# CHAPTER 10

## PIPELINE INSTALLATION

### 10.1 Pipeline Design and Installation

The Polypipe® SDR7 3408 G48 pipe was chosen as the most suitable pipeline material for the new developmental wells, see Annex IV for specifications. This will form part of the Spanish Lookout Field Gathering System. The design and installation was chosen because of the following reasons:

1. 265 psi pressure rating downgraded to about 130 psi for oil and gas used is ideal where flowing wellhead pressures are less than 100 psi

2. Polyethylene pipe, in contrast to steel pipe, has no susceptibility to corrosion from the highly saline oilfield waters which are experienced in the Spanish Lookout Field.

3. Ease of construction using a butt fusion process combined with flexibility of the pipe which will permit bends down to 28 ft radius.

### 10.2 Pipeline Route

There will be two sets of pipeline route for this impact assessment mainly for the San Marcos wells and the Spanish Lookout wells. The following sections summarized the pipeline installation in relation to the overall pipeline network. It is important to note that it is BNE's intention to link all the wells and conduct the oil to its central storage facility at Iguana Creek.

#### 10.2.1 San Marcos Route

The pipeline route is designed to take the shortest route between wells taking into account the ecological nature of the area, agricultural land use and their preferred routing. Principally, a 6" Polypipe® trunk line will be laid along the desired route. BNE presently contemplates two options as described below:

A 4" pipeline will run from San Marcos # 2 to San Marcos # 1

1. 6" pipeline from SM # 1 directly to the Iguana Creek Tank Farm Facility

2. 6" pipeline from SM # 1 along the constructed access road and traversing along the San Marcos upgraded road.

