Alternative Siting Options
Fraser Grain Terminal

Prepared for:
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Hemmera
An Ausenco Company

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1.0 INTRODUCTION

The proposed Fraser Grain Terminal Export Facility (the "Project") will be located on 11041 Elevator Road in Surrey, BC. The Project will be a new agri-products handling facility located on land adjacent to the Fraser Surrey Docks (FSD) facility. Parrish & Heimbecker (P&H) currently operate an agri-products handling facility on FSD-leased property adjacent to the Site.

The Site is leased from Vancouver Fraser Port Authority (VFPA) by FGT and was formerly leased by Bekaert Canada Ltd. (Bekaert).

The new Project will serve as a trans-shipment storage location for bulk grain products, and will include loading and unloading infrastructure, storage silos, a transfer tower and gallery, and ancillary works.

2.0 METHODOLOGY

This alternative siting options document summarizes the decision-making process undertaken by the FGT Project team during the initial planning phase in developing the Project. It compares key components of the Project and assesses each alternative against considerations related to environmental, community, physical construction, economic, and view and shade. Based on this assessment, the key findings are summarized. Maximizing the capacity and efficiency of FGT will ensure effective storage and shipment of bulk grain products to meet the predicted demand.

3.0 ALTERNATIVES CONSIDERED

An Alternative Siting Analysis is required as part of the PER process to identify and explain alternative solutions for addressing impacts and provide the rationale for the preferred solution. **Table 1** includes a description of preferred options and all alternative siting options or designs considered (description column). Design drawings of the options considered and the option selected are provided in **Appendix A**. The drawings provided in **Appendix A** which represent the options considered are numbered A1, A2, A3, and B1, B2, B3, B4, B5, B6. The A series are site configurations on the FSD property near the existing Shed 1 grain handling facility, and the B series are site configurations on the property previously leased by Bekaert. The arrangement included in **Drawing P001 (Attachment 4A)** was selected as the preferred option. Table 1 summarizes considerations of each option from environmental, community, physical construction and/or economic and view and shade perspectives.

Multiple iterations of each of the two major options were compiled and evaluated. The configuration displayed in **Drawing P001 (Attachment 4A)** was ultimately selected.

View and shade assessments were conducted on final design and not on the alternative siting considerations (the tallest silos selected will be 35.6 m high). Community considerations were the same for all design options and include utilizing Best Available Technology Not Entailing Excessive Cost (BATNEC) to minimize potential effects. Economic considerations for all design options included selecting a cost-effective option to ensure market competitiveness.

Specific criteria for environmental considerations and physical construction considerations differed across design options. They include the items summarized below and in **Table 1**.

Environmental Considerations

- Avoid excavation development in areas with contaminated soil
- Minimize development on areas with existing vegetation or habitat

Physical Construction Considerations

- Suitable apron area for direct support of silos
- Sufficient storage space to achieve desired throughput
- Layout conducive to addition of rail and truck loading business
- Siting of Project components on FGT lease area.

Table 1 Summary of Alternative Siting Options Considerations

Drawing Label	Description	Physical Construction Considerations	Environmental Considerations	Conclusion
A1	• 8 silos @ 14 m diameter and 6 silos @ 22 m diameter • All silos on the existing FSD apron.	• Apron area not suitable for direct support of silos. Insufficient storage space to achieve desired throughput.	N/A	No Go due to technical feasibility
A2	• 16 silos @ 14 m diameter on the FSD apron. • 3 silos @ 22 m diameter NE of the apron where more space was available.	• Apron area not suitable for direct support of silos.	N/A	No Go due to technical feasibility
A3	• 16 silos @ 14 m diameter on the FSD apron. • 2 silos @ 43 m diameter NE of the apron where more space was available.	• Apron area not suitable for direct support of silos.	N/A	No Go due to technical feasibility
B1	• 8 silos @ 17 m diameter. • 6 silos @ 22 m diameter. • All silos on the Bekaert site. • New unloading pit at the edge of the Bekaert site.	N/A	• Unloading pit in contaminated ground. • Foundation for silos requiring piles in contaminated ground.	No Go due to environmental feasibility
B2	• 24 silos @ 15 m diameter. • All silos on the Bekaert site. • New unloading pit at the edge of the Bekaert site	• Layout not conducive to addition of container handling business. • Layout not conducive to addition of rail and truck loading business.	• Unloading pit in contaminated ground.	No Go due to technical and environmental feasibility
B3	• 24 silos @ 15 m diameter. • All silos on the Bekaert site. • New unloading pit on FSD site.	• Unloading pit on FSD property.	N/A	No Go due to technical feasibility
B4	• 16 silos @ 15 m diameter. • 2 silos @ 43 m diameter • All silos on the Bekaert site. • New unloading pit on FSD site.	• Unloading pit on FSD property.	• Foundation for large silos requiring piles in contaminated ground.	No Go due to technical and environmental feasibility
B5	• 16 silos @ 15 m diameter. • 2 silos @ 43 m diameter • All silos on the Bekaert site. • New unloading pit on FSD site. • Mirror image of storage in version B4.	• Unloading pit on FSD property.	• Foundation for large silos requiring piles in contaminated ground.	No Go due to technical and environmental feasibility
B6	• 24 silos @ 14.6 m diameter. • 10 silos @ 6.4 m diameter • All silos on the Bekaert site. • New unloading pit at the edge of the Bekaert site	• Support for the shiploader and silo foundations were potentially not seismically adequate • Design conflicted with Metro Vancouver watermain	N/A	No Go due to physical feasibility
08-17-075CP001RA	• 20 silos @ 14.6 m diameter • 4 silos @ 7.3 m diameter • 1 silo @ 10.0 m diameter • All silos on the Bekaert site • Travelling shiploader replaced with three stationary shiploader towers • Ground densification to be completed for the silo and shiploader foundations using Rammed Aggregate Pier densification	N/A	• Soil densification in contaminated ground designed to contain contamination plume.	Final site selected

4.0 RATIONALE FOR SELECTION OF PREFERRED CONFIGURATION

The selected configuration and location is preferred primarily due to physical constraints such as ability to support Project structures, and allowing sufficient space for effective Project operations. Environmental constraints considered include avoidance of excavation in areas with contaminated soil and minimization of development on areas with existing vegetation.

