PHASE 2 AREA
CONTROLLED WATERS REMEDIATION METHODOLOGY

BESSEMER PARK
SHEPCOTE LANE
SHEFFIELD

JUNE 10, 2019

NOVA PROJECT NO. L19-3070

Nova Ambiente

Leaders in Environmental and Engineering Services

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1.0 INTRODUCTION

1.1 Preamble

This report details the proposed methodology for the remediation of an area of groundwater hydrocarbon contamination at the former Outokumpu site located at Shepcote Lane, Sheffield, now known as Bessemer Park. It has been prepared for the sole use and reliance of Peel Logistics Properties and their appointed agents. No other third party may rely or reproduce the content of this report without the written approval of Nova CGI Ltd. If any unauthorised third party comes into possession of this report, they rely upon it entirely at their own risk and the authors do not owe them any warranty, duty of care or skill.

1.2 Proposed Development

The Bessemer Park development comprises two phases, Phase 1 is currently being redeveloped. This report deals only with the remediation of an area of groundwater contamination on Phase 2 of the development, hereafter referred to as 'the Site'. The Bessemer Park development will comprise the construction of a number of industrial / warehouse units.

Phase 2 forms the southern part of the development and forms the bulk of the area, being approximately 38 acres (15.4 hectares). This area has been used for the production and processing of stainless steel.

A site plan is presented as Figure 1 showing the location and extent of the development area and the Phase 1 and Phase 2 boundaries.

1.3 Report Objectives

This report provides detail on the groundwater remediation required as outlined in the Site Investigation, Risk Assessment and Remediation Statement Report prepared by Nova CGI for the Phase 2 Area of the Bessemer Park Development.

1.4 Report Structure

The structure of this report is set out as follows:

- Section 2.0 summarises the ground conditions and the identified groundwater contamination and the requirements for remediation;
- Section 3.0 details the proposed remediation works;
- Section 4.0 presents the proposed monitoring; and,
- Section 5.0 details the validation works to be undertaken.

2.0 BACKGROUND

Several phases of ground investigation have been undertaken across the whole development area between 2003 and 2018, both whilst the Site was still operational and following closure and demolition of the buildings.

A limited area of free phase hydrocarbons has been identified on the groundwater in the north west corner of the Site, centred on Borehole CP1006. A small associated plume of dissolved phase hydrocarbons has been identified immediately down gradient. Figure 2 shows the location and extent of the contamination. Groundwater flow has been identified to be generally East to West. The River Don flows from South to North approximately 1km to the West of the Site.

Previous investigations had identified a surface water sewer that runs beneath Shepcote Lane, immediately west of the Site. Ingress of groundwater is known to have historically occurred into this sewer, it is not known if this still occurs. The sewer runs from South to North past the Site and discharges into the River Don, approximately 500m to the north. This sewer has the potential to act as a direct pathway for groundwater to enter the River Don and hence allow groundwater contamination from the Site to reach the River Don.

Monitoring data shows that currently the area of free phase hydrocarbons is immobile and the associated dissolved phase plume is limited in extent and degrades before reaching the Site boundary and therefore does not currently pose a risk to the River Don. During redevelopment there is the potential that the free phase hydrocarbons could be mobilised and either impact the sewer directly or produce a dissolved phase plume that could impact the sewer. Therefore, it was judged that during the redevelopment the free phase hydrocarbons posed a potentially unacceptable risk to controlled water and so remediation would be required to remove the free phase hydrocarbons.

Full details are presented in the Nova Ambiente report: “Phase 2 Area Site Investigation, Risk Assessment and Remediation Statement”, May 20, 2019, Revision A Ref: L19-3070.

3.0 CONTROLLED WATERS REMEDIATION

3.1 General Aim

The aim of the proposed remediation is to remove the free phase hydrocarbons present in the area of borehole CP1006. The existing monitoring data shows that the free phase is essentially immobile and only a limited plume of dissolved phase hydrocarbons is present in the groundwater immediately down gradient of the area of free phase. There is also evidence that the dissolved phase plume degrades before reaching the site boundary. Consequently, it is considered that specific remediation of the dissolved phase plume is not required, following removal of the free phase the dissolved phase plume will degrade and attenuate within a short period of time.

