APPENDIX C

Drawings

LION SMELTER

NEW TAILINGS STORAGE FACILITY – FEASIBILITY STUDY

PROJECT No. 30100592/07

CONSULTANT DRAWING NO	DESCRIPTION	REV
301-00592/07 - 000	LIST OF DRAWINGS	D
301-00592/07 - 001	GENERAL ARRANGEMENT – LAYOUT PLAN AND SETTING OUT DATA	H
301-00592/07 - 006	PHASE 1 STARTER WALL – PLAN LAYOUT	C
301-00592/07 - 007	PHASE 1 AND 2 STARTER WALL – PLAN LAYOUT	C
301-00592/07 - 008	PHASE 1 STARTER WALL – TYPICAL SECTIONS	C
301-00592/07 - 009	PHASE 1 PADDOCK WALLS – TYPICAL LAYOUT, SECTIONS AND DETAILS	B
301-00592/07 - 010	FLOOD LINES – PLAN LAYOUT	B
301-00592/07 - 011	STORMWATER DIVERSION CHANNELS – PLAN LAYOUT	B
301-00592/07 - 012	DIRTY AREA – LAYOUT PLAN	B
301-00592/07 - 013	PHASE 1 & 2 – UNDER DRAINAGE AND FILTER DRAIN – LAYOUT	C
301-00592/07 - 014	UNDER DRAINAGE AND FILTER DRAIN – SECTIONS AND DETAILS	B
301-00592/07 - 017	TAILINGS DELIVERY PIPELINE AND SPIGOTS – SECTIONS AND DETAILS	B
301-00592/07 - 020	DECANT TOWER – LAYOUT, SECTIONS AND DETAILS	C
301-00592/07 - 026	ENERGY DISSAPATOR – LAYOUT, SECTIONS AND DETAILS	C
301-00592/07 - 029	CATWALK – LAYOUT, SECTIONS AND DETAILS	C
301-00592/07 - 030	TSF RETURN WATER DAM – LAYOUT, SECTIONS AND DETAILS	B
301-00592/07 - 031	TSF RETURN WATER DAM – SECTIONS AND DETAILS	B
301-00592/07 - 032	TSF RETURN WATER DAM – SECTIONS AND DETAILS	C
301-00592/07 - 037	SILT TRAP – LAYOUT AND SECTIONS	C
301-00592/07 - 039	SLAG DUMP RETURN WATER DAM – LAYOUT, SECTIONS AND DETAILS	B
301-00592/07 - 040	SLAG DUMP RETURN WATER DAM – SECTIONS AND DETAILS	C
301-00592/07 - 041	SLAG DUMP RETURN WATER DAM – SECTIONS AND DETAILS	B
301-00592/07 - 042	POLLUTION CONTROL DAM – PLAN LAYOUT	B
301-00592/07 - 043	POLLUTION CONTROL DAM – SECTIONS AND DETAILS	B
301-00592/07 - 045	POLLUTION CONTROL DAM – SECTIONS AND DETAILS	B
301-00592/07 - 046	SILT TRAP – SECTIONS AND DETAILS	B
301-00592/07 - 047	SPILLWAY FROM SILT TRAP – SECTIONS AND DETAILS	B
301-00592/07 - 050	RIVER DIVERSION CHANNEL – SITE PLAN	C
301-00592/07 - 055	STREAM DIVERSION CHANNEL – CH: 0.00M-540.00M	A
301-00592/07 - 056	STREAM DIVERSION CHANNEL – CH: 540.00M-1000.00M	A
301-00592/07 - 057	STREAM DIVERSION CHANNEL – CH: 1000.00M-1500.00M	A
301-00592/07 - 058	STREAM DIVERSION CHANNEL – CH: 1500M-2068.00M	A
301-00592/07 - 059	STREAM DIVERSION CHANNEL – CH: 0.00M-381.00M	A
301-00592/07 - 060	STREAM DIVERSION CHANNEL ENERGY DISSIPATORS – LAYOUT, SECTIONS & DETAILS	A
301-00592/07 - 062	OUTLET – TYPICAL LAYOUT, SECTIONS & DETAILS	A
301-00592/07 - 063	INLET – TYPICAL LAYOUT, SECTIONS & DETAILS	A
301-00592/07 - 064	REHABILITATION AREA – PLAN LAYOUT	A
301-00592/07 - 065	PIPELINE FROM SILT TRAP TO RETURN WATER DAM – LAYOUT, SECTIONS & DETAILS	A
301-00592/07 - 066	PIPELINE FROM SILT TRAP TO RETURN WATER DAM – LAYOUT, SECTIONS & DETAILS	A
301-00592/07 - 067	PIPELINE FROM SILT TRAP TO RETURN WATER DAM – LAYOUT, SECTIONS & DETAILS	A

Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/2018
DRAWING CHECK	RG	31/08/2018
DESIGN	AS	31/08/2018
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	-
-		

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	21.09.18	ISSUED FOR INFORMATION	ME	RG	AS
C	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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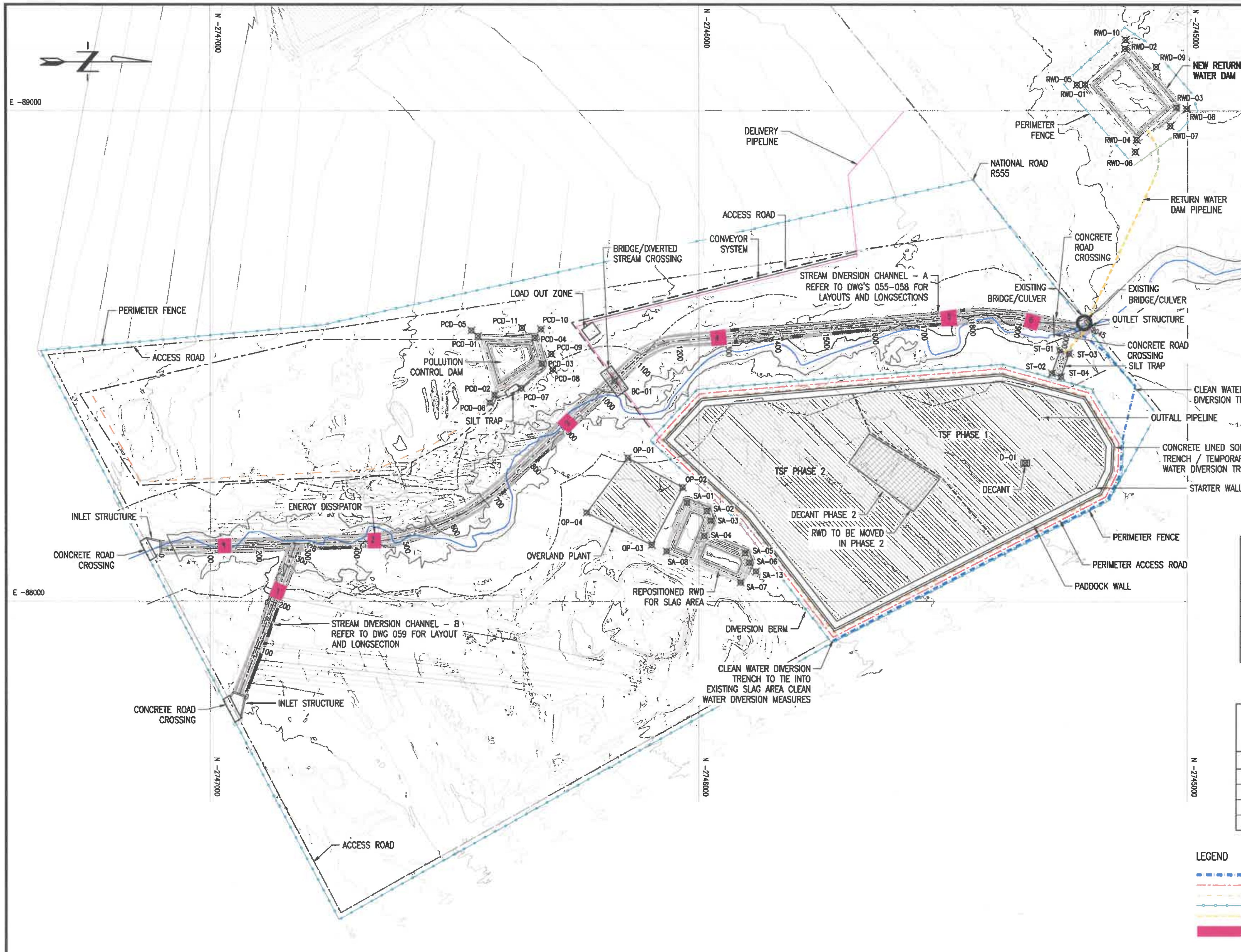
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY

DRAWING LIST

DRAWING NUMBER	SCALE	REV.
301-00592/07-000	AS SHOWN	E

P:\301-00592\07\A\DRAWINGS\KP\For Tender\DWG\301-00592-07-000 Rev E.dwg



SITE LAYOUT
NTS

RETURN WATER DAM SETTING OUT DATA

POINT	EASTING	NORTHING
RWD-01	-89053.6394	-2745211.5476
RWD-02	-89126.7645	-2745129.3726
RWD-03	-89007.2373	-2745023.0089
RWD-04	-88941.1713	-2745104.7724