The cost of implementing alternatives is a consideration in determining the preferred arrangements. The capacity increases / benefits to traffic relative to the associated costs are also an important selection factor. The results of these findings guided the development of the project design. The existing constraints to the east of the site limit the potential for expansion in this direction.

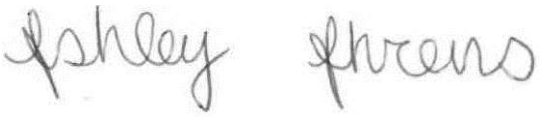
The new design provides the following additional benefits when compared to Option B6:

- Relocation of a reduced number of silos further south on the site to:
  - minimize ground densification over contaminated soils, and
  - avoid the existing Metro Vancouver Annacis No. 3 Water Main.
- Replacement of the travelling shiploader with three stationary shiploaders, (reducing number of foundation piles from 123 to 31);
- Likely reduction in point source air quality emissions;
- Reduction in noise due to fewer equipment sources;
- Similar view and shade effects to the current layout.

5.0 CLOSURE

This Work was performed in accordance with 08-17-115C Professional Services Agreement between Hemmera Envirochem Inc. ("Hemmera") and Parrish and Heimbecker Ltd. c/o FWS Group of Companies ("Client"), dated December 8, 2017 ("Contract"). This Report has been prepared by Hemmera, based on information provided by FWS Group and Enns Gauthier Landscape Architects, for sole benefit and use by Fraser Grain Terminal Ltd. In performing this Work, Hemmera has relied in good faith on information provided by others, and has assumed that the information provided by those individuals is both complete and accurate. This Work was performed to current industry standard practice for similar environmental work, within the relevant jurisdiction and same locale. The findings presented herein should be considered within the context of the scope of work and project terms of reference; further, the findings are time sensitive and are considered valid only at the time the Report was produced. The conclusions and recommendations contained in this Report are based upon the applicable guidelines, regulations, and legislation existing at the time the Report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

Report prepared by:
Hemmera Envirochem Inc.



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Project Manager

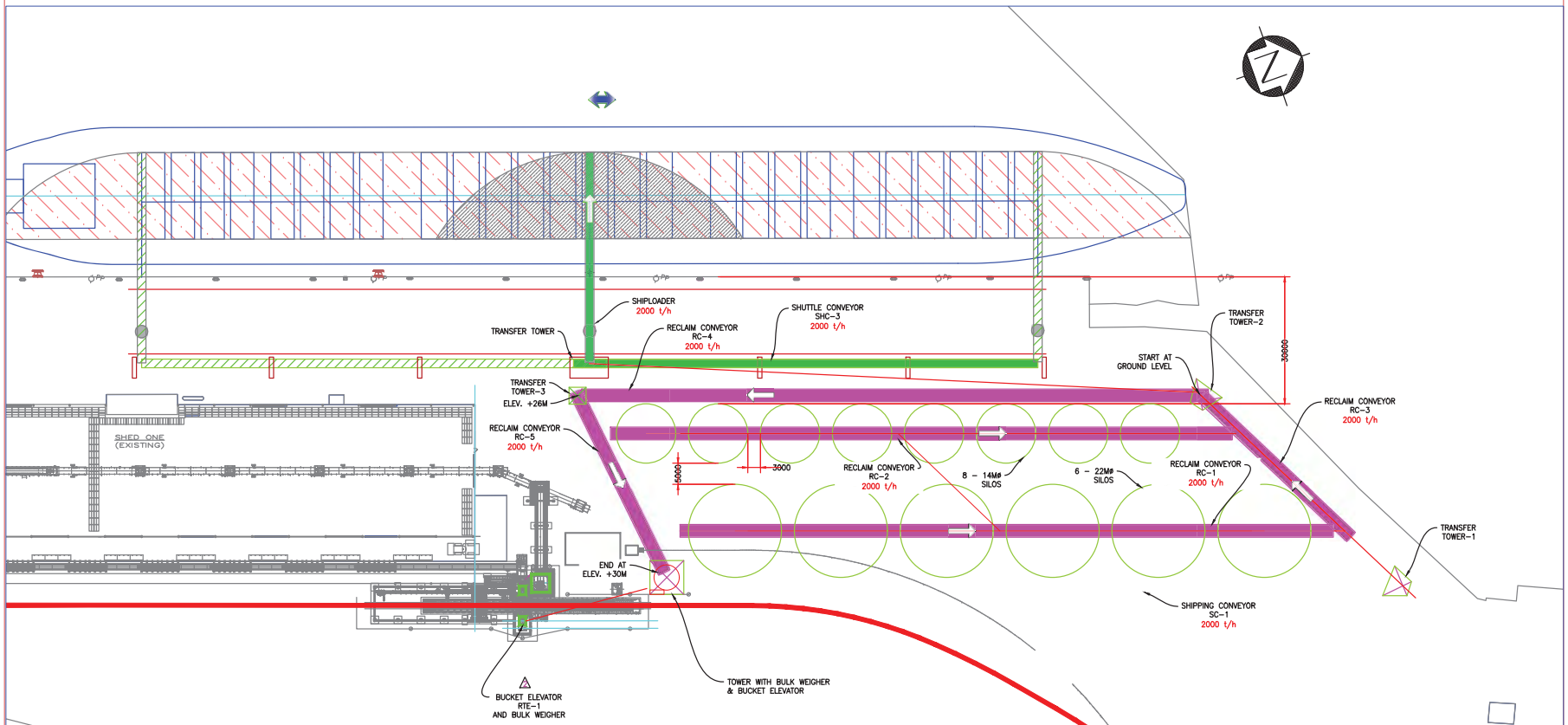
Reviewed by:
Hemmera Envirochem Inc.