3.2 Timing

Whilst the contamination appears to be immobile it may be that it is confined by foundations or other below ground structures associated with the former steel works. Consequently, the groundwater remediation works will need to be undertaken prior to, or at the start of the site clearance works in order to minimise the potential for mobilisation of the free phase to occur.

3.3 Remediation Works

The remediation works will utilise a pump and treat system to abstract both free phase hydrocarbons and groundwater. The extracted mixture of water and hydrocarbons will be passed through an oil/water separator with the free phase that accumulates skimmed off and stored in a double skinned tank. The resulting water from the separator will then be passed through a granulated activated carbon vessel in order to remove any dissolved phase hydrocarbons. The treated water will then be discharged to foul sewer or back to groundwater through one or more discharge wells. A schematic layout of the remediation system is presented in Appendix A.

Approximately five large diameters wells will be installed within the area of the free phase hydrocarbons. A further well will be installed down gradient within the area of dissolved phase hydrocarbons. This additional well will form a down gradient backstop in case mobilisation of the free phase occurs and also to allow for abstraction within the dissolved phase plume if required. Figure 3 shows the proposed layout for the remediation wells.

By abstracting groundwater as well as free phase shallow cones of depression will form around the remediation wells that will draw free product towards the remediation wells.

Initially pumping will be undertaken from all five of the wells. The thickness of free phase in each well will be monitored and pumping rates and which wells are pumped will be varied in order to maximise the free phase recovery.

In the remediation area groundwater levels are generally at a depth of around 3m below existing ground level. The remediation wells will therefore be installed to a minimum depth of 5m below ground level with the top of the response zone no deeper than 2m.

4.0 MONITORING

It is proposed to utilise the existing monitoring wells within and around the remediation area and to install a number of additional monitoring wells within the remediation area. The existing wells and proposed additional monitoring wells are shown on Figure 3.

The purpose of the additional monitoring wells is to allow the thickness of free phase to be accurately monitored whilst pumping is ongoing in the remediation wells.

Monitoring will be undertaken on a regular basis during the remediation works of all the available wells. When the recovery rate of free phase in the remediation wells decreases then the system will be switched off and the recovery of free product in the pumping and monitoring wells monitored. The rates of free phase recovery will be used to inform the approach for further pumping.

The cycles of pumping and recovery will be repeated with appropriate changes to the pumping wells utilised and abstraction rates to maximise free phase recovery.

5.0 VALIDATION

5.1 Remediation End Point

The end point for the remediation is the absence of a measurable thickness of free product in the remediation and monitoring wells within the free phase area.

This will be established by undertaking monitoring on a weekly basis for a period of one month following cessation of pumping using an oil/water interface probe. Sampling of the dissolved phase plume will also be undertaken with a minimum of two rounds of sampling of selected monitoring wells undertaken. The results will be used to confirm that dissolved phase concentrations are stable or decreasing.

During this period the remediation system will remain in situ and is to be restarted should recharge of free phase occur.

Once it is confirmed that free phase is no longer present the remediation system will be decommissioned together with the remediation and monitoring wells.