OVERLAND PLANT SETTING OUT DATA

POINT	EASTING	NORTHING
OP-01	-88293.2592	-2746144.9183
OP-02	-88233.0103	-2746032.6037
OP-03	-88115.3932	-2746095.6969
OP-04	-88181.3828	-2746229.0000

RWD FOR SLAG AREA SETTING OUT DATA

POINT	EASTING	NORTHING
SA-01	-88201.9688	-2746023.7152
SA-02	-88184.9449	-2745983.1605
SA-03	-88165.2828	-2745975.1340
SA-04	-88133.9380	-2745988.3061
SA-05	-88099.0707	-2745905.3346
SA-06	-88079.4309	-2745897.3172
SA-07	-88038.8671	-2745914.3634
SA-08	-88102.4030	-2746065.5560

CENTRE POINT SETTING OUT DATA

POINT	EASTING	NORTHING
BC-01	-88450.1154	-2746171.7647
D-01	-88283.2276	-2745333.5333
ST-01	-88513.0590	-2745262.4520

RETURN WATER DAM PERIMETER SETTING OUT DATA

POINT	EASTING	NORTHING
RWD-05	-89053.3380	-2745227.9154
RWD-06	-88916.2293	-2745107.6002
RWD-07	-88968.9873	-2745035.2691
RWD-08	-89004.0713	-2745002.0166
RWD-09	-89089.3125	-2745064.3165
RWD-10	-89144.5431	-2745127.9112

SILT TRAP SETTING OUT DATA

POINT	EASTING	NORTHING
ST-01	-88513.0590	-2745262.4520
ST-02	-88465.9417	-2745279.1839
ST-03	-88506.0312	-2745243.7274
ST-04	-88459.2456	-2745260.3382

POLLUTION CONTROL DAM PERIMETER SETTING OUT DATA

POINT	EASTING	NORTHING
PCD-05	-88552.7278	-2746464.0121
PCD-06	-88405.8260	-2746426.4688
PCD-07	-88435.6335	-2746362.0000
PCD-08	-88473.0156	-2746298.3522
PCD-09	-88504.4872	-2746301.2426
PCD-10	-88555.3100	-2746322.3149
PCD-11	-88557.7560	-2746361.1931

POLLUTION CONTROL DAM SETTING OUT DATA

POINT	EASTING	NORTHING
PCD-01	-88541.6786	-2746450.6144
PCD-02	-88421.3806	-2746416.6560
PCD-03	-88484.9483	-2746320.3015
PCD-04	-88537.8788	-2746335.2431

RWD FOR SLAG AREA PERIMETER SETTING OUT DATA

POINT	EASTING	NORTHING
SA-09	-88223.9722	-2746029.4754
SA-10	-88203.1868	-2745965.7220
SA-11	-88145.3168	-2745959.7798
SA-12	-88113.8570	-2745887.0065
SA-13	-88061.2844	-2745883.3663
SA-14	-88022.2342	-2745906.2797
SA-15	-88057.7021	-2746000.0000
SA-16	-88096.7941	-2746079.7937

LEGEND

- CLEAN WATER DIVERSION TRENCH
- PERIMETER ACCESS ROAD
- CONCRETE LINED SOLUTION TRENCH
- PERIMETER FENCE
- RETURN WATER DAM PIPELINE
- ENERGY DISSIPATOR

100 0 100 200 300
METRES 1:5000

Knight Piésold CONSULTING

N. Lmaude
Pr. Eng 900255
27/06/19

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	23/07/2018
DRAWING CHECK	RG	23/07/2018
DESIGN	RG	23/07/2018
DESIGN CHECK	AS	23/07/2018
PROJECT ENGINEER	–	–
–		

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	23.07.18	ISSUED FOR TENDER	RW	RG	AS
B	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
C	21.09.18	ISSUED FOR INFORMATION	ME	RG	AS
D	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
E	05.11.18	ISSUED FOR INFORMATION	RW	MS	AS
F	01.04.19	ISSUED FOR INFORMATION	MKM	MG	AS
G	02.04.19	ISSUED FOR INFORMATION	MKM	MG	AS
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
592-55	–	RETURN WATER DAM CH: 0.00m – 540.00m
592-56	–	RETURN WATER DAM CH: 540.00m – 1000.00m
592-57	–	RETURN WATER DAM CH: 1000.00m – 1500.00m
592-58	–	RETURN WATER DAM CH: 1500.00m – 2068.00m
592-59	–	RETURN WATER DAM CH: 0.00m – 381.00m
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LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
GENERAL LAYOUT PLAN
AND SETTING OUT DATA

DRAWING NUMBER	SCALE	REV.
301-00592/07-001	AS SHOWN	G

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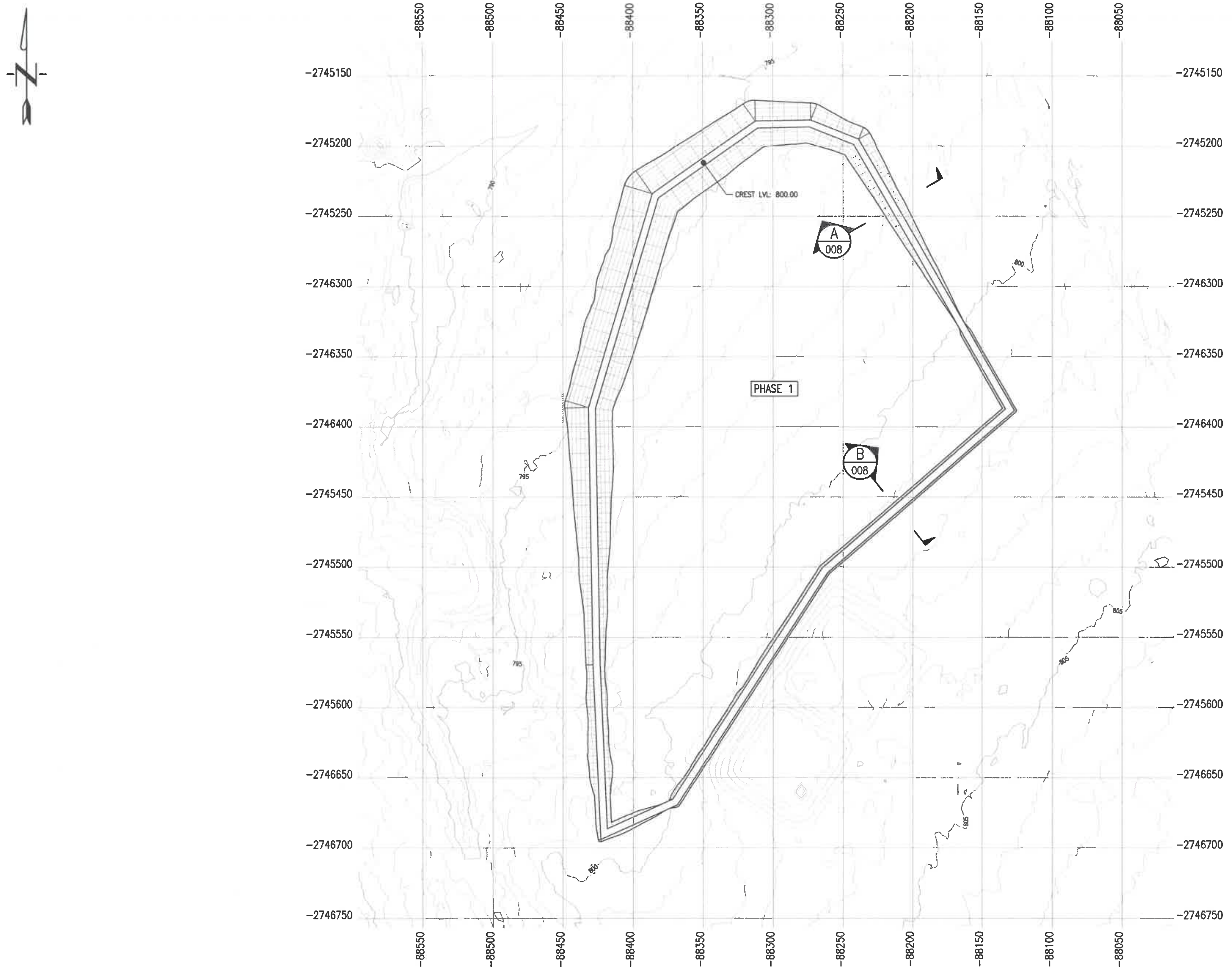

NOTE:
PHASE 1
FOOTPRINT AREA: 9.98ha
CREST WIDTH: 5m

50 0 50 100
METRES 1:1500

Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/2018
DRAWING CHECK	RG	31/08/2018
DESIGN	AS	31/08/2018
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	–
–		