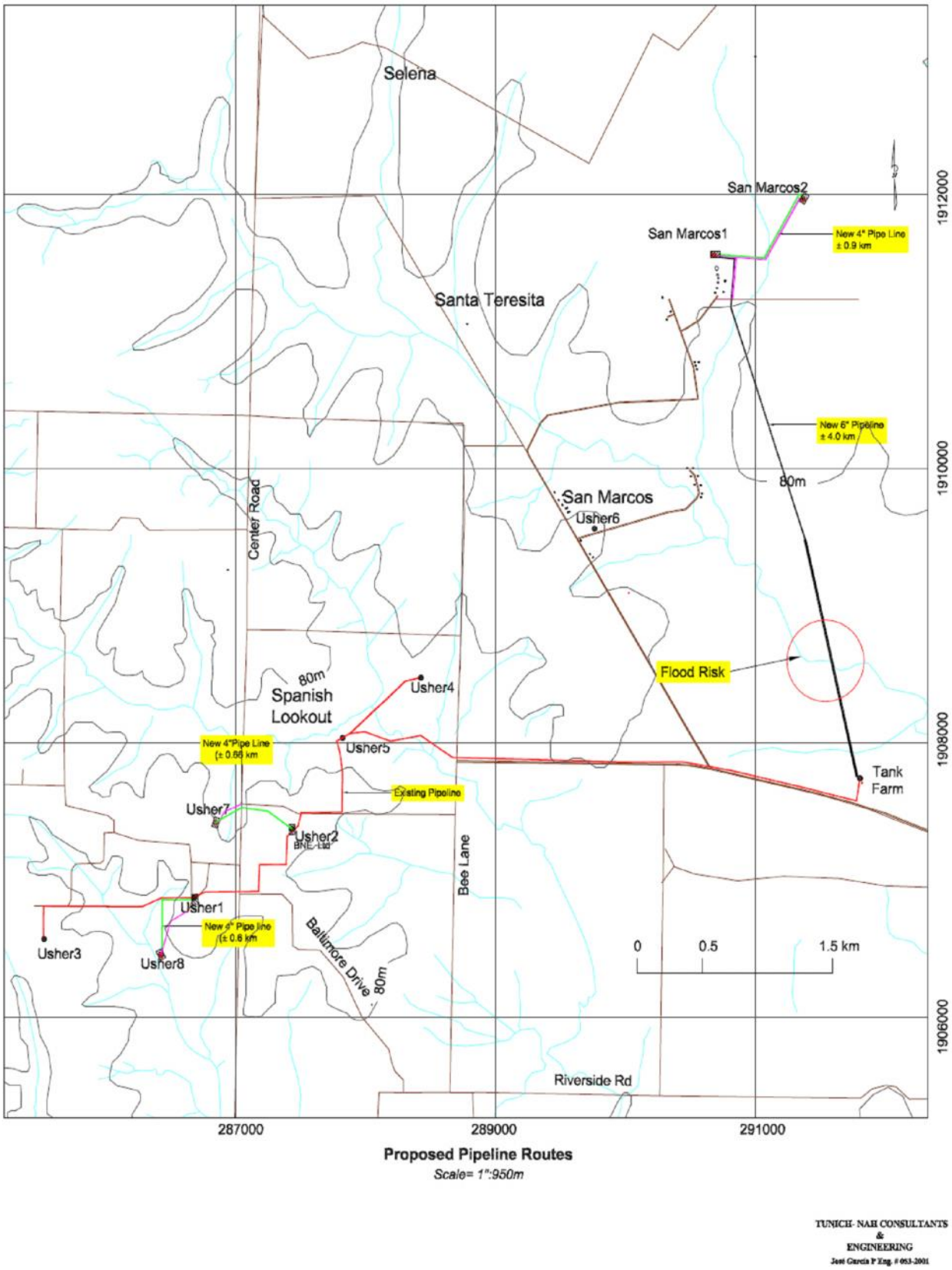



**Fig.10.1** Proposed Pipeline Routes for the new BNE wells.

In accessing the two options, the first option will be taken into consideration. This is primarily due to shortest possible route and causing the least impact to the residents in terms of air and noise pollution and traffic congestion.

This would undoubtedly have the least amount of impact on the area as opposed to meandering along the road side impacting the surrounding road environment.

The proposed pipeline route will cut across mostly agricultural land and several lowland broadleaf ridges as seen in section 10.9. BNE has consulted with several land owners prior to making this decision. Land concession and clearance will be obtained by BNE.

Overall, a 10" steel manifold will be installed at SM # 1 to facilitate the transportation of oil from the San Marcos wells to the Iguana Creek facility for treatment and storage.

### 10.2.2 Spanish Lookout Route

The new Spanish Lookout wells will be linked up to the existing pipeline networks via the respective 10" steel manifold at MU # 1 and # 2. Oil produced will be piped to the manifolds via a 4" pipeline. From there, the oil will eventually be transported via a 12" Polypipe® line that run from Mike Usher #5 to the Iguana Creek facility. See figure 10.1.

## 10.3 Pipeline Installation

The installation of the pipelines from the wells (San Marcos and new Mike Usher) will be similar to those installed previously by Belize Natural Energy Limited. The same procedures and guidelines will be carried out. This entails the butt fusing of the 50 foot sections in the field and eventual pressure testing with air of the entire length fused in a days work. Following a successful pressure test of a pipeline length the pipeline will be laid in a 5.5ft deep trench excavated by a Speicher trenching machine or an excavator.

A minimum of 12 in of backfill will be placed over the pipeline before laying a 1/0 3/C+G 25 KV 100% shielded (UL) Marine Shipboard Cable in the same trench. The trench will be backfilled to within 2 ft from surface and marking tapes for both the pipeline and power cable laid in the trench. The trench will then be backfilled to surface and the surface will be re-instated to original condition. The pipeline/power cable route will be marked using **Triview** markers with warnings in Spanish and English to provide line of sight coverage with markings at every fence and road crossing.

Each well will be equipped with a 2" Model B-ESV Rupture Pin Valve mounted on steel pipe downstream of the adjustable choke and upstream of the steel to Polypipe® connection set at 130 psig +/- 5% to protect the Polypipe® line from excess pressure. In the event that the pipeline is shut in before closing in the wells, the wells will automatically be shut when the pipeline pressure reaches 130 psi.

## 10.4 Pipeline Operating Conditions

The operating pressures of the pipeline, as demonstrated by Forerunner simulation shows the following pipeline inlet pressures to achieve 20 psig at the separators at Iguana Creek follows:

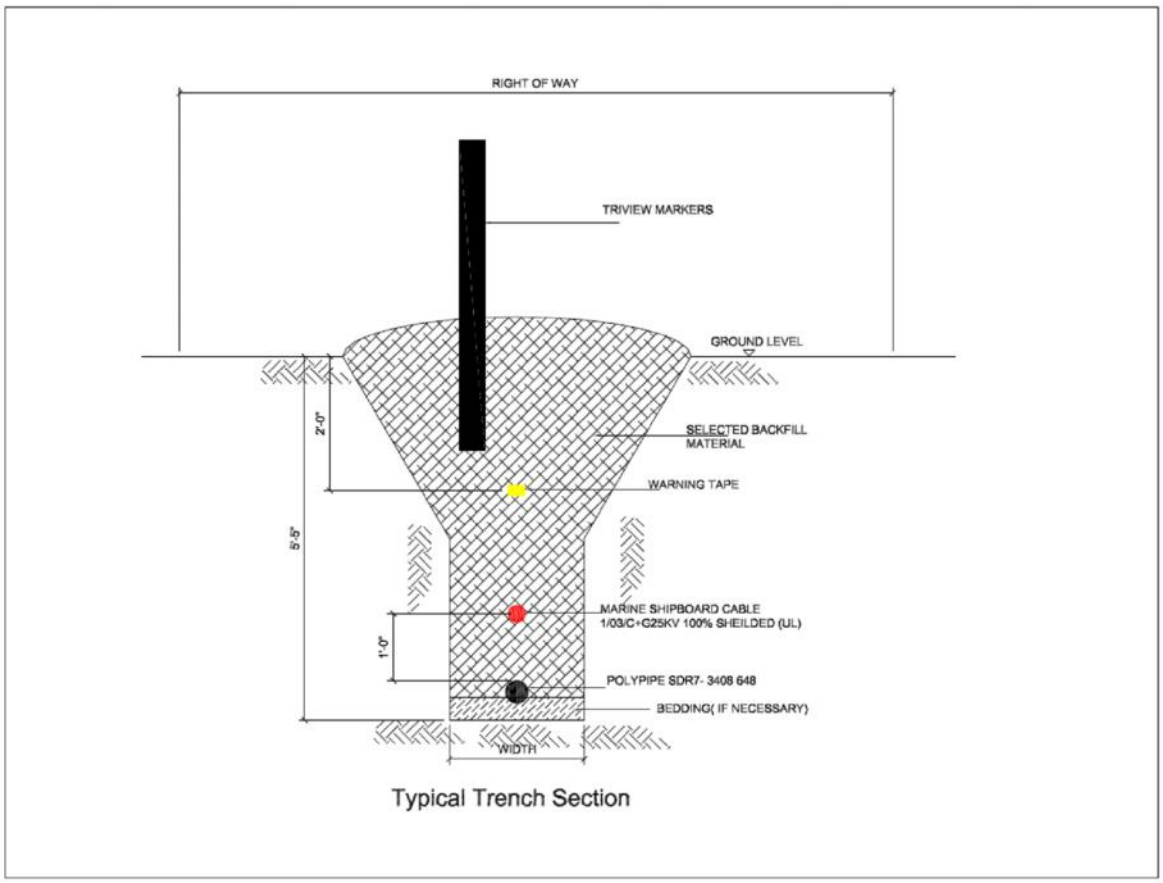



**Fig. 10.2** Typical trench section

It is likely that in practice however that the pipeline pressure will possibly increase up to about 70 psig. This is dependent upon the amount of water production and the production volumes required. The pipeline itself is rated to 132.5 psig for oil and gas service.

## 10.5 Pipeline Construction Operations

The construction of the pipeline is an integral part in transporting the oil from one location to the next. The following sections outline the pipeline construction operations for BNE.

### 10.5.1 Fusion Jointing

An integral part of any pipe system is the method used to join the system components. Proper engineering design of a system will take into consideration the type and

effectiveness of the techniques used to join the piping components and appurtenances, as well as, the durability of the resulting joints. The integrity and versatility of the joining techniques used for polyethylene pipe allow the designer to take advantage of the performance benefits of polyethylene in a wide variety of applications.

There are three types of heat fusion joints currently used in the industry: Butt, Saddle and Socket Fusion. Additionally, there are two methods for producing the socket and saddle fusion joints. The fusion procedures that follow have been proven to consistently produce sound fusion joints when used correctly and are recommended for the joining of Polypipe® products. The recommended procedures for butt and saddle fusions are consistent with the Plastic Pipe Institute (PPI) TR-33, Generic Butt Fusion Procedures and TR-41, Generic Saddle Fusion Procedures.

### 10.5.2 Polypipe® Product Range

| POLYPIPE® PRODUCTS | |
|---|---|
| **GAS DISTRIBUTION** | **M&I, WATER AND SPECIALTY** |
| POLYPIPE® GDB50 (GB50)<br>POLYPIPE® GDB40 (GB40)<br>POLYPIPE® GDB30 (GB30)<br>POLYPIPE® GDY20 | POLYPLUS™<br>POLYPIPE® EHMW PLUS<br>POLYPIPE® EHMW<br>POLYPIPE® PW<br>POLYPIPE® DUCT<br>POLYPIPE® LIGHTVIEW™ |

The fusion joining procedures to be used in the new wells pipeline are compliant with the U.S. Department of Transportation Regulations. The pipe manufacturer is also providing technical support to ensure that jointing operators are qualified in accordance with U.S. Department of Transportation Regulations. Each joint in the gathering lines and the pipeline will be made in accordance with written procedures that have been proven by testing to produce strong joints.

