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## 1 INTRODUCTION

### 1.1 Scope

This volume contains:

- a series of environmental alignment sheets for the following Mackenzie Gas Project components:
  - the gathering pipelines
  - the gas and natural gas liquids (NGL) pipelines
  - the gas pipeline
- environmental alignment sheets for the NOVA Gas Transmission Ltd. (NGTL) Northwest Mainline (Dickins Lake Section) in northwestern Alberta
- overview maps and index maps for the alignment sheets

#### 1.1.1 Purpose

Environmental alignment sheets have been prepared in part to meet the requirement of the National Energy Board for mapping project components and the current biophysical and socio-economic setting at an appropriate scale. The sheets are at a scale that accurately depicts the potential environmental effects of the project. This volume supports Volume 5, Biophysical Impact Assessment, Volume 6, Socio-Economic Impact Assessment and Volume 7, Environmental Management.

These sheets will be revised during planning and design of the pipeline, and are subject to change up to the start of construction. Revisions will be based on:

- advances or improvements in pipeline design and construction methods
- detailed routing
- site-specific environmental information and mitigation measures

Before construction begins, a set of construction alignment sheets will be prepared that will include environmental data.

#### 1.1.2 Pipeline Corridor and Route

A preferred 1-km-wide corridor has been established for the gathering, NGL and gas pipelines and related facilities. The corridor was studied during the environmental baseline data-gathering process. A preliminary pipeline route has been identified within the corridor, and the environmental setting, potential issues and conceptual protection measures have been mapped for this route.

## 1.2 Sheet Content

The environmental alignment sheets in the Northwest Territories are presented from north to south, which is the direction of gas flow for the pipeline. However, in northwestern Alberta the sheets are presented south to north, representing a build-up or extension of an existing pipeline to the interconnect facility. Each sheet consists of:

- a photomosaic
- data bands

### 1.2.1 Photomosaic

The photomosaic on each alignment sheet was created or assembled from orthophotographs that cover the pipeline route and adjacent area (see Section 1.4.1, Selecting Orthophotographs). These orthophotographs were produced from 1:30,000-scale aerial photographs obtained over a four-year period, ending in 2003.

Features on the photomosaic include the pipeline route and other project components in the mapped region. The project components and other features are either identified in a legend at the top right of the sheet or by callout boxes, or labels, on the photomosaic.

#### 1.2.1.1 Matchlines

Matchlines are black and white bars drawn across the pipeline route on the photomosaic. They identify the point at which one sheet ends and the next sheet begins. Matchlines also correspond to the beginning and end of the data bands. On either side of the photomosaic, a reference number identifies which environmental alignment sheets are adjacent to the sheet being viewed.

### 1.2.2 Data Bands

Data bands above and below the photomosaic contain information that has been divided into five main groups:

- environmental setting
- kilometre post
- potential environmental issues
- conceptual right-of-way design
- conceptual protection measures

### 1.2.2.1 Environmental Setting

The environmental setting data bands provide baseline information about the biophysical and social environments along the proposed route before construction begins. Most data bands show only features that are susceptible to potential environmental or social impacts if no mitigation occurs. Some data bands, such as jurisdiction and ownership, include information not susceptible to project impacts. This information is included to meet regulatory requirements or because of an identified local interest.

The environmental setting data bands contain information in the following categories:

- jurisdiction or ownership:
  - political jurisdiction, i.e., settlement area or region
  - owner, i.e., Crown or private lands
  - agency, or agencies, responsible for administering these lands
- surface dispositions and protected areas – proposed or existing protected areas and other surface land designations, such as oil and gas dispositions
- traditional resource use – areas or features culturally important to the Aboriginal people who use the lands along the route. Traditional knowledge studies are ongoing and information will be added to this data band when available.
- heritage resources – areas with perceived moderate or high potential for discovering heritage resources during construction
- watercourse crossings and aquatic resources – locations of watercourse crossings and a list of fish species observed at the crossing location or in the downstream zone of influence
- sensitive landforms and soils – areas with sensitive landforms or soils, described on the basis of soil texture, slope, and ice or water content
- vegetation, rare plants and weeds – locations or areas of plant species, types or communities that are considered unique, uncommon or rare
- sensitive wildlife habitat – locations sensitive to disturbance because of high concentrations of wildlife at certain times of the year

The information in the environmental setting data bands is based on:

- aerial photograph interpretation
- spatial analysis
- modelling or other processing
- detailed or reconnaissance-level surveys conducted during the 2001, 2002 or 2003 field seasons

### 1.2.2.2 Kilometre Post

The data band immediately above the photomosaic contains the kilometre post (KP) markers. A KP marker indicates the distance, in kilometres, of a particular location along a route from the start of that project component. The naming convention for the laterals is:

- Niglintgak lateral = N1, N2
- Taglu lateral = T1, T2
- Parsons Lake lateral = P1, P2
- Storm Hills lateral = S1, S2

The NGL and gas pipelines do not have a prefix before the KP number.