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	21.09.18	ISSUED FOR INFORMATION	ME	RG	AS
C	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
592-008	–	STARTER WALL TYPICAL SECTIONS
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LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
PHASE 1
STARTER WALL
PLAN LAYOUT

DRAWING NUMBER	SCALE	REV.
301-00592-006	AS SHOWN	C

20090268

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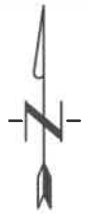

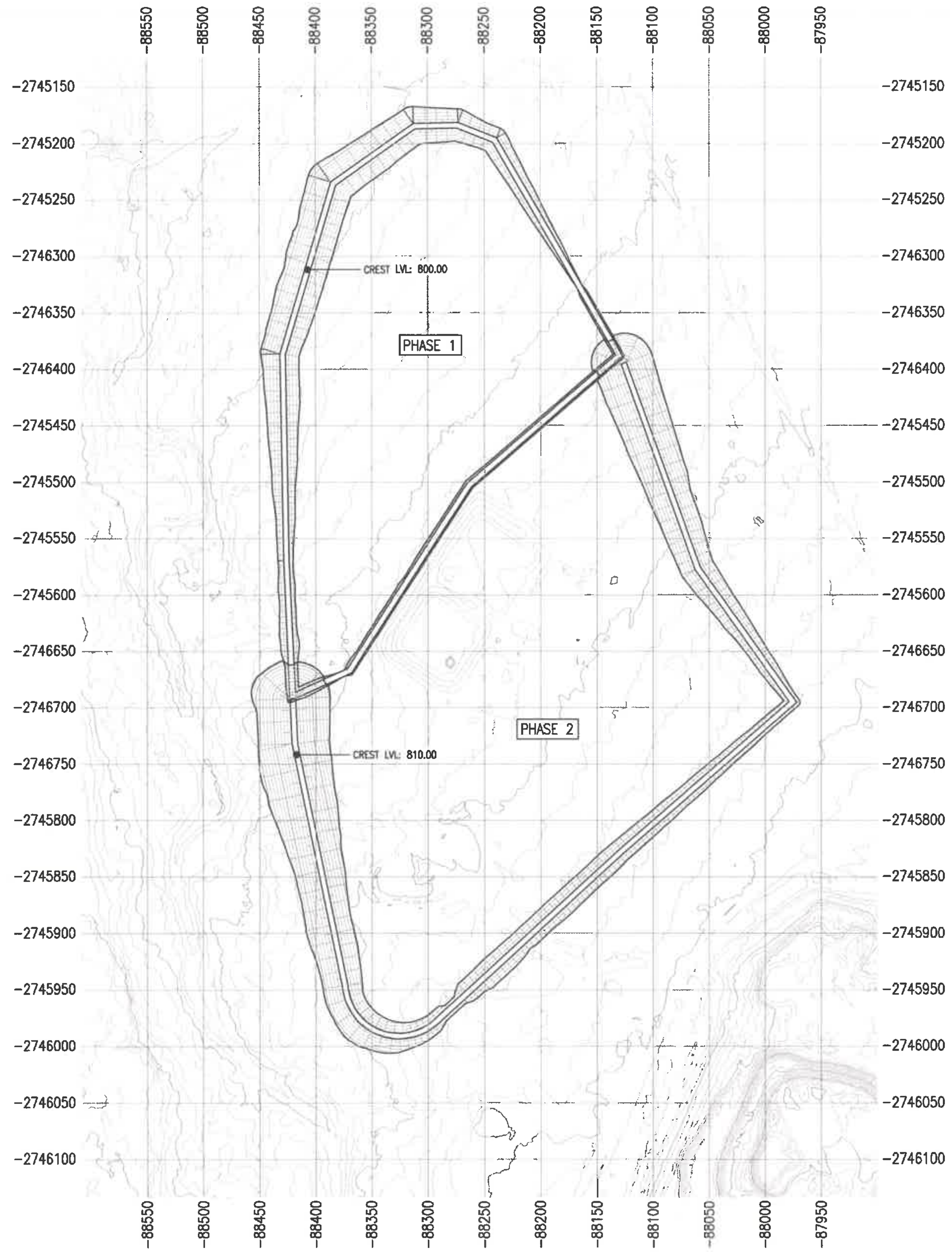

NOTE:

PHASE 1
FOOTPRINT AREA: 10.5ha
CREST WIDTH: 5m

PHASE 2
FOOTPRINT AREA: 15.8ha
CREST WIDTH: 5m

50 0 50 100 150
METRES 1:2500

Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/2018
DRAWING CHECK	RG	31/08/2018
DESIGN	AS	31/08/2018
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	–
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REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	21.09.18	ISSUED FOR INFORMATION	ME	RG	AS
C	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
PHASE 1 & 2
STARTER WALL
PLAN LAYOUT

DRAWING NUMBER	SCALE	REV.
301-00592/07-007	1: 2500	C

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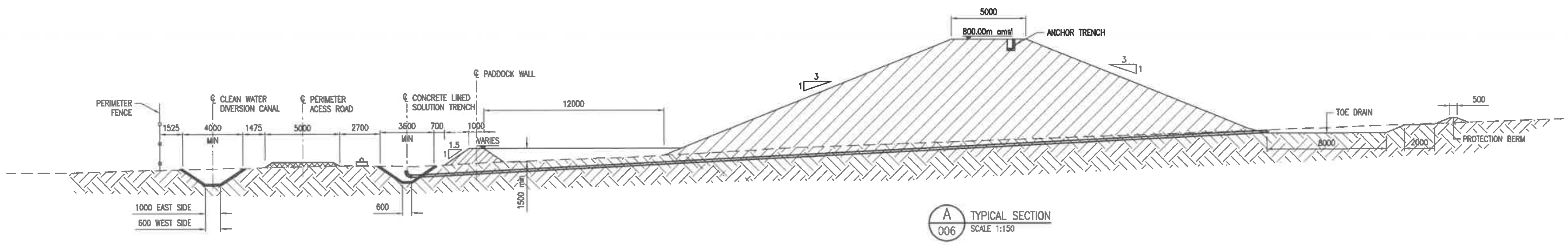
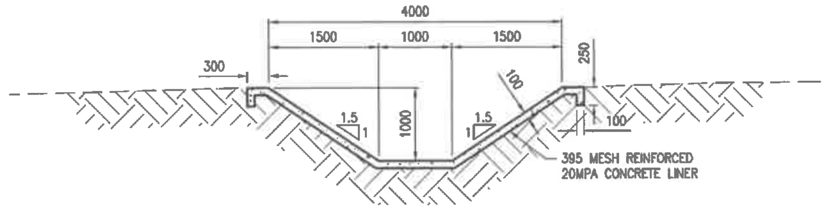
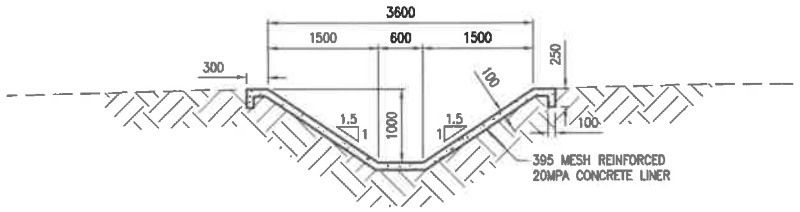