### 10.5.3 Jointing Qualification Procedure

Due to the requirements of the U.S. DOT, any person joining polyethylene pipe must receive training in each of the fusion procedures (49 CFR, Part 192). Each operator should make a sample joint for each procedure used. Each sample joint must pass the following inspections and tests:

**1.** Pressure and tensile testing as described in **§192.283, CFR**,
**2.** Ultrasonically inspected and found to contain no flaws, or
**3.** Cut into at least three (3) strips, each of which is:

**(a)** Visually examined and found free of voids or discontinuity on the cut surface of the joint.

**(b)** Deformed by bending, torque or impact, and if failure occurs, must not initiate in the joint area.

BNEL in accordance with the Manufacturer's recommendation will ensure that a quality control procedure is provided by the manufacturer and in compliance with the US DOT regulations are in place and will ensure that each operator is qualified in accordance with this section.

### 10.5.4 Heat Fusion

The principle behind heat fusion is to heat two surfaces to a designated temperature, and then fuse them together by application of a sufficient force. This applied force causes the melted materials to flow and mix, resulting in a permanent, monolithic fusion joint. When fused according to the recommended procedures, the fusion or joint becomes as strong or stronger than the pipe itself in both tensile and pressure properties. Polypipe®® fusion procedures require specific tools and equipment for the fusion type and for the sizes of pipe and fittings to be joined. The pipes at Spanish Lookout will be jointed using Butt Fusion

> **Butt Fusion** – This technique consists of heating the squared ends of two pipes, a pipe and fitting, or two fittings by holding them against a heated plate, removing the plate when the proper melt is obtained and promptly bringing the ends together and allowing the joint to cool while maintaining the appropriate applied force.

Properly fused polyethylene joints do not leak. Prior to commissioning, the pipeline will be pressure tested to 132.5 psig. Any pressure loss will indicate a leak which will be found and the leak rectified, see Annex IV for specification.

### 10.6 U.S. Risk Based Regulation of Gathering Lines

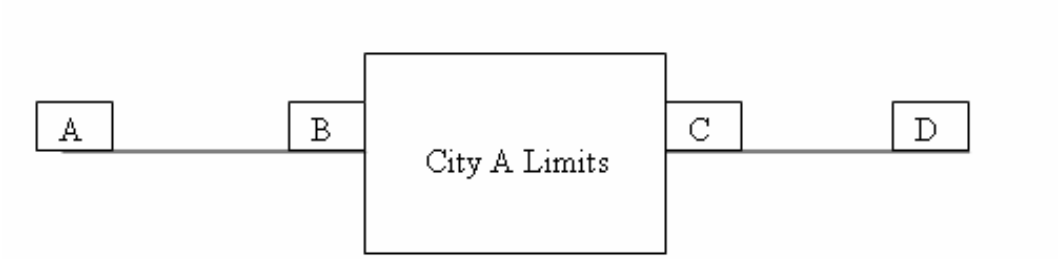
From the U.S. Department of Transportation definitions a Gathering Line for oil (a hazardous liquid) is defined as follows:

- A pipeline 219.1 mm (8 5/8 in) or less in nominal outside diameter that transports petroleum from a production facility (49 CFR 195.2); and

Plainly speaking, gathering lines are those pipelines that are used to transport crude oil or natural gas from the production site (wellhead) to a central collection point. They generally operate at relatively low pressures and flow, and are smaller in diameter than transmission lines. Consequently the Environmental risk is very low.

The U.S. pipeline safety regulations provide exceptions for both oil and gas gathering pipelines regarding the scope of what is covered under the regulations. Regulatory exceptions are pertinent to gathering pipelines located in sparsely populated areas. For crude oil gathering lines, the exceptions relate to defined populated areas.

The following diagram is used to define the regulated and non regulated gathering lines and may be of interest in defining where Spanish Lookout Area may fall within DOT definitions




If an onshore crude oil gathering line runs from point A to point D, passing through the area within City A's limits, the section represented by point B to point C would be regulated. The sections running between points A-B and C-D would be non-regulated. The regulated sections would have to meet the requirements of U.S. DOT, Pipeline and Hazardous Materials Safety Administration (PHMSA) Regulation 49 CFR Part 195.