Below each KP marker are two thin lines or ticks:

- one at the top of the photograph
- one that crosses the pipeline in the centre of the photograph

The intersection of the tick and the pipeline is the approximate location of that KP. Locations of KP markers depend on the revision of the route used to produce the alignment sheets, and should not be interpreted as absolute positions along the pipeline corridor. They are shown on environmental alignment sheets for relative placement only.

### 1.2.2.3 Potential Environmental Issues

The potential environmental issues data band shows the issues that could develop during pipeline construction at a particular location. These potential issues always correspond to an identified feature in the environmental setting data bands. The issues are currently considered to be only potential issues, because the mapped feature might not be identified as an issue during future preliminary detailed engineering or construction. The conditions during construction cannot be described or predicted accurately today.

#### 1.2.2.4 Conceptual Right-of-Way Design

The conceptual right-of-way design data band shows a sketch of the conceptual pipeline right-of-way and any extra workspace that is expected during construction. Extra workspace is based on conceptual planning and is subject to change because of detailed design and grade planning conducted before construction begins.

#### 1.2.2.5 Conceptual Protection Measures

Corresponding to each potential issue in the potential environmental issues data band is one or more conceptual protection measure that might prevent, or reduce disturbance to, the potential issue of concern. The conceptual protection measures were developed in conjunction with the environmental management information in Volume 7, Environmental Management, and the mitigation measures in Volume 5, Biophysical Impact Assessment. The protection measures will evolve as engineering design advances and site conditions are better understood. More site-specific environmental protection measures will then be formulated.

The data bands for the conceptual protection measures are:

- timing constraints – periods when construction activities should be carried out with caution to avoid adverse effects on the sensitive stages in the life history of fish (overwintering, spawning, rearing and migrating)
- clearing and timber salvage:
  - any potential special measures that might be implemented during right-of-way clearing
  - locations where timber might be retained for other project uses or for community use
- right-of-way preparation – potential measures that might be implemented, such as restricting grading or constructing a work pad
- erosion control – potential locations and types of erosion control structures that might be installed either in the ditch or on the right-of-way to reduce erosion along the right-of-way after construction
- watercourse crossing method – the type of watercourse crossing technique that might be used for:
  - the pipeline
  - vehicles and equipment
- revegetation – locations where a seasonal cover crop might be applied

- special measures – the location and type of other protection measures that do not belong in one of the other data bands, such as:
  - narrowing the right-of-way
  - conducting pre-construction wildlife surveys
  - importing backfill

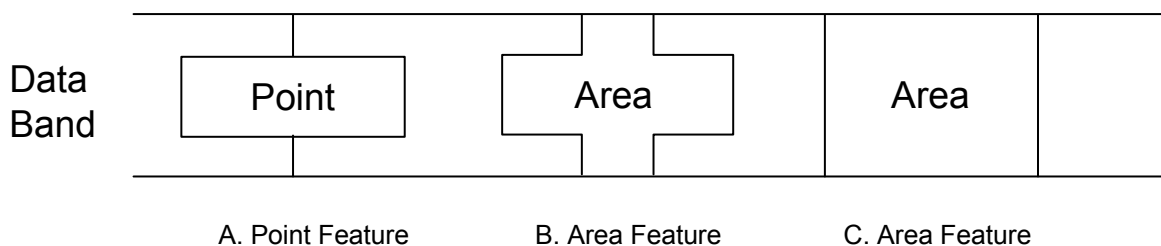
### 1.3 Interpreting Environmental Alignment Sheets

Environmental alignment sheets are designed to show a large amount of information about a narrow linear corridor. The information in the data bands corresponds with a section of the pipeline route.