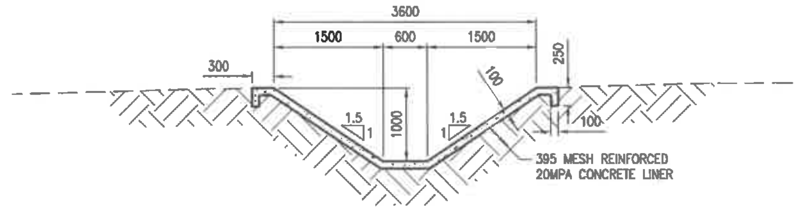
A 006 TYPICAL SECTION
SCALE 1:150



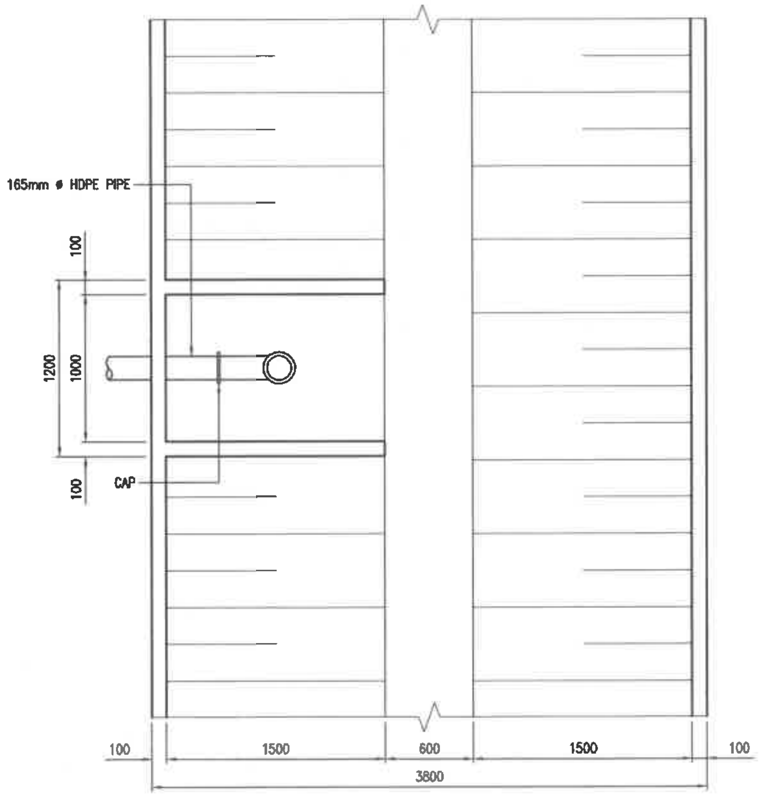
CLEAN WATER DIVERSION CANAL
TYPICAL SECTION – EAST SIDE OF TSF
SCALE 1:50



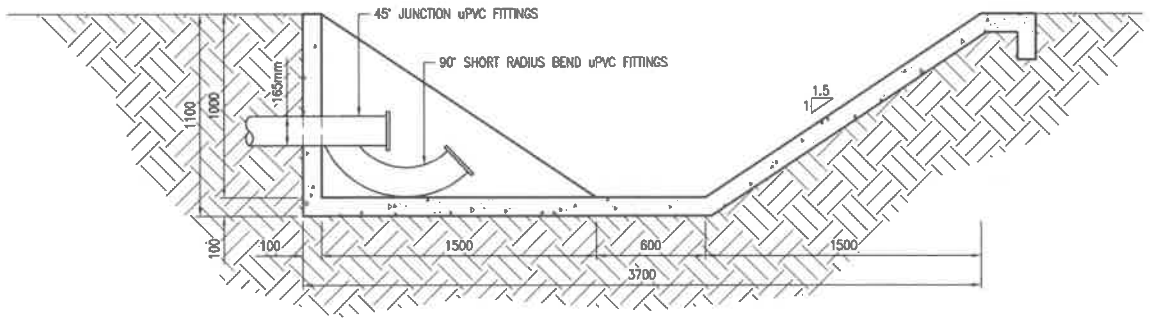
CLEAN WATER DIVERSION CANAL
TYPICAL SECTION – WEST SIDE OF TSF
SCALE 1:50



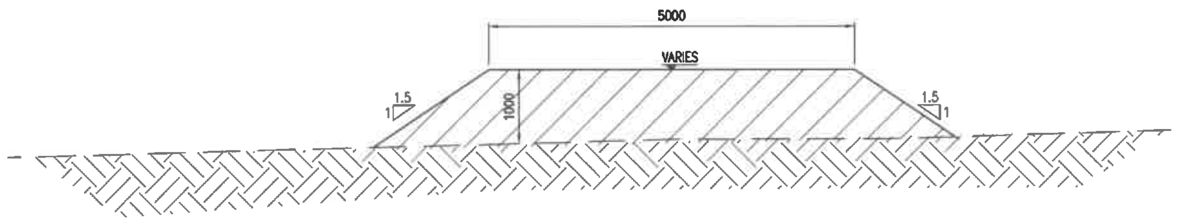
TYPICAL SECTION – SOLUTION TRENCH
SCALE 1:50



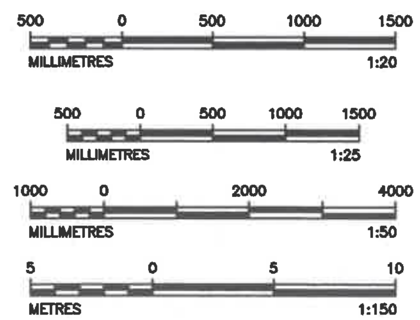
TYPICAL PLAN VIEW OF FILTER DRAIN – OUTLET PIPES
SCALE 1:25



TYPICAL FILTER DRAIN OUTLET DETAIL
SCALE 1:20



B 006 TYPICAL BERM SECTION
SCALE 1:50



Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/2018
DRAWING CHECK	RG	31/08/2018
DESIGN	AS	31/08/2018
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	–

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	21.09.18	ISSUED FOR INFORMATION	ME	RG	AS
C	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
592-006	–	STARTER WALL LAYOUT PLAN
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LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
PHASE 1
STARTER WALL
TYPICAL SECTION

DRAWING NUMBER	SCALE	REV.
301-00592/07-008	AS SHOWN	C

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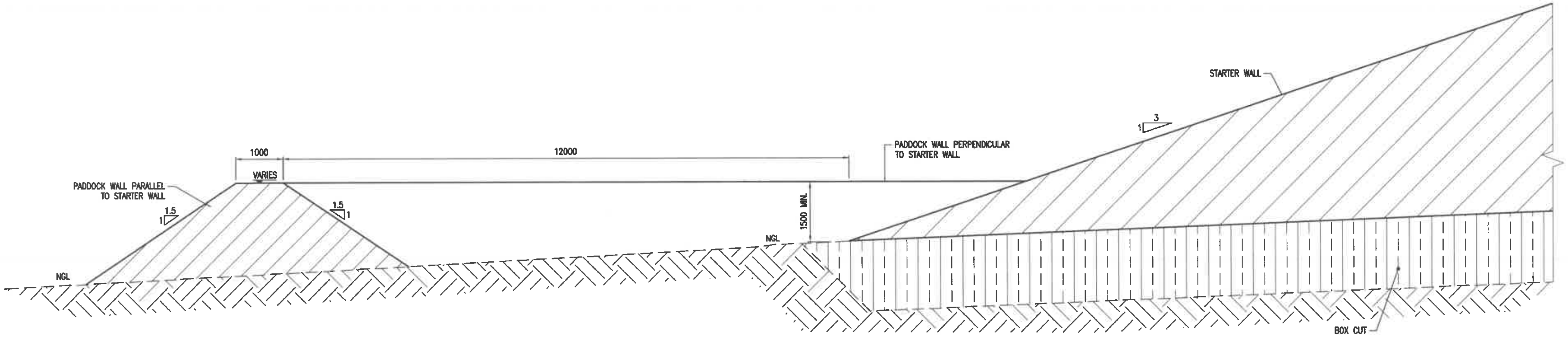
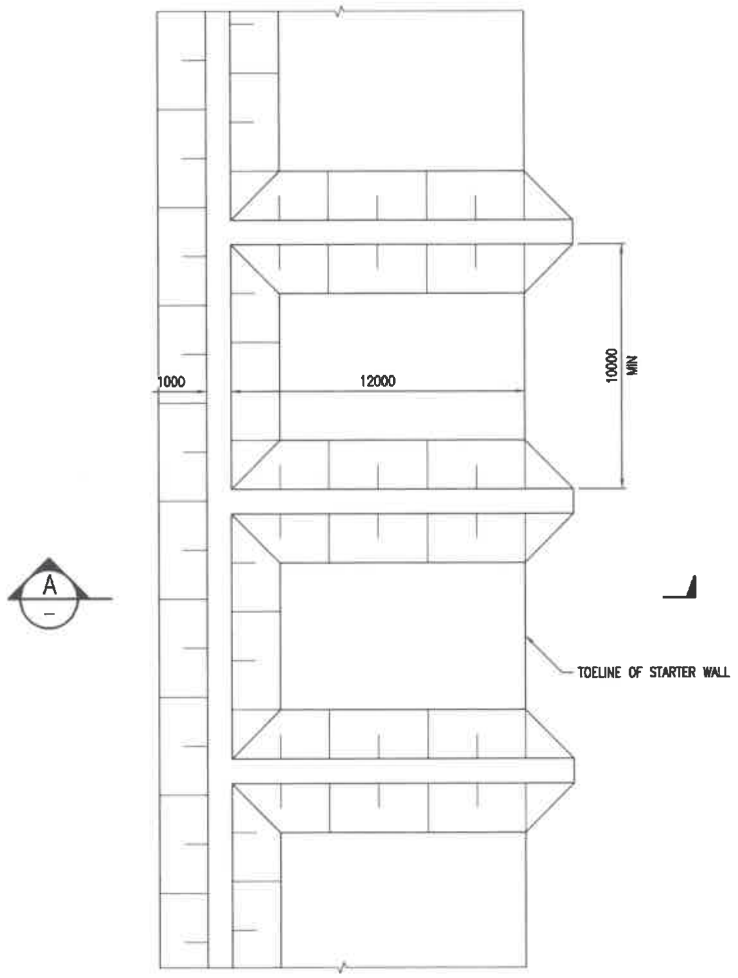


A TYPICAL PADDOCK WALL SECTION
SCALE 1:50



TYPICAL PADDOCK LAYOUT
SCALE 1:150

1000 0 2000 4000
MILLIMETRES 1:50

5 0 5 10
METRES 1:150

Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31.08.18
DRAWING CHECK	RG	31.08.18
DESIGN	AS	31.08.18
DESIGN CHECK	AS	31.08.18
PROJECT ENGINEER	AS	–
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Atraum 20090268