Robin Taylor, EP
Senior Environmental Assessment Manager

APPENDIX A

Alternative Siting Drawings

NOTES:
1. FOR SHIPPING & RECEIVING TRANSFER CONVEYORS REFER TO DWG. M-GA-0001



SITE LAYOUT
RECLAIM & SHIPPING
METHOD 1 – OPTION 1 ⚠

REVIEW OF PRIOR ARRANGEMENTS OF FGT SITE CONSIDERED DURING PRE-FEED EXERCISE

ARRANGEMENT A1

0 1 2 3 4 5 INCHES
0 5 10 CENTIMETRES

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Date: 2014.07.15

REFERENCE DRAWINGS

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-	-

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VER.	DATE	DESCRIPTION
7		
6		
5		
4		
3	2014 08 25	CHANGED TITLE
2	2014 08 11	ADDED BULK WEIGHER DIVERTER AND SAMPLER
1	2014 08 01	ISSUED FOR DISCUSSION

REVISION HISTORY

SIGNATURE

ENGINEER OF RECORD

PRELIMINARY

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CMC ENGINEERING AND MANAGEMENT LIMITED

FRASER SURREY DOCKS
Pacific Rim Stevedoring

AGEX PRE-FEED STUDY
SITE GENERAL ARRANGEMENT
RECLAIM / SHIPPING
METHOD 1 - OPTION 1 ⚠

PROJECT NO. 1415 SCALE 1:500

DRAWING NO. M-GA-0002 Version: 3

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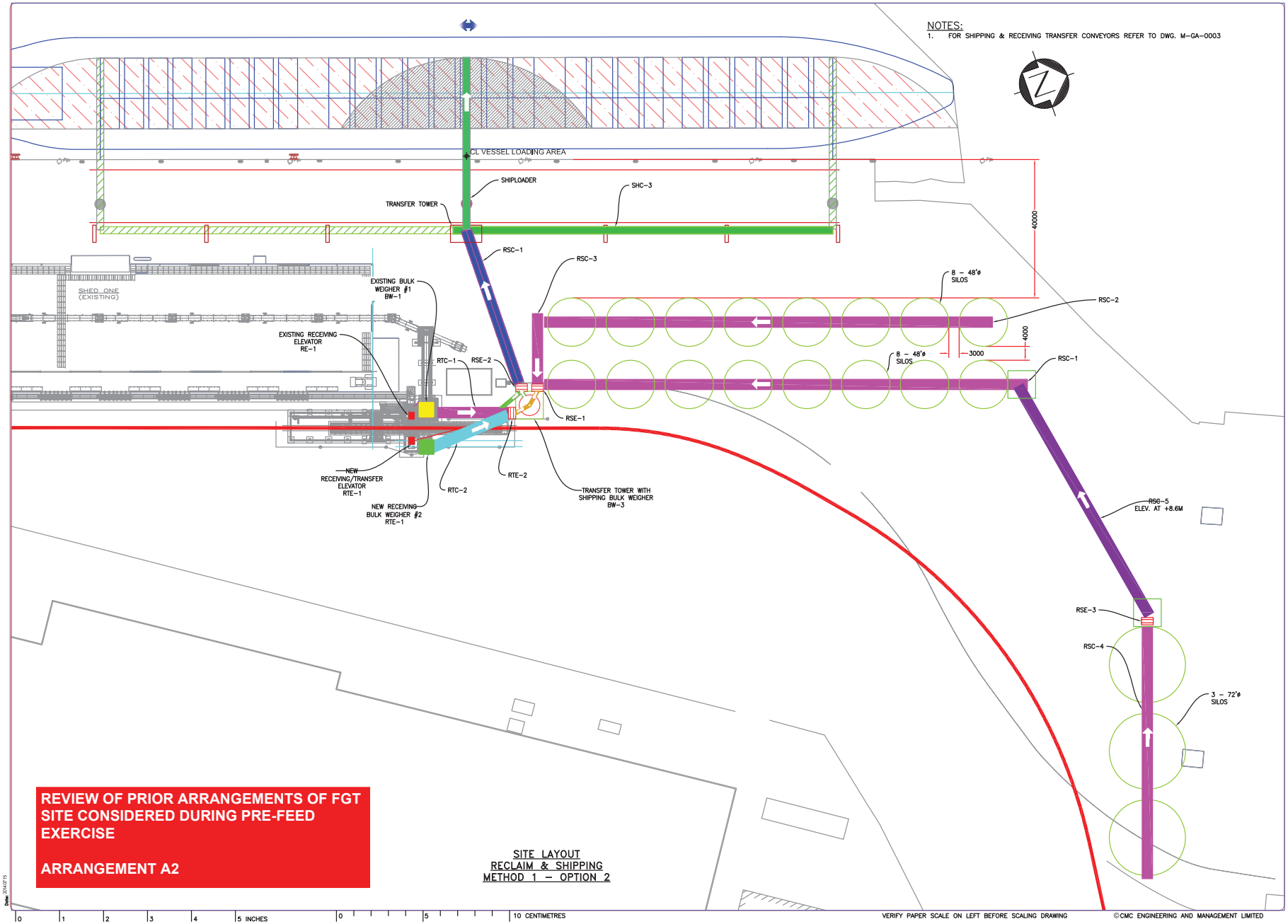

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VER.	DATE	DESCRIPTION
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1	2014 08 19	ISSUED FOR DISCUSSION

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AGEX PRE-FEED STUDY
SITE GENERAL ARRANGEMENT
RECLAIM / SHIPPING
METHOD 1 - OPTION 2

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DRAWING NO.	M-GA-0004	Version:	1