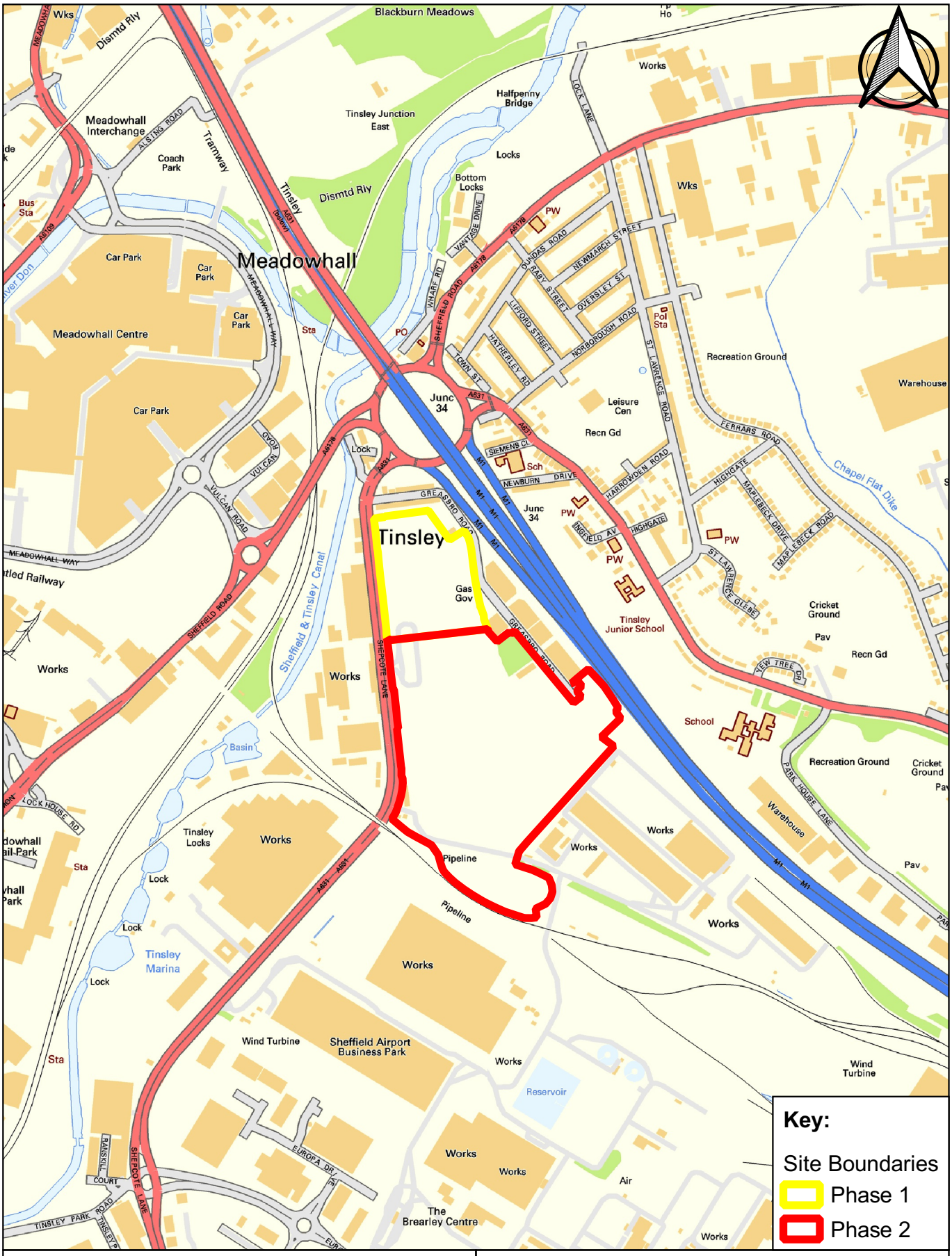
5.2 Regulator Liaison

Throughout the remediation and monitoring phases the monitoring and operational data will be supplied to the Environmental Health Officer (EHO) at Sheffield City Council, and others as required. The EHO will be consulted as part of the process of deciding to move from active remediation to monitoring, and then again as part of the decision to decommission the remediation system.

5.3 Validation Report

Once the remediation works are complete a validation report will be prepared. The report will detail the works undertaken, the volumes of water abstracted and free phase recovered, the monitoring data and chemical analysis results. The locations and decommissioning details for the remediation and monitoring wells will also be included.