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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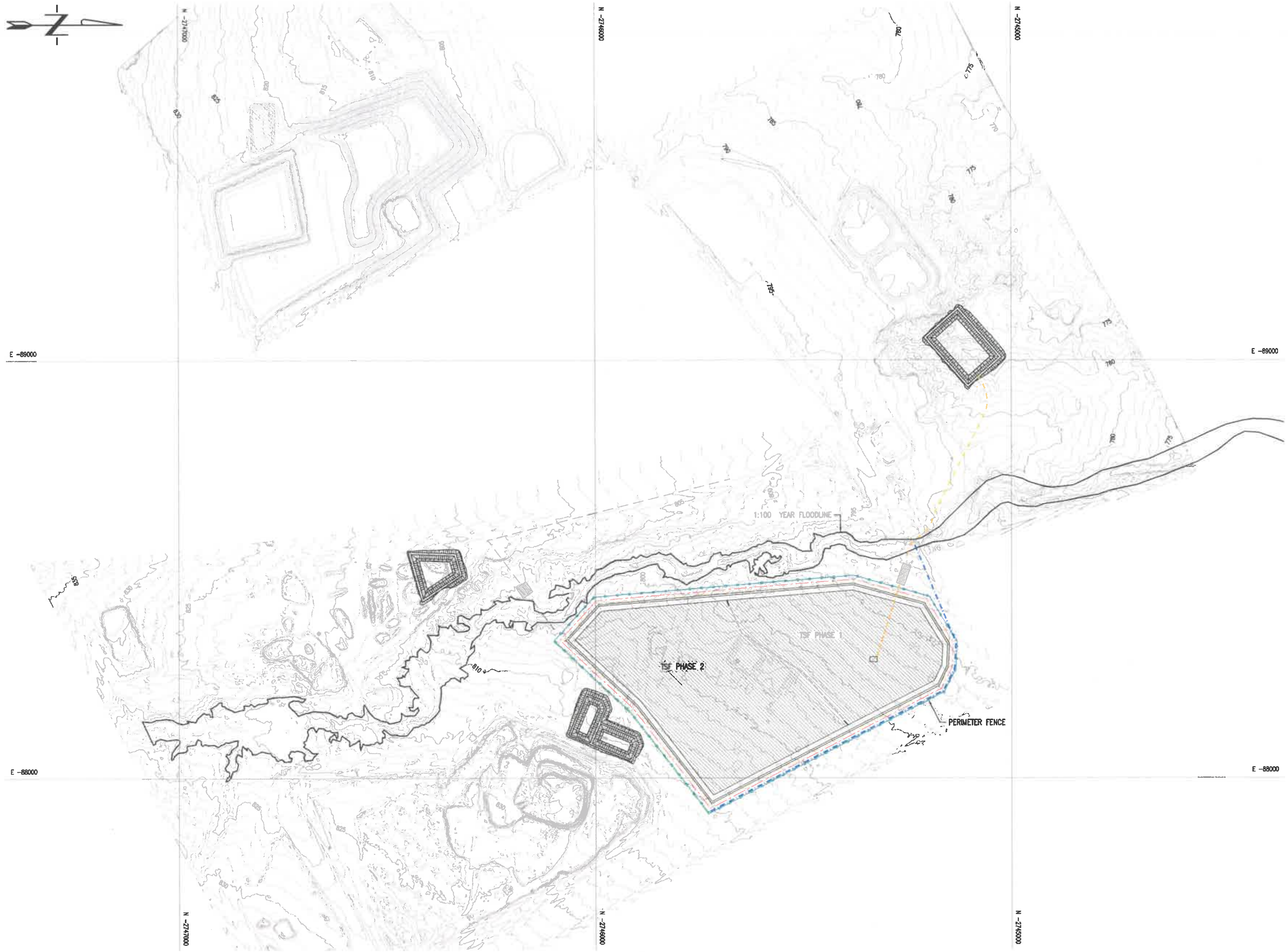
LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
PHASE 1
PADDOCK WALLS
TYPICAL LAYOUT, SECTIONS AND DETAILS

DRAWING NUMBER	SCALE	REV.
301-00592/07-009	AS SHOWN	B

P:\301-00592\07\A\DRAWINGS\KP\For Tender\301-00592-07-008, 009 Rev B.dwg



SITE LAYOUT
SCALE 1: 5000

LEGEND

- CLEAN WATER DIVERSION TRENCH
- PERIMETER ACCESS ROAD
- CONCRETE LINED SOLUTION TRENCH
- DIVERSION BERM
- PERIMETER FENCE
- RETURN WATER DAM PIPELINE

100 0 100 200 300
METRES 1:5000

Knight Piésold CONSULTING

Hraeuro 20090268

PRIMARY DISCIPLINE	CIVIL	
DRAWN	RW	23/07/2018
DRAWING CHECK	RG	23/07/2018
DESIGN	RG	23/07/2018
DESIGN CHECK	AS	23/07/2018
PROJECT ENGINEER	–	–

–

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	23/07/18	ISSUED FOR TENDER	ME	RG	AS
B	11/10/18	ISSUED FOR TENDER	RW	RG	AS
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–	–	–	–	–	–

REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
FLOODLINES
LAYOUT PLAN

DRAWING NUMBER	SCALE	REV.
301-00592/07-010	1: 5000	B

P:\301-00592\07\...\DRAWINGS\KP\For Tender\301-00592-07-010 Rev B.dwg

SITE LAYOUT
SCALE 1: 5000

Knight Piésold CONSULTING

20090268

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	23/07/2018
DRAWING CHECK	RG	23/07/2018
DESIGN	RG	23/07/2018
DESIGN CHECK	AS	23/07/2018
PROJECT ENGINEER	–	–
–		

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	23/07/18	ISSUED FOR TENDER	ME	RG	AS
B	11/10/18	ISSUED FOR TENDER	ME	RG	AS
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–	–	–	–	–	–
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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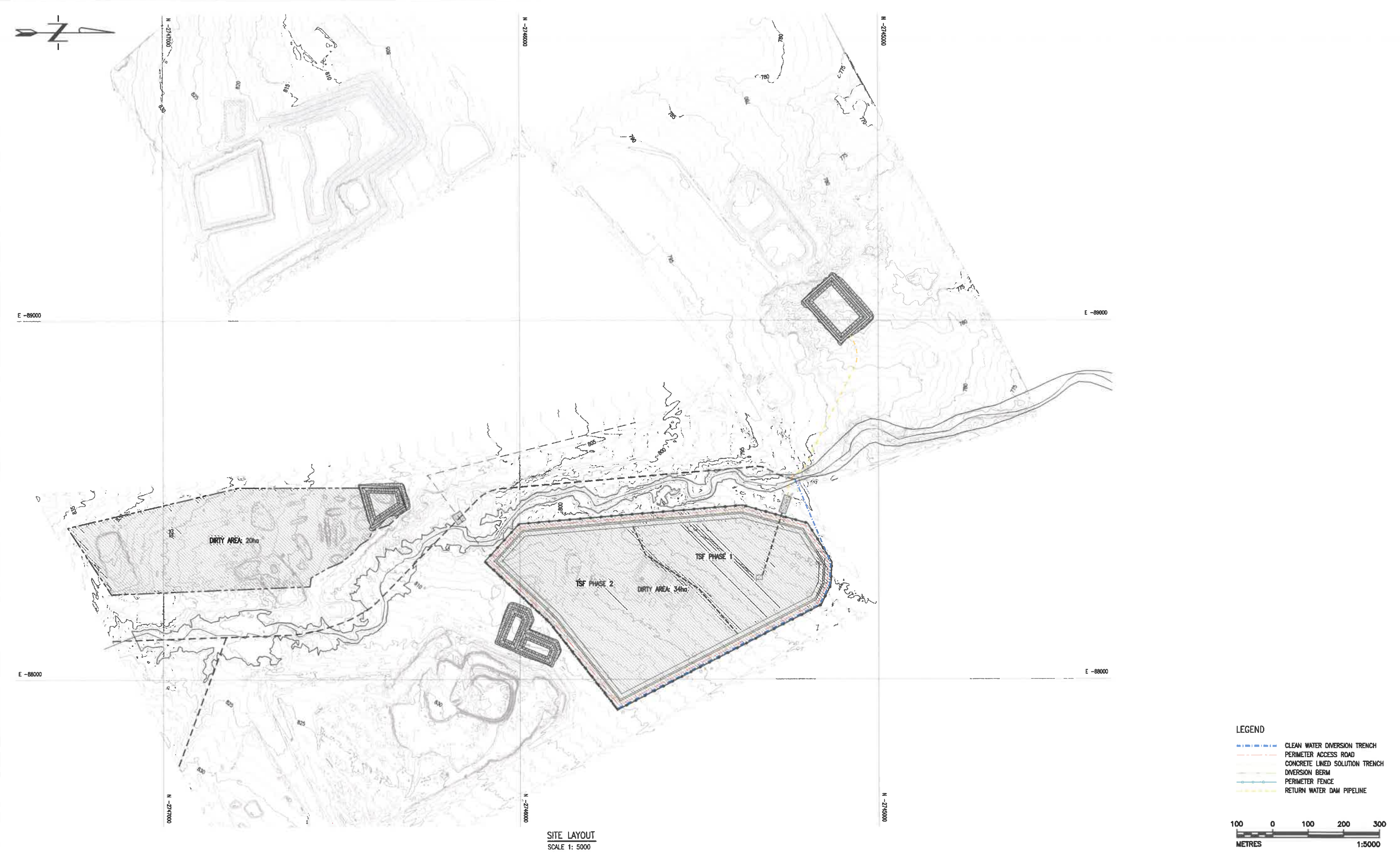
LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
STORMWATER DIVERSION CHANNELS LAYOUT PLAN