#### 1.3.1 Sheet Features

Figure 8-1 is a simplified illustration of information in a data band. The ticks or vertical lines represent the boundaries of a feature. The style used for each feature depends on the size of the feature:

- A = point feature
- B = area feature, used when the length of the text string is longer than the width of the feature. The vertical ticks at the top and bottom represent the boundaries of the feature, and the sides are widened or expanded to enclose the text string.
- C = area feature, used when the text string fits comfortably inside the boundaries of the feature



**Figure 8-1: Alignment Sheet Features**



The following steps describe how to interpret information on an alignment sheet:

1. Identify the feature of interest in one of the environmental setting bands.
2. From the ticks on the feature of interest, draw an imaginary vertical line to the pipeline route on the photomosaic. This line indicates where the feature would occur on the pipeline right-of-way.
3. Continue the imaginary line down to the potential environmental issues data band. If the feature has a potential environmental issue, the imaginary line will intersect that issue in this band.
4. Continue the imaginary line through the conceptual protection measures data band. The line will intersect any potential mitigation measures that have been identified for that feature.

### 1.3.2 Complex Data Bands

Figure 8-2 shows a typical example, from one of the alignment sheets in this volume, of information in the conceptual protection measures data band. The styles of the following five features are illustrated:

- *Preconstruction Surveys* is a small area feature requiring a long text string. The feature's boundaries are represented by the small ticks and the opening above and below the text. The text box is widened on each side to enclose the text. The preconstruction survey special measure only applies to the area where the text box is open, i.e., between the ticks, not to the rest of the text box.
- *Ice Bridge, Open Cut, Isolate, and Temporary Bridge* are point features that occur in line with small ticks above and below the centre of the text boxes. The text box is there only to enclose the text.
- *Subdrains; Import Fill* at the bottom of the Special Measures data band, is an area feature with boundaries identified by the vertical lines on either side of the text that are wide enough to enclose the entire text string.
- *Do Not Block Wildlife Trails* represents two area features that share the same text string, and have a small gap between them. The first area feature starts at the vertical line on the left and goes to the first set of ticks. The second area feature starts after the gap at the second set of ticks and extends to the vertical line on the right. The horizontal lines in between the two sets of ticks indicate the gap between the two area features where the special protection measure does not apply. These two area features were merged because they are close enough to share the same text string. Merging features optimizes space and avoids overcrowding in data bands. It is possible for more than two area features to be merged.

It is also possible for point features that share the same text string and are close together to be merged. They would be represented by a text box with two or more sets of ticks indicating where the point features are located.

- *Heritage Assessment Required* does not have any lines, ticks, or a text box. This area feature has boundaries wider than the visible part of this alignment sheet. This conceptual protection measure possibly applies to the entire alignment sheet, so only the text string is in the centre of the data band, with no lines, ticks, or text box.

WATERCOURSE CROSSING METHOD	PIPELINE	Open Cut	Isolate
	EQUIPMENT	Ice Bridge	Temporary Bridge
REVEGETATION			Cover Crop
SPECIAL MEASURES		Preconstruction Surveys	Heritage Assessment Required Do Not Block Wildlife Trails Subdrains; Import fill

Figure 8-2: Example of Complex Data Bands

## 1.4 Methodology Overview

### 1.4.1 Selecting Orthophotographs

The photomosaics for the different Mackenzie Gas Project components were compiled from:

- orthophotographs produced from 1:30,000-scale aerial photography obtained over a four-year period, ending in 2003
- smaller-scale aerial photographs or high-resolution satellite images in a small number of cases (usually limited to either edge of the corridor being mapped)

Orthophotographs were selected based on a series of preferences, starting with *best quality* photography, rather than *most recent* photography, when a choice of photographs was available at the same scale of acquisition, i.e., the altitude or height above ground of the flights. Then, larger scale is preferred over smaller scale.

Best quality means photography obtained during the leaf-on period for deciduous trees and shrubs, combined with constant contrast along and across each photograph, minimal distortion in the printed product, and good positional accuracy in the digital product.

For interpreting vegetation, photography that is leaf-off during snow-free periods in the fall is usable but not desirable. Snow cover can pose problems during vegetation interpretation and typing. However, a dusting of snow can enhance subtle terrain features that are not always apparent during snow-free periods.