FIGURES



SITE LOCATION PLAN

SCALE: 1:10000 @ A4

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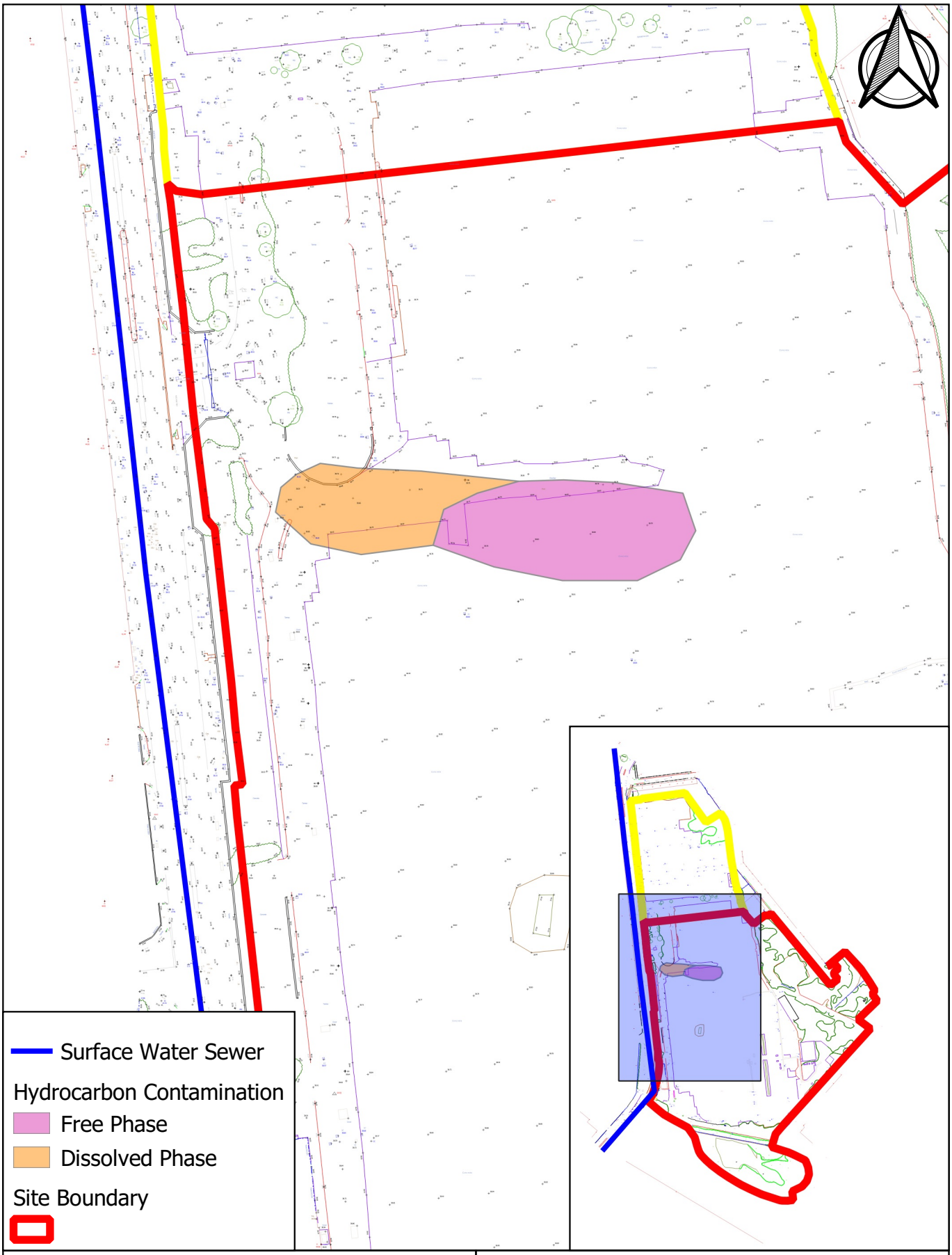
FIGURE 1