DRAWING NUMBER	SCALE	REV.
301-00592/07-011	1: 5000	B

P:\301-00592\07\A\DRAWINGS\KP\For Tender\301-00592-07-011 Rev B.dwg



SITE LAYOUT
SCALE 1: 5000

Knight Piésold CONSULTING

20090268

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	23/07/2018
DRAWING CHECK	RG	23/07/2018
DESIGN	RG	23/07/2018
DESIGN CHECK	AS	23/07/2018
PROJECT ENGINEER	–	–
–		

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	23/07/18	ISSUED FOR TENDER	ME	RG	AS
B	11/10/18	ISSUED FOR TENDER	RW	RG	AS
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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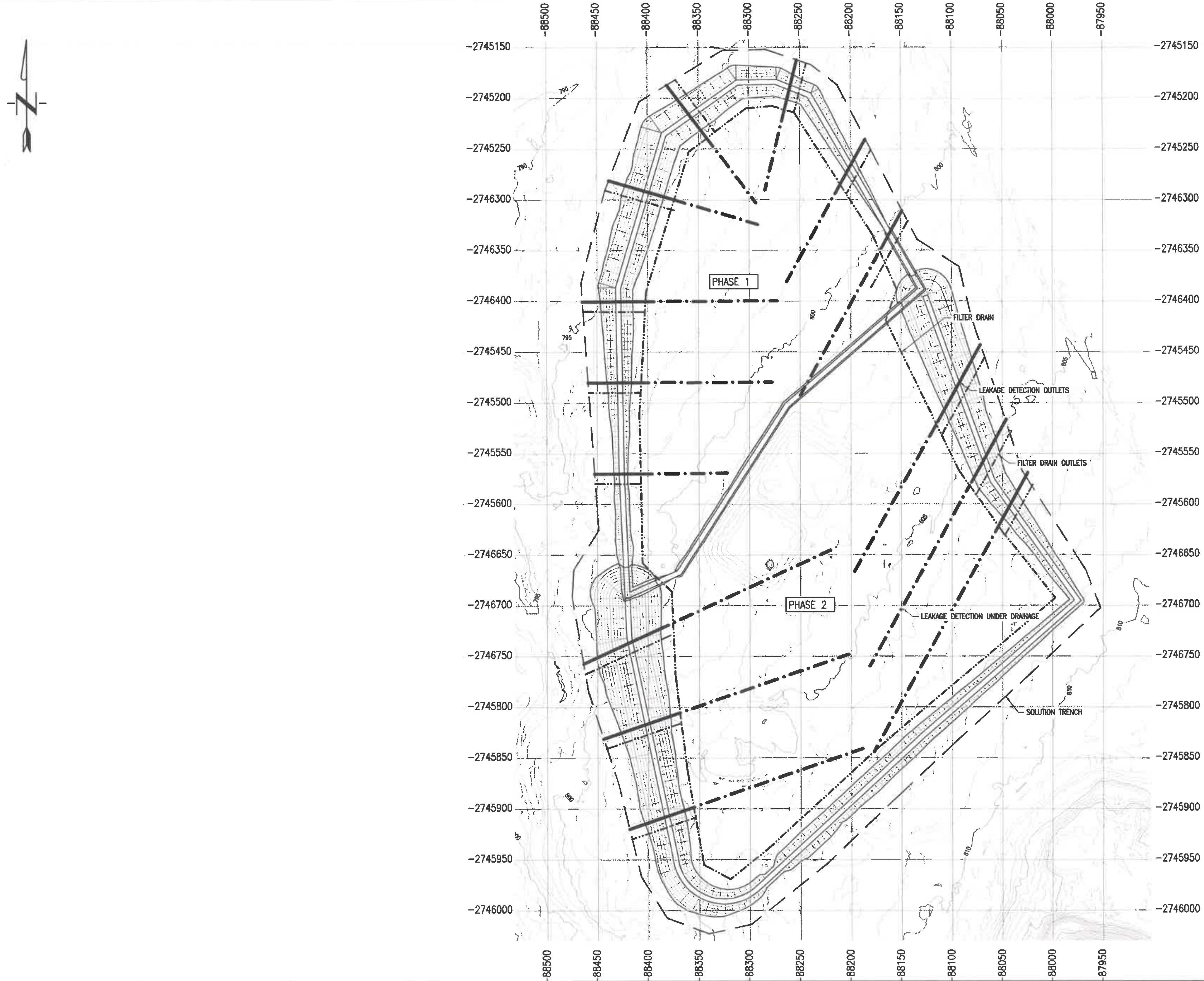
LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
DIRTY AREA
LAYOUT PLAN

DRAWING NUMBER	SCALE	REV.
301-00592/07-012	1: 5000	B

P:\301-00592\07\A\DRAWINGS\KP\For Tender\301-00592-07-012 Rev B.dwg



50 0 50 100 150
METRES 1:2000

Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/2018
DRAWING CHECK	RG	31/08/2018
DESIGN	AS	31/08/2018
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	-

-

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	21.09.18	ISSUED FOR INFORMATION	ME	RG	AS
C	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
-	-	-	-	-	-
-	-	-	-	-	-
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-	-	-	-	-	-
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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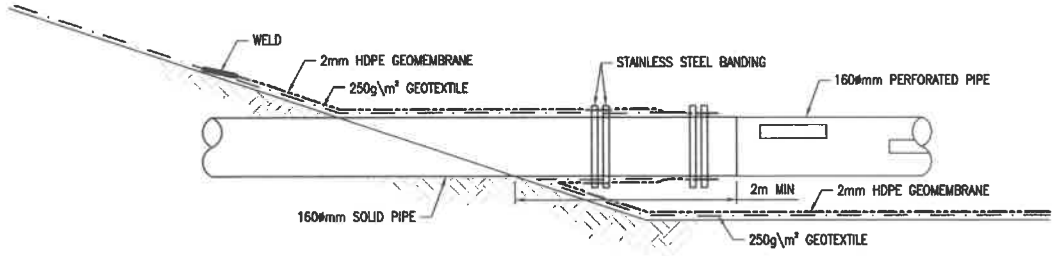
-	-	-
-	-	-

LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
PHASE 1 AND 2
UNDER DRAINAGE AND FILTER DRAIN
LAYOUT

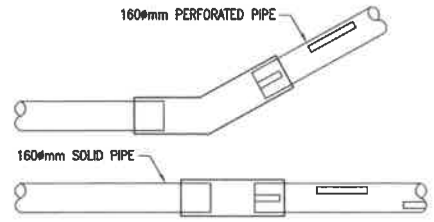
DRAWING NUMBER	SCALE	REV.
301-00592/07-013	1: 2000	C

Strauss 20090268

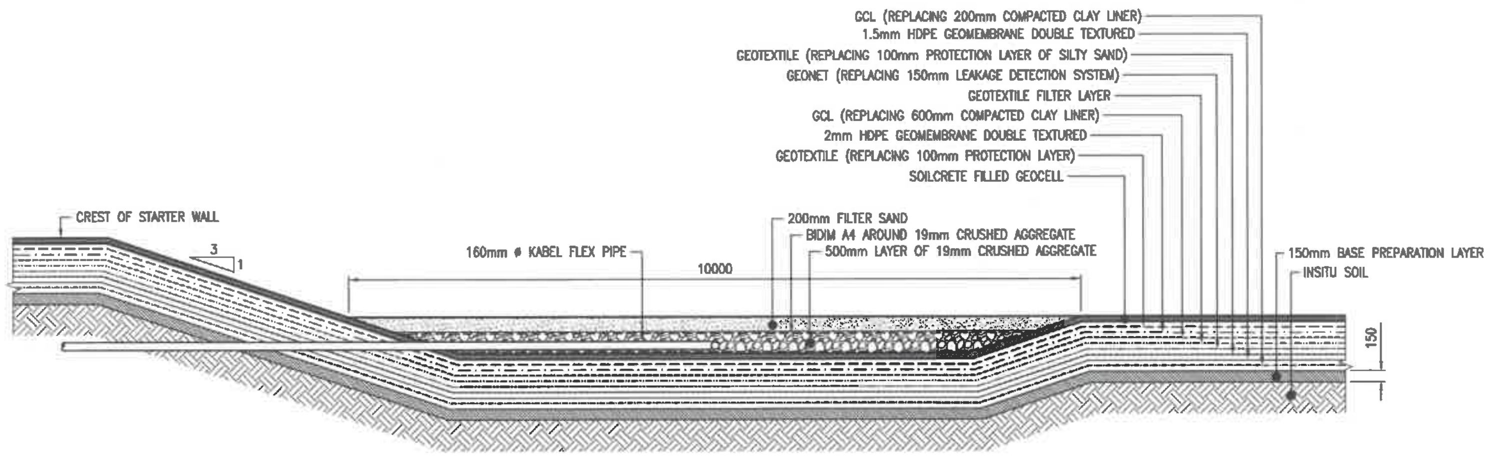
P:\301-00592\07\A\DRAWINGS\KP\For Tender\301-00592-07-013, 014 Rev C.dwg