Date: 2014.07.15

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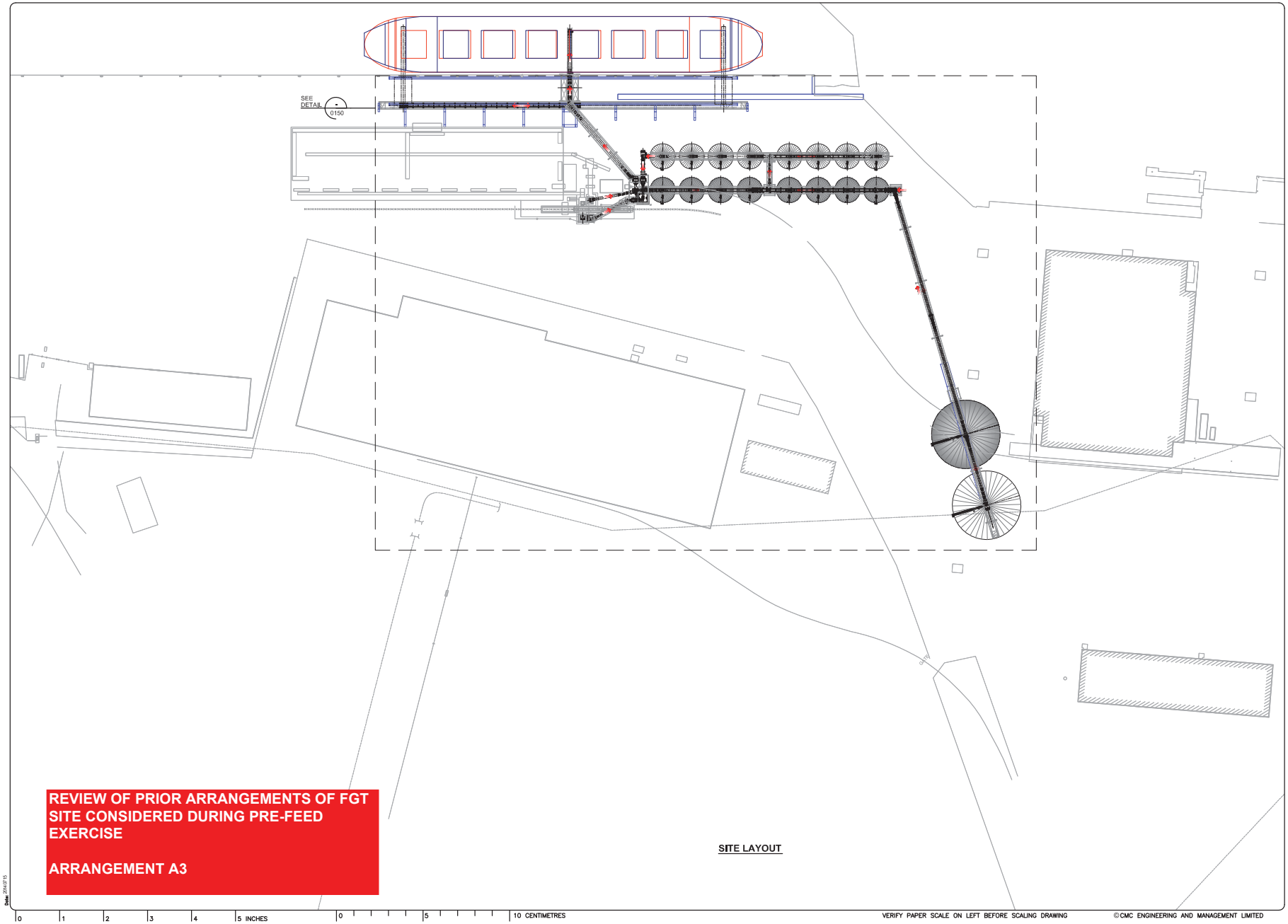

REVIEW OF PRIOR ARRANGEMENTS OF FGT SITE CONSIDERED DURING PRE-FEED EXERCISE

ARRANGEMENT A3

SITE LAYOUT

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-	-
-	-

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2	14/09/30	GENERAL REVISION
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AGEX PRE-FEED
METHOD 1
SITE GENERAL ARRANGEMENT - PLAN
SITE LAYOUT 1 OF 4

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Date: 2014/07/15

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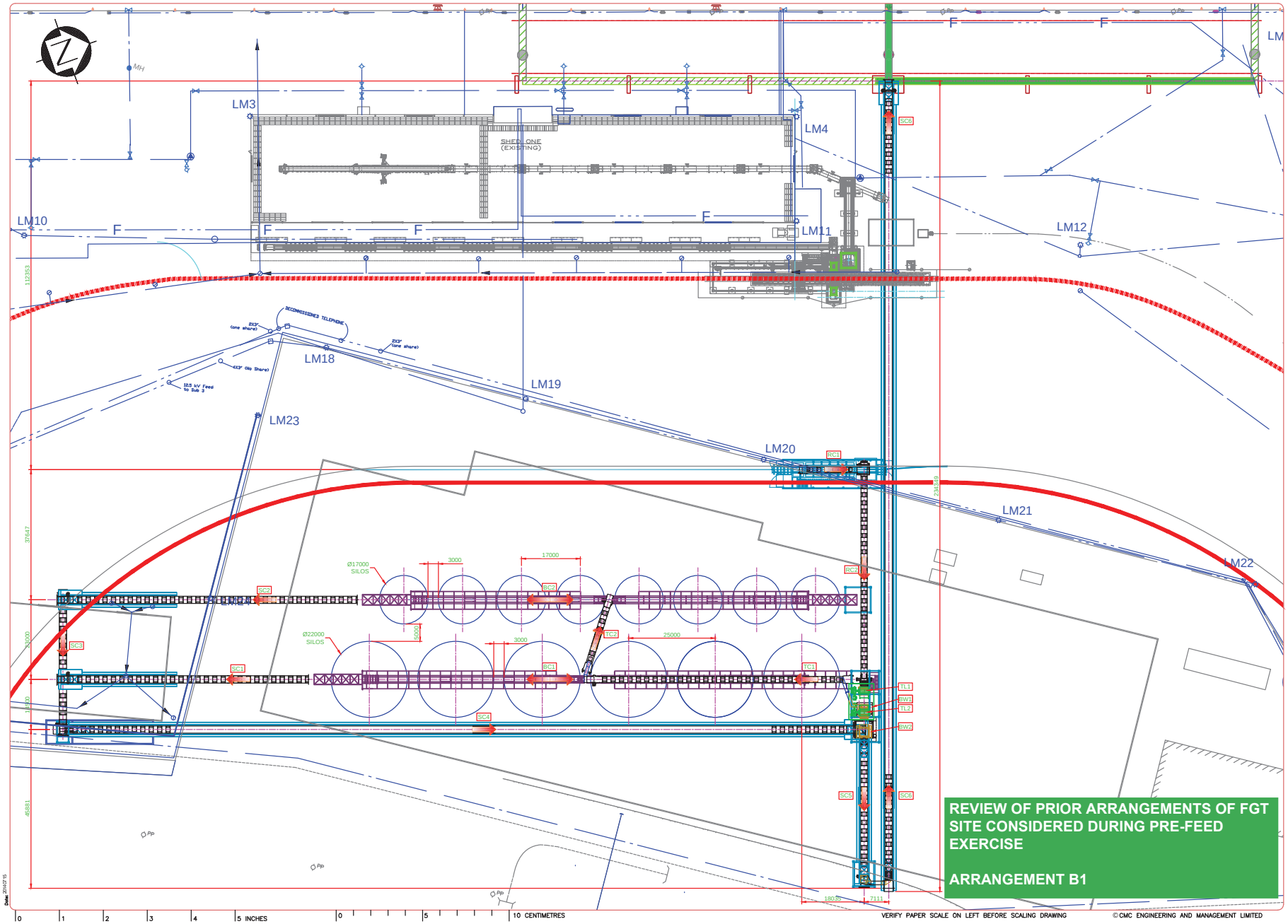