Site Name: Bessemer Park, Phase 2
Project Number: L19-3070



GROUNDWATER CONTAMINATION AREA

SCALE: 1:1500 @ A4

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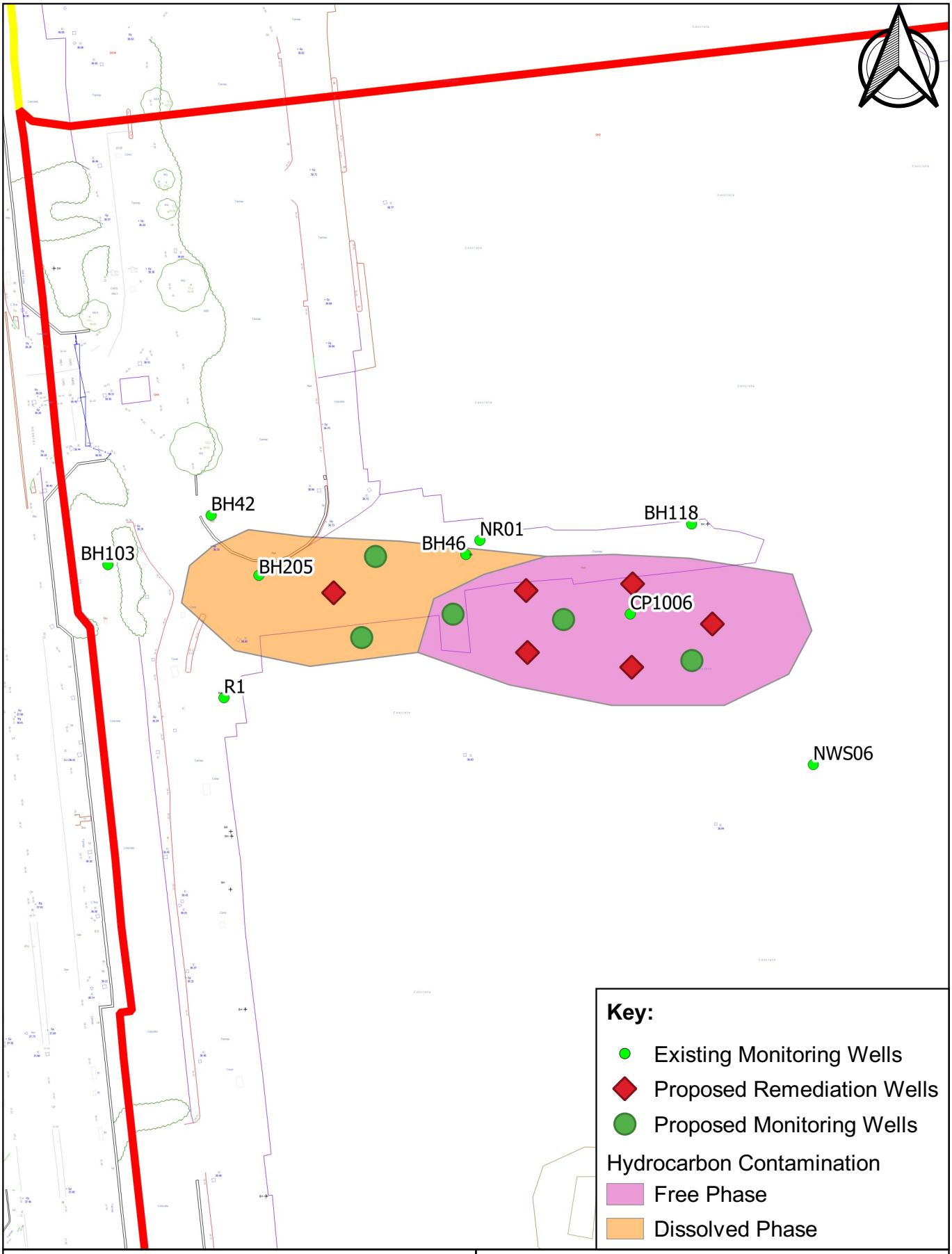
FIGURE 2

Site Name: Bessemer Park, Phase 2
Project Number: L19-3070



Remediation & Monitoring Well Layout

SCALE: 1:1000 @ A4

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FIGURE 3

Site Name: Bessemer Park, Phase 2
Project Number: L19-3070

APPENDIX A

REMEDIATION SYSTEM SCHEMATIC LAYOUT

Remediation System Schematic Layout