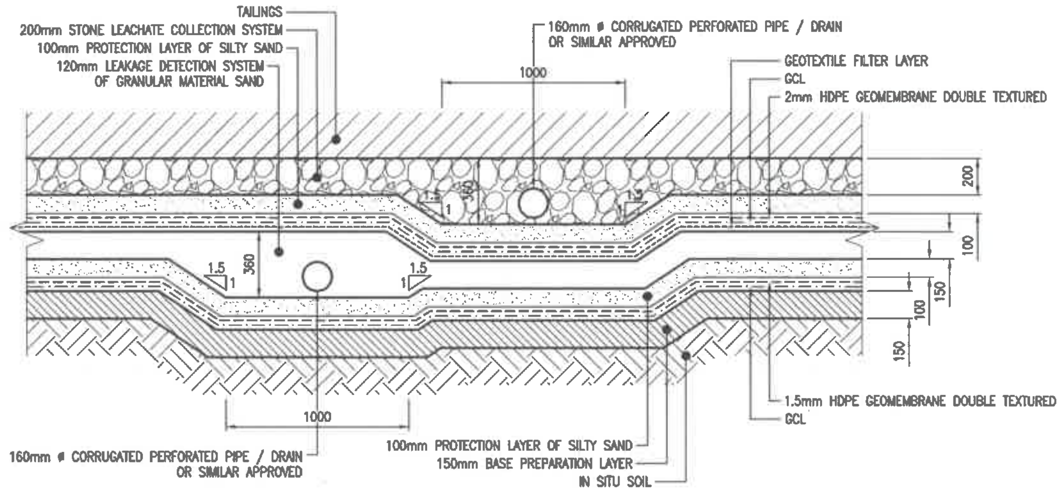
TYPICAL PIPEBOOT DETAIL
SCALE 1:10



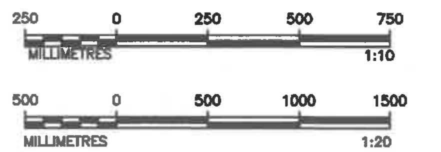
TYPICAL PIPE JOINT DETAIL
SCALE 1:20



TYPICAL FILTER DRAIN SECTION
SCALE N.T.S.



TYPICAL CLASS A LINER DETAIL WITH UNDER DRAINAGE
SCALE 1:20



Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CIVIL	
DRAWN	–	31.08.18
DRAWING CHECK	RG	31.08.18
DESIGN	AS	31.08.18
DESIGN CHECK	AS	31.08.18
PROJECT ENGINEER	AS	–
–		

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
–	–	–	–	–	–
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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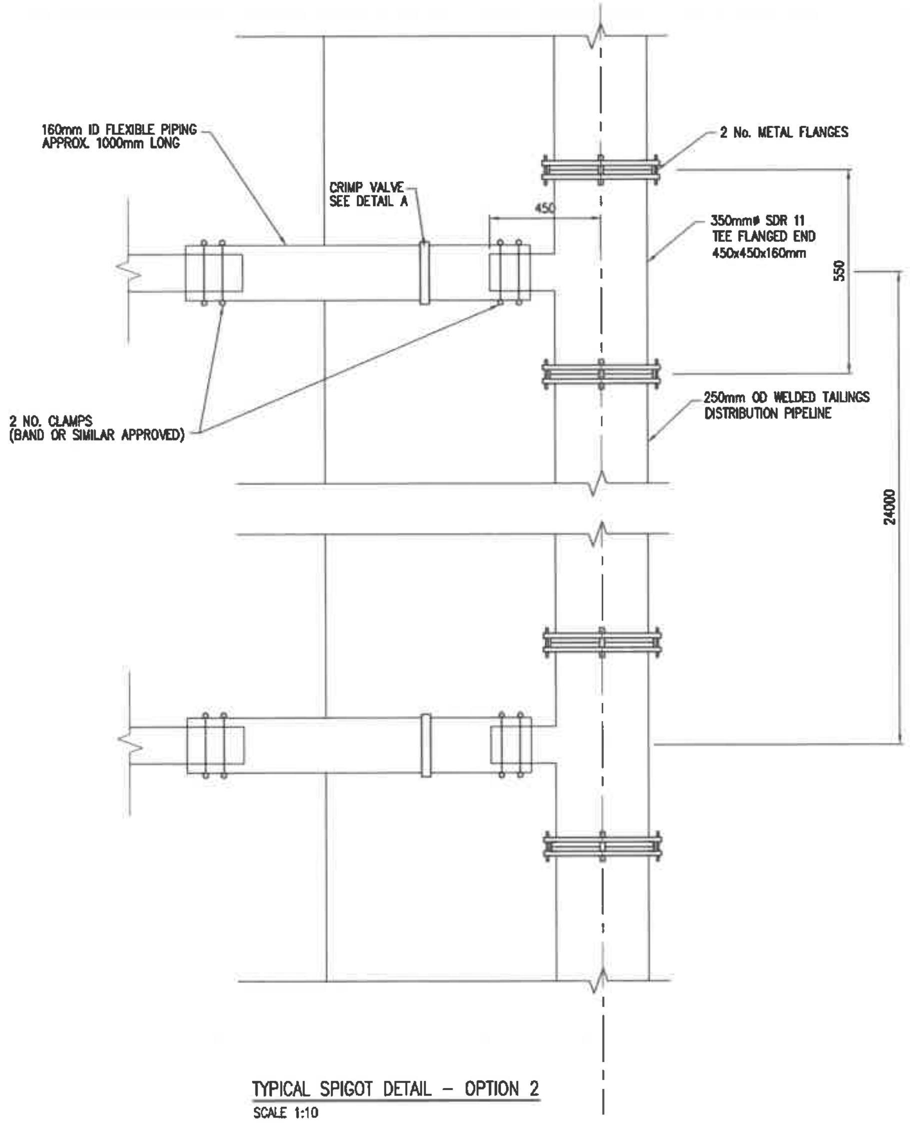
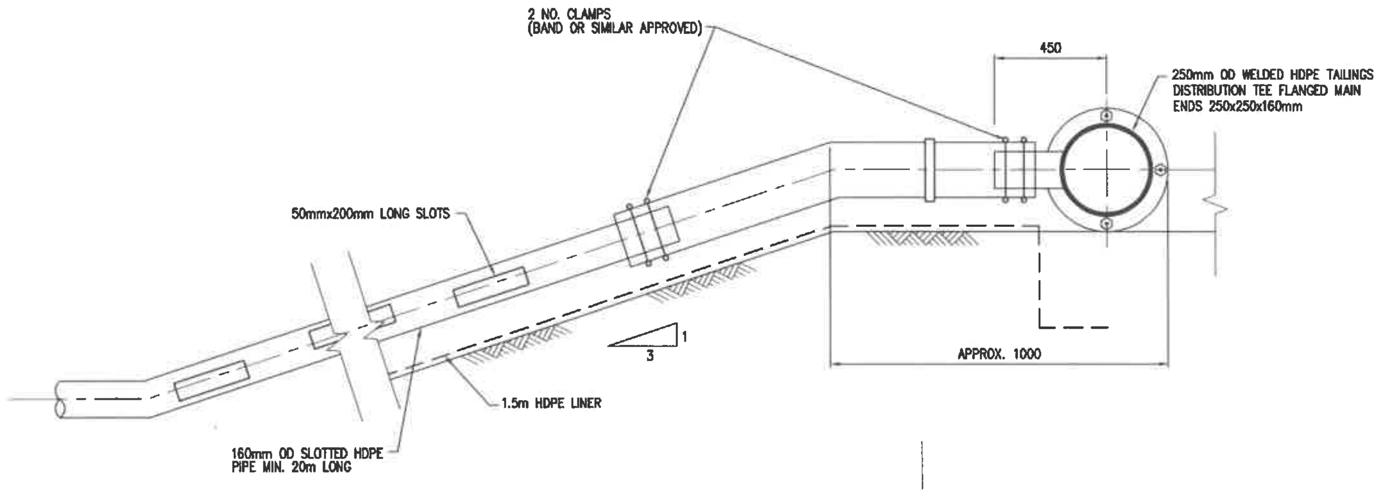
LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
PHASE 1 AND 2
UNDER DRAINAGE AND FILTER DRAIN
TYPICAL SECTIONS AND DETAILS