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REVIEW OF PRIOR ARRANGEMENTS OF FGT SITE CONSIDERED DURING PRE-FEED EXERCISE

ARRANGEMENT B1

AGEX PRE-FEED
METHOD 2
SITE GENERAL ARRANGEMENT - PLAN

PROJECT NO.	SCALE
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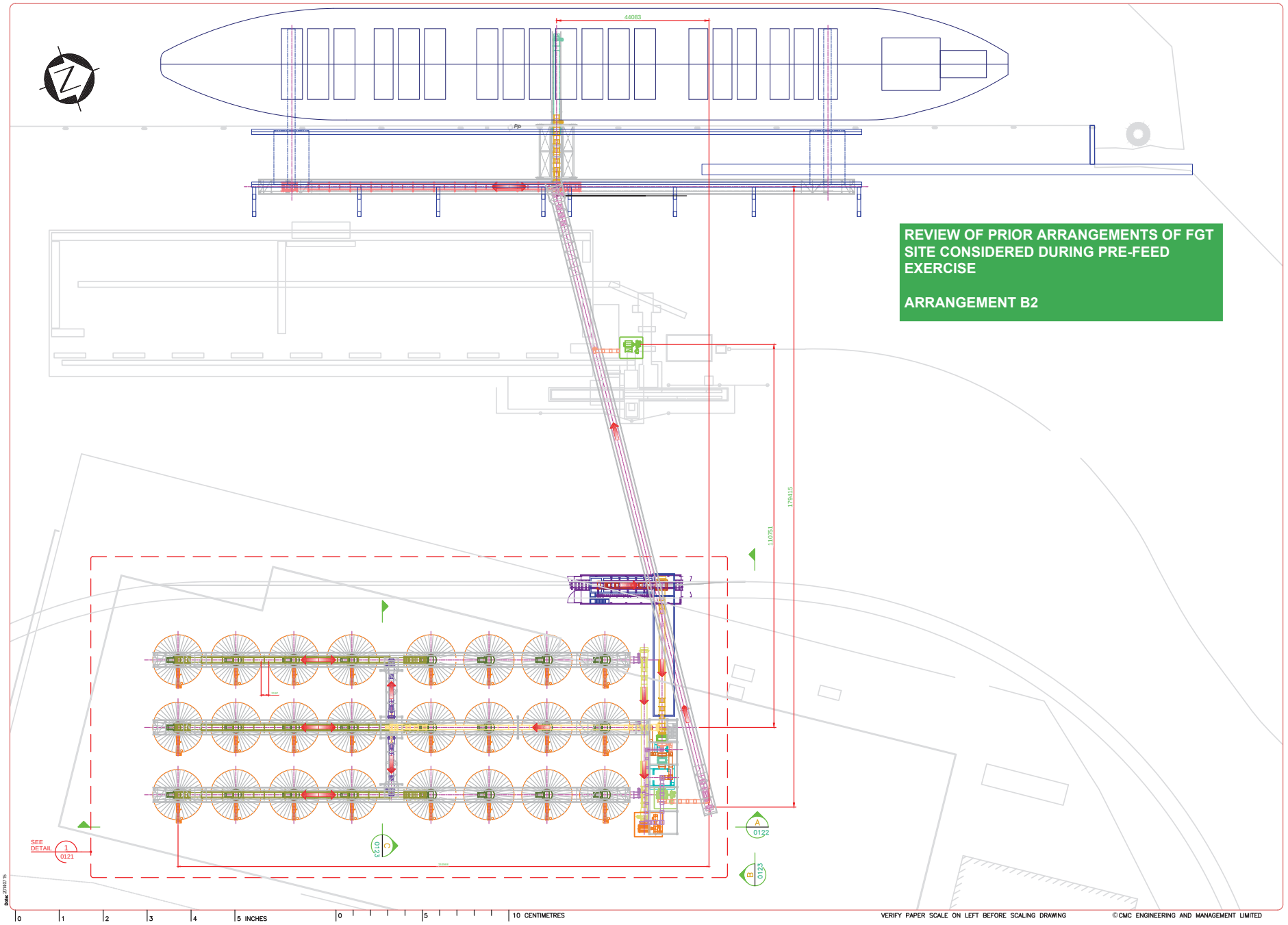

REVIEW OF PRIOR ARRANGEMENTS OF FGT SITE CONSIDERED DURING PRE-FEED EXERCISE

ARRANGEMENT B2

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M-GA-0123	-
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AGEX PRE-FEED
METHOD 2 - OPTION 2
SITE GENERAL ARRANGEMENT - PLAN

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DRAWING NO.	M-GA-0120	Version	1

