Procedures

9 APPENDIX

9.1 Glossary

Item No.	Term	Definition
1	Agency Report	A report that includes regular updates on authorizations, construction status, planned work, schedule changes, problem areas, non-compliances, Landowner complaints, and correspondence received from federal, state, or local agencies.
2	Alignment sheet	Sheets showing the location and route of the pipeline and associated facilities.
3	Banding	Rope bands used during pipe transportation to protect the pipe coating.
4	Deficiency	An isolated deviation from requirements that does not impact safety, environment, structural integrity, cost, or schedule.
5	Diversion berms	Drainage systems that divert water away from the trench bottom.
6	Drain tiles	Perforated tubing that allows water to enter and be drained away from the pipeline or facility.
7	Environmental studies	Studies that provide information on an environmental project's setting and potential issues. This knowledge can be used to develop project-specific mitigations and address environmental concerns, thus limiting the potential adverse effects of pipeline construction.
8	Flumes	Ditches that run next to an existing pipe trench.
9	Fly-rock	Debris scattered following a blasting activity.
10	Hydrocarbon sheen	An iridescent film of hydrocarbon on the surface of a water body.
11	Line list	A table containing information (e.g., lot designation, owner name) related to specific parcels of land.
12	Milepost	A marker on the ROW that indicates distance from the upstream mainline valve.
13	Non-compliance report	A document outlining non-compliance occurrences.
14	Non-conformance	A recurring deficiency or major deviation from regulation or Owner Company specifications such that safety, environment, structural integrity, cost, or schedule could be impacted.
15	Non-destructive examination	A group of analysis techniques used in industry to evaluate the properties of a weld without causing damage.
16	Padding	Support material used to shore up the underside and sides of pipe to properly distribute loading, typically sand and/or foam pillows.
17	Pioneer crew	The crew that sets up access to the ROW for the Clearing and Grading crew.
18	Problem area report	A report created when someone observes an activity that does not meet the definition of acceptable but is not yet non-compliant.
19	Restoration	The process of returning natural or cultural resources that have been affected by a project to their pre-construction condition or to a condition that provides equivalent or improved resource values.
20	Riparian zone	Interface between land and a river or stream.
21	Riprap	Rock or other support material used to armor drainage trenches and trench walls.
22	Scalping	Disrupting the pre-existing layer of vegetation.
23	Serious violation report	A Serious violation report may be written when an activity that is not in compliance with project specifications causes substantial harm or a serious threat to resources.

Item No.	Term	Definition
23	Staking	Marking of proposed pipelines, equipment, or features required for construction operations in a consistent manner.
24	Stockpiling	Storing bulk construction materials, such as pipe or soil.
25	Straw crimp	A crimped layer of straw used to protect seeded areas from erosion.
26	Sub-drains	Drainage systems that divert water away from trench bottoms and/or facilities.
27	Timber / swamp mats	A portable wooden platform used to protect subsoils and support equipment. Also known as a rig or access mat.
28	Tackifier	A soil adhesive.
29	Temporary workspace	An area, usually adjacent to the permanent facility site limits and/or permanent Right-Of-Way, to be used for construction purposes.
30	Trench breaker	Physical dams built across the inside of a trench, around the pipeline, to prevent backfill migration and/or erosion.
31	Trenchless crossings	A pipeline crossing created without disturbing the ground surface. Methods include boring, jacking, and horizontal directional drilling (HDD).
32	Vent bracing	Used to prevent movement of the vent under blowdown conditions.

ENDNOTE

This Guide was developed by the INGAA Foundation for the use of Environmental Inspectors in the US. This is the original version and is subject to future revision.

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