The majority of the lines to be installed at San Marcos and Spanish Lookout new wells is 4" gathering lines and represents little risk to occupied premises. In the event of an unplanned event (e.g. in the event of a leak) the hazard to life would be low but remediation and environmental cleanup operations would require to be carried out.

**10.7 Iguana Creek Processing Facility**

a) Oil & Gas Processing

Upon reaching the Iguana Creek Processing Facility, the 12" SDR 7 Polypipe pipeline will be drought aboveground in 12" steel pipeline and the flow stream will be manifold into two 48" x 15ft, 125 psi MAWP, 3 phase, skid mounted horizontal separators each with a nominal capacity of 6520 bpd and 14.8 mmscfpd at 50 psi operating pressure. In practice the separators will be operated at between 15 & 20 psi.

The oil from the separator will dump to two 10,000 bbl storage tanks with facilities to load the crude into road tankers. Any produced water will be dumped from the separator to water holding tanks prior to treatment and re-injection or disposal.

The gas from the separator will pass through a 24" x 8ft horizontal coalescer which will remove all particulate, mist and condensing vapors down to 10 microns. The liquid leg of the gas coalescer will dump to a low level from where the liquids will be pumped to the oil storage tanks and combined with the crude oil.

b) Oil Storage

Two 10,000 bbl bolted steel oil storage tanks will be installed at Iguana Creek together with discharge pumps, metering and a loading gantry for loading the crude oil into road tankers for shipment to Big Creek.

## 10.8 Pipeline Installation Outline

(a) Description of the proposed activities;

The installation of the Polypipe pipeline and gathering line from the proposed San Marcos Developmental wells to the Iguana Creek Storage Facility. In addition, the installation and connection of the Polypipe pipeline from the proposed new SLO developmental wells to the existing pipeline network.

(b) Description of the potentially affected environment,

The route along which the proposed San Marcos pipeline will follow is along the existing terrain through agricultural land and several patches of lowland broad leaf ridges. In retrospect of the Spanish Lookout pipeline which will follow the existing road verges through some agricultural properties.

(c) Summary of the environmental effect of the proposed activities;

- Removal of the flaring of gas from production well sites
- Reduction of Large Road tanker traffic in Spanish Lookout
- Reduction of Heavy Transport Exhaust emissions within San Marcos and Spanish Lookout
- Short term disturbance to land during excavation and construction
- Short term disruption of traffic and land use during construction

(d) Description of the practical activities, as appropriate;

- Digging of a trench
- Pipe lengths will be butt jointed using a high temperature fusion process in Situ
- Proposed gathering lines and pipelines along with electrical cable will be placed on sand in trench
- Trench back filled upon completion of pressure testing.

(e) An assessment of the likely or potential environmental impacts of the proposed activities and the alternatives, including the direct and indirect, cumulative, short-term and long-term effects;

- The impacts of this installation will be predominantly short term and transient and relates to the disturbance caused during trenching operations
- Transient and insignificant air emissions from fusion process
- Short term soil/clay disposal waste disposal issues
- Long term Reduction in greenhouse gases due to cessation of flaring
- Prevention of fugitive emissions from road tankers within San Marcos and SLO

(f) Identification and description of measures available to mitigate the adverse environmental impacts of proposed activity or activities and assessment of those mitigating measures;

Negative Impacts will be mitigated through utilization of :

- Industrial Best practice for pipeline installation to approved Standards
- Effective Management and control of Site operations
- Detailed training to workforce and use of specialist pipeline contractors

(g) An indication of gaps in knowledge and uncertainty which may be encountered in computing the required information.

There are unknowns relating to the following:

- Deterioration in the weather due to heavy rainfall: Potential flooding
- Potential hurricane/storms: Cause delays in construction
- Flooding of trench. (pipeline depth 5 1/2 feet)
- These have been appraised and standard engineering solutions such as pumping solutions have been identified.

## 10.9 Pictorial of Pipeline Route and Proposed Installation

**Upper right,** Open pasture along proposed 6" pipeline Route looking north to San Marcos Well # 1. Note Broad leaf forest in foreground **Lower left**, Iguana Creek crossing proposed pipeline route **Lower right,** Land used for mechanized Agriculture. Note broadleaf forest in background looking north to San Marcos Well # 1.

**Upper right,** Proposed San Marcos Developmental Well # 1 Site - South West view. **Center left** San Marcos Well # 1 Site - North view. **Center right,** Proposed San Marcos Developmental Well # 2 Site **Lower left,** Santa Maria Tree cut down for lumber by loggers along San Marcos Well # 1 to Well # 2 pipe line route **Lower right,** BNE Tank Farm under construction