Date: 2014/07/15

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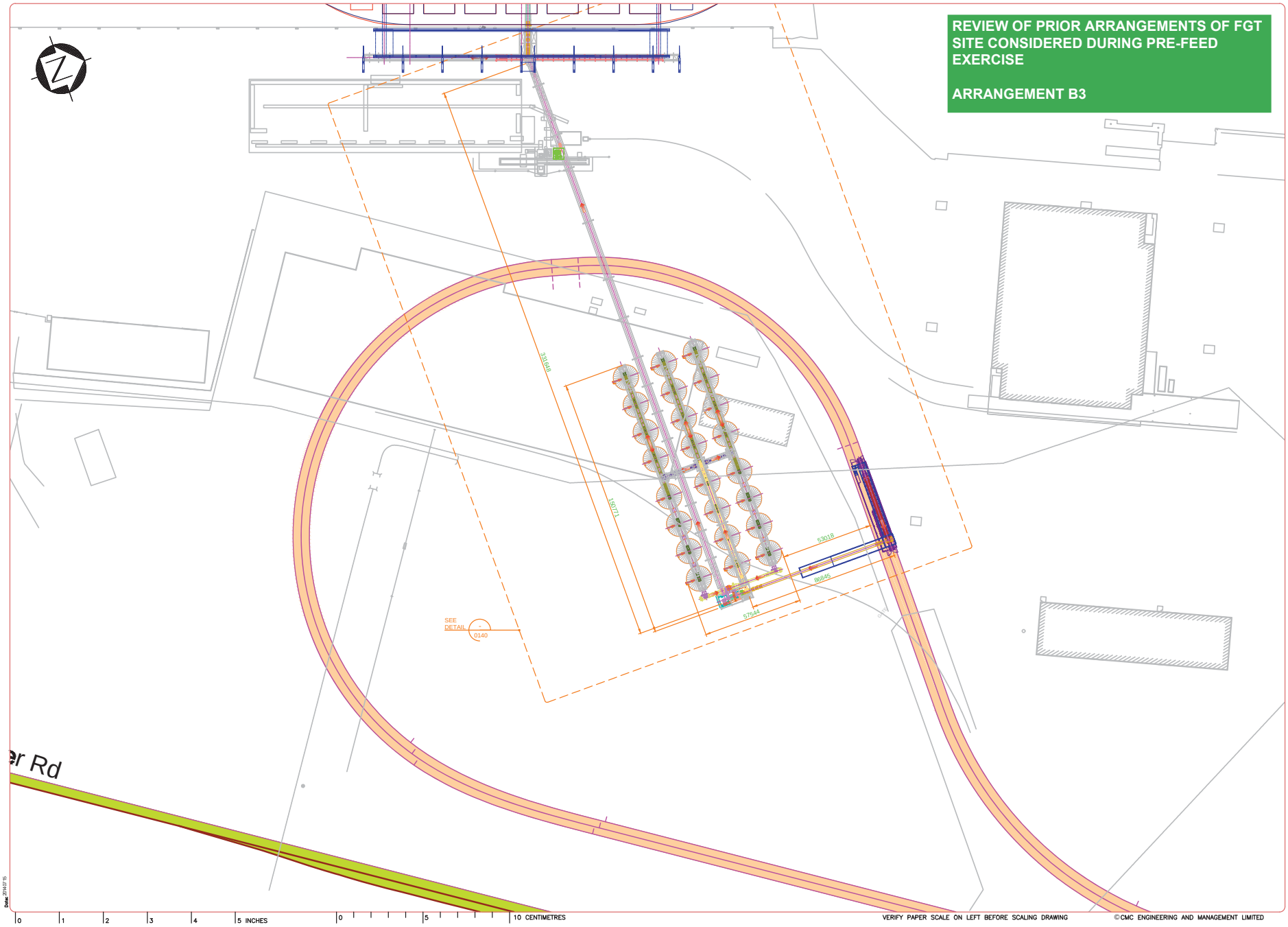

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3	14/09/19	IN PROGRESS
2	14/09/16	GENERAL REVISION
1	14/09/09	ISSUED FOR DISCUSSION