It is important to interpret vegetation accurately, reliably, and consistently, based on the photography preferences mentioned previously. The vegetation theme extracted from photography during photo-interpretation, and the photography, are used for subsequent tasks, including:

- wildlife modelling
- additional vegetation analysis
- landform mapping

Photography preferences also affect information derived from mapping, and from analysis performed on the vegetation theme or on the photography from which it is derived. For example, this influence extends to information in data bands for environmental setting maps, including:

- sensitive wildlife habitat (from modelling with a wildlife version of the vegetation theme)
- sensitive landforms and soils
- vegetation, rare plants and weeds

## 1.4.2 Preparing Data Band Content

The following topics describe how some of the key content was prepared for data bands in the alignment sheets. How environmental setting information was obtained for aquatics, landforms and permafrost is covered in more detail than for vegetation, wildlife and heritage resources. Preparing the conceptual right-of-way construction data band information is also described.

### 1.4.2.1 Aquatics

Fish and fish habitat specialists supplied information for:

- the watercourse crossings and aquatic resources data band
- water-related information in the data bands under the photomosaic

Volume 3, Section 7, Fish and Fish Habitat, gives details of how the specialists obtained their information for the project. It includes information about timing constraints that exist to protect sensitive life stages of fish from project activities at watercourses. Identifying periods for limiting in-water activities is an important mitigation measure. Consequently, a set of timing guidelines was established for the project.

The pipeline corridor crosses five types of waterbodies, and timing guidelines were developed for each watercourse type within each hydrologic region (see Volume 3, Biophysical Baseline for details). The timing guidelines are intended to indicate periods when in-stream work should be carried out with caution to avoid adverse effects. Site-specific information will be used to assess the risk of adverse effects when in-stream work is required during these periods.

#### 1.4.2.2 Landforms and Permafrost

Landform and permafrost specialists supplied information for:

- the sensitive landforms and soils data band
- terrain-related information in the data bands under the photomosaic

Volume 3, Section 8, Soils, Landforms and Permafrost, gives details of how the specialists obtained their information for the project. It also describes the valued components and key indicators derived from potential project-related issues.

Areas with issues related to sensitive landforms and soils are shown on the alignment sheets. These are areas along the pipeline route where ground conditions and mitigation during construction can be identified.

Information on material texture, topography (slope) and moisture content (frozen or unfrozen, expressed as a percentage of dry soil density) was used to describe existing conditions in the environmental setting data band. For the potential environmental issues data band, other information was selected based on modelling or analysis, involving:

- drainage disruption potential
- erosion potential
- pond formation
- slope instability potential

Mitigation information was produced by reviewing the environmental protection plan (see Volume 7, Environmental Management).

#### 1.4.2.3 Vegetation

Information for the environmental setting data band on uncommon vegetation types, rare plants and weeds was developed using two methods:

- identifying locations of uncommon or sensitive vegetation types and tall forest stands, by using aerial photographs to:
  - map the local study area into vegetation types
  - identify tall forest stands

- overlaying the LSA with point data locations from various field studies. These studies were conducted to:
  - confirm the photo-interpretation mentioned previously
  - collect ecological vegetation data
  - survey sites for rare plants and uncommon communities

#### 1.4.2.4 Wildlife

Various wildlife field studies were conducted in most areas of the local study area. This baseline data was used for wildlife habitat modelling, in conjunction with other information, including topography, hydrology and disturbance data. Modelling results were regarded as a preliminary indication of sensitive habitat in the production area and along the pipeline corridor. The results were validated by wildlife biologists knowledgeable about the project area.

#### 1.4.2.5 Heritage Resources

The information in the Heritage Resources data band represents perceived heritage resource potential along the proposed pipeline route. It is based on interpretation and judgement by archaeology specialists only, developed from professional knowledge and a desktop study of available environmental data. This information has not been validated in the field.

Heritage resource potential was based on the number of favourable environmental conditions present, including:

- vegetation
- slope
- aspect
- proximity to lakes or open water
- proximity to flowing water
- probable trail locations from the proximity analyses

#### 1.4.3 Conceptual Right-of-Way Design

The right-of-way and temporary workspace information provided is preliminary. Five types of temporary workspace are included in this data band:

- horizontal directional drilling locations
- open cut watercourse crossings requiring 2 m of cover
- isolated watercourse crossings
- laydown areas for pipeline construction spreads
- block valves for the gas pipeline or NGL pipeline

The different types of workspace are not identified by name on the alignment sheets. However, in many cases, the kind of temporary workspace involved can

be inferred from details in the environmental setting or conceptual protection measures data bands. The locations of the workspace shown in the data band could be modified before construction of the pipeline begins. It is also possible that additional types of temporary workspace will be added to this data band in the future.

#### **1.4.4 Copyright**

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