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AGEX PRE-FEED
METHOD 2
SITE GENERAL ARRANGEMENT - PLAN

PROJECT NO.	1415	SCALE	1:1000
DRAWING NO.	M-GA-0140A	Version	3

S-file: FSD-GA-0140-V3.7.dwg

Date: 2014/07/15

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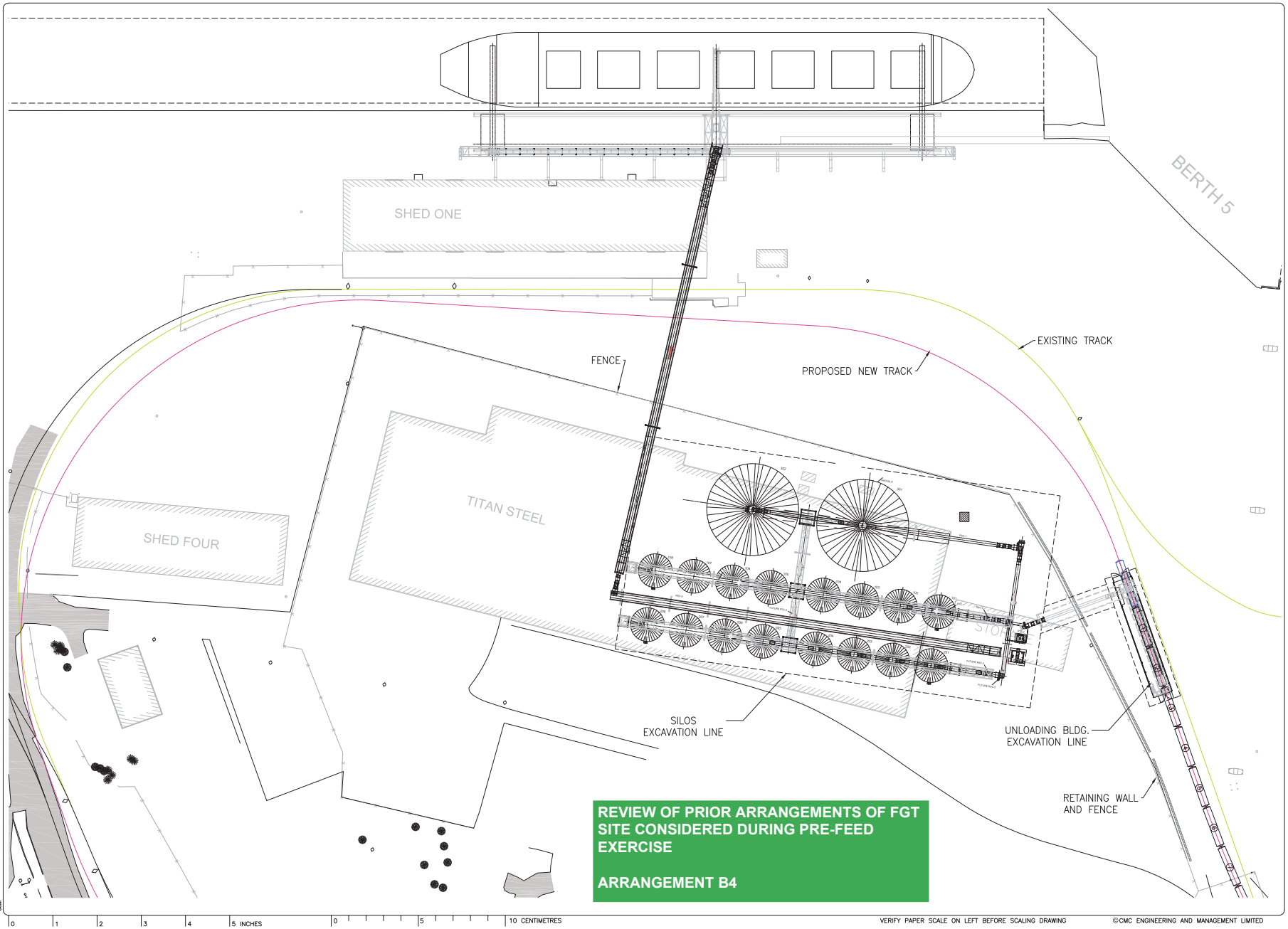

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REFERENCE DRAWINGS

M-GA-0121	M-GA-0122
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AGEX PRE-FEED
METHOD 2 - OPTION 2
EXCAVATION LINES

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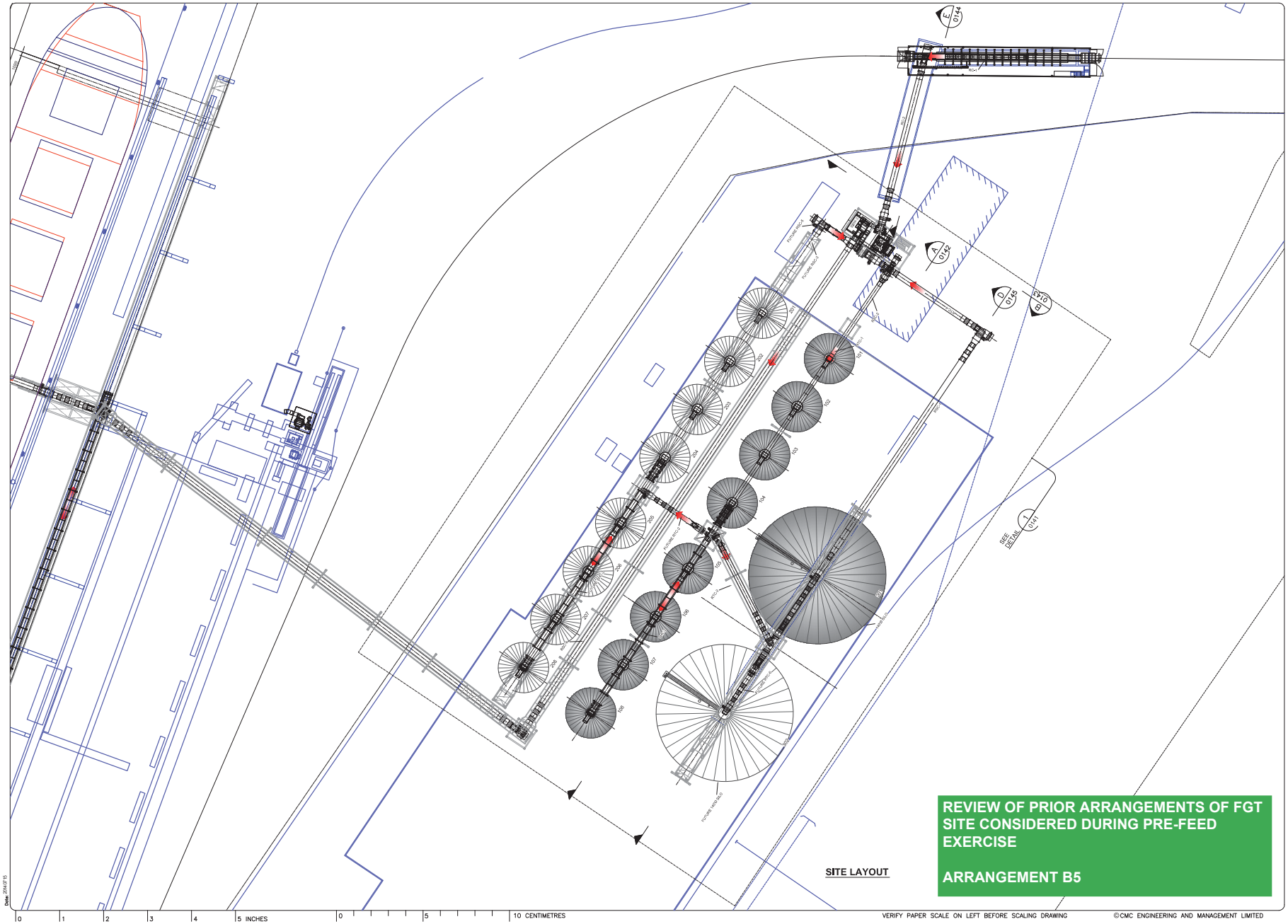

REVIEW OF PRIOR ARRANGEMENTS OF FGT SITE CONSIDERED DURING PRE-FEED EXERCISE

ARRANGEMENT B5

REFERENCE DRAWINGS	
M-GA-0140A	M-GA-0141
M-GA-0142	M-GA-0143
M-GA-0144	-

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14/10/28		ISSUED FOR REVIEW
4	14/09/30	GENERAL REVISION
3	14/09/19	IN PROGRESS
2	14/09/16	GENERAL REVISION
1	14/09/08	ISSUED FOR DISCUSSION

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Pacific Rim Stevedoring

AGEX PRE-FEED
METHOD 2
SITE GENERAL ARRANGEMENT
SITE LAYOUT 2 OF 3

PROJECT NO.	1415	SCALE	1:500	
DRAWING NO.	M-GA-0140			Version: 5

S-file: FSD-GA-0140-V5.5.dwg

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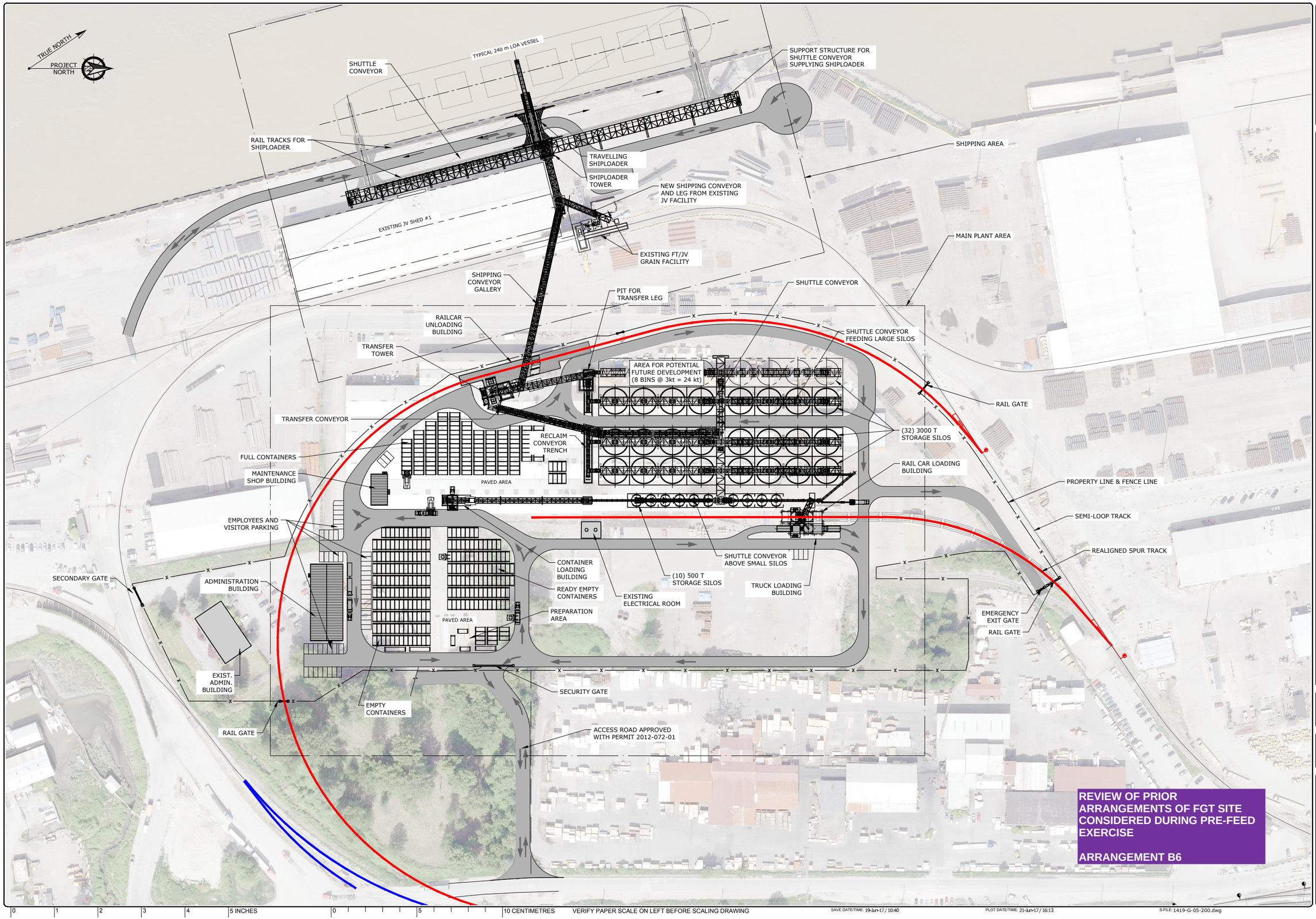

REVIEW OF PRIOR ARRANGEMENTS OF FGT SITE CONSIDERED DURING PRE-FEED EXERCISE

ARRANGEMENT B6

REFERENCE DRAWINGS	
G-05-001	

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REV.	DATE	DESCRIPTION
6	2017-APR-28	REVISED BOUNDARY LINE AND VESSEL
5	2017-MAR-13	FENCE BOUNDARY REVISED
4	2017-FEB-23	FENCE BOUNDARY REVISED
3	2017-JAN-03	NEW ACCESS ROAD
2	2016-SEP-16	ISSUED FOR ARCHEOL STUDY
1	2016-JUL-08	ISSUED FOR PER

REVISION HISTORY

ISSUED FOR PER
DO NOT USE FOR CONSTRUCTION

SEAL (when required)

SIGNATURE

DD-MMM-YYYY

ENGINEER OF RECORD

CMC ENGINEERING AND MANAGEMENT LIMITED

FGT
FRASER GRAIN TERMINAL

SITE LAYOUT
GENERAL ARRANGEMENT
OVERALL SITE
PLAN VIEW

PROJECT NO.	SCALE
1419	1:1000 U.N.O.

DRAWING NO.	REV.
1419-G-05-200	6

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