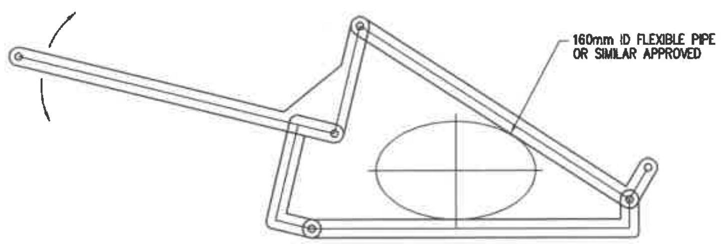
DRAWING NUMBER	SCALE	REV.
301-00592/07-014	AS SHOWN	B

P:\301-00592\07\A\DRAWINGS\KP\For Tender\301-00592-07-013, 014 Rev B.dwg

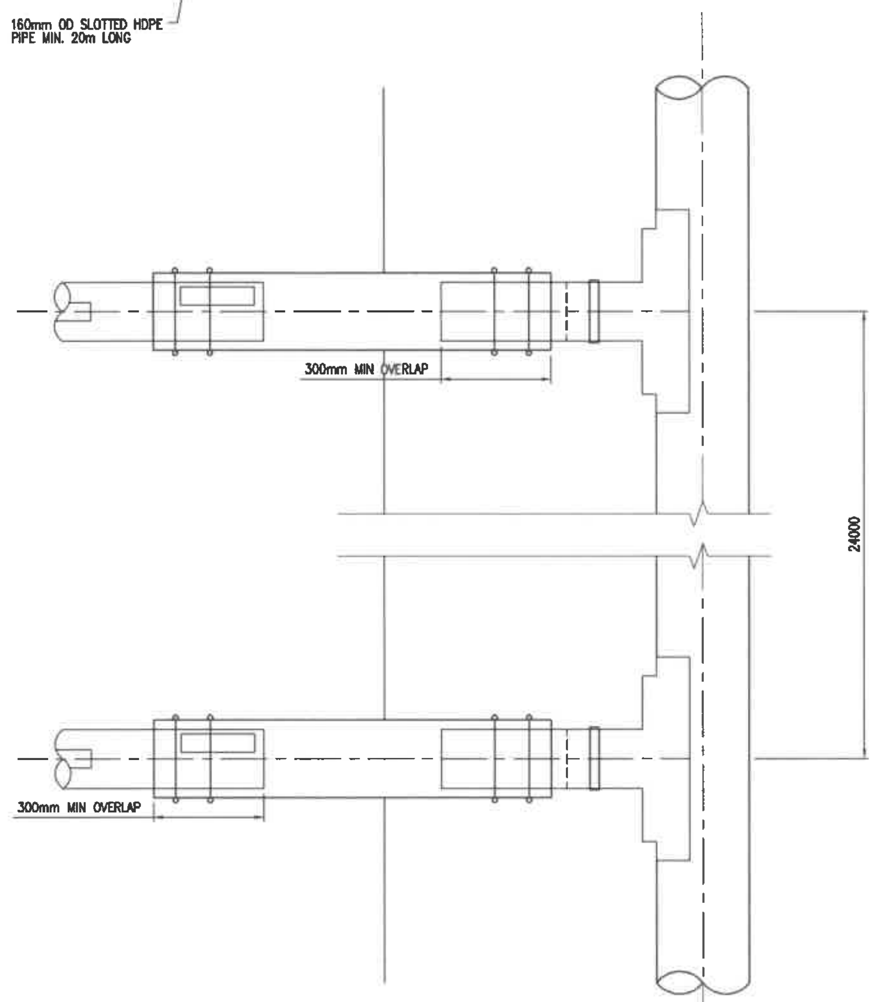


TYPICAL SPIGOT DETAIL – OPTION 2
SCALE 1:10





TYPICAL CLAMP VALVE DETAIL
SCALE 1:5



TYPICAL SPIGOT DETAIL – OPTION 2
SCALE 1:10

100 0 200 400
MILLIMETRES 1:5

250 0 250 500 750
MILLIMETRES 1:10

Knight Piésold CONSULTING

Strauss ZCD 90268

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/2018
DRAWING CHECK	RG	31/08/2018
DESIGN	AS	31/08/2018
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	–
–		

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
–	–	–	–	–	–
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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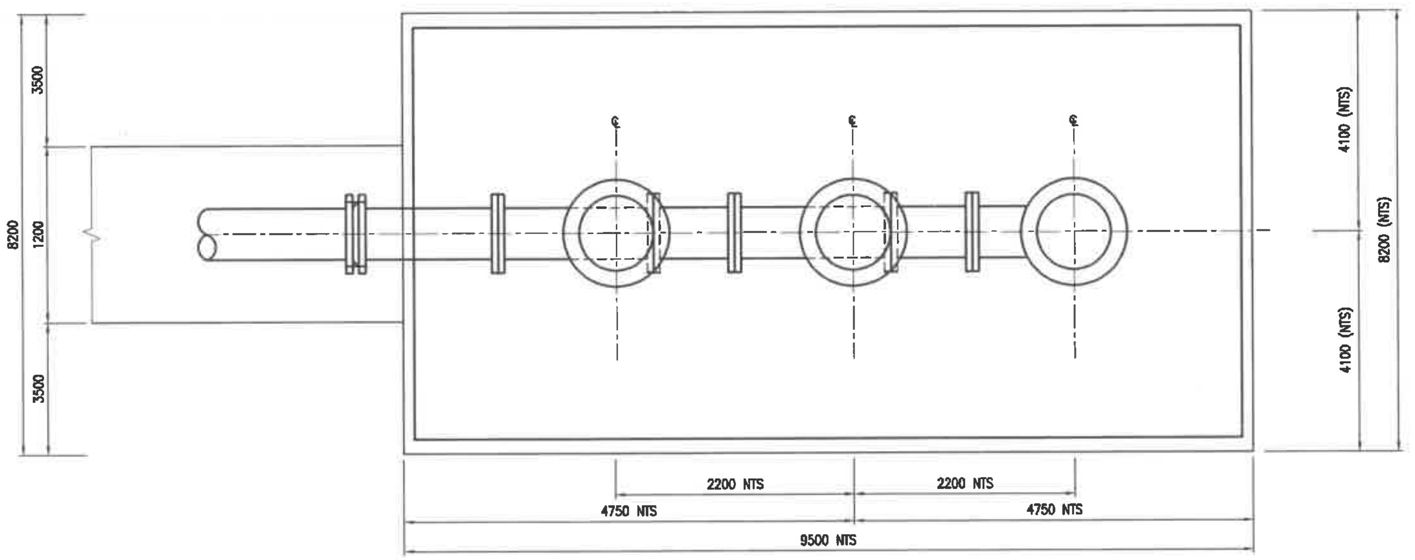
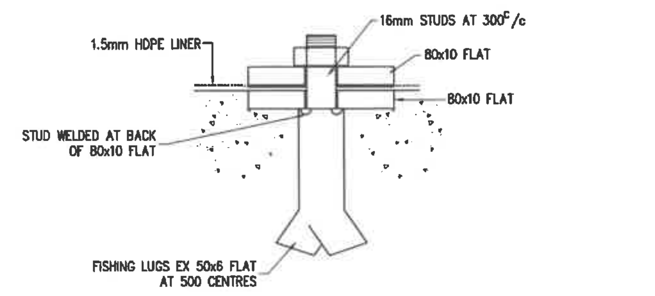
LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
PHASE 1 AND 2
TAILINGS DELIVERY PIPELINE AND SPIGOTS
TYPICAL SECTIONS AND DETAILS

DRAWING NUMBER	SCALE	REV.
301-00592/07-017	AS SHOWN	B

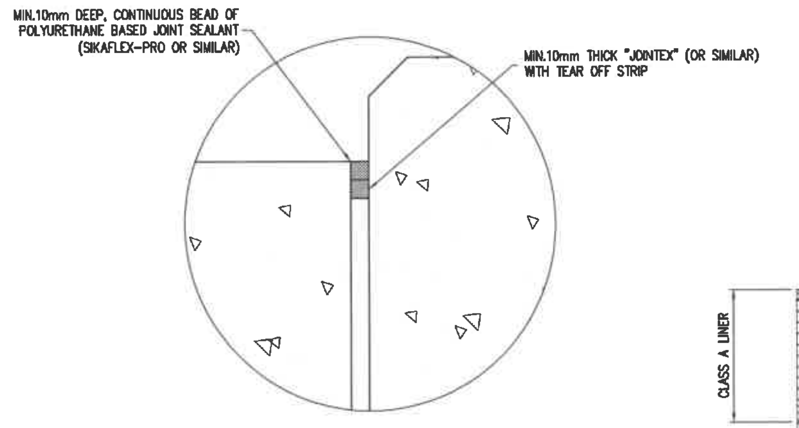
P:\301-00592\07\A\DRAWINGS\KP\For Tender\301-00592-07-017 Rev B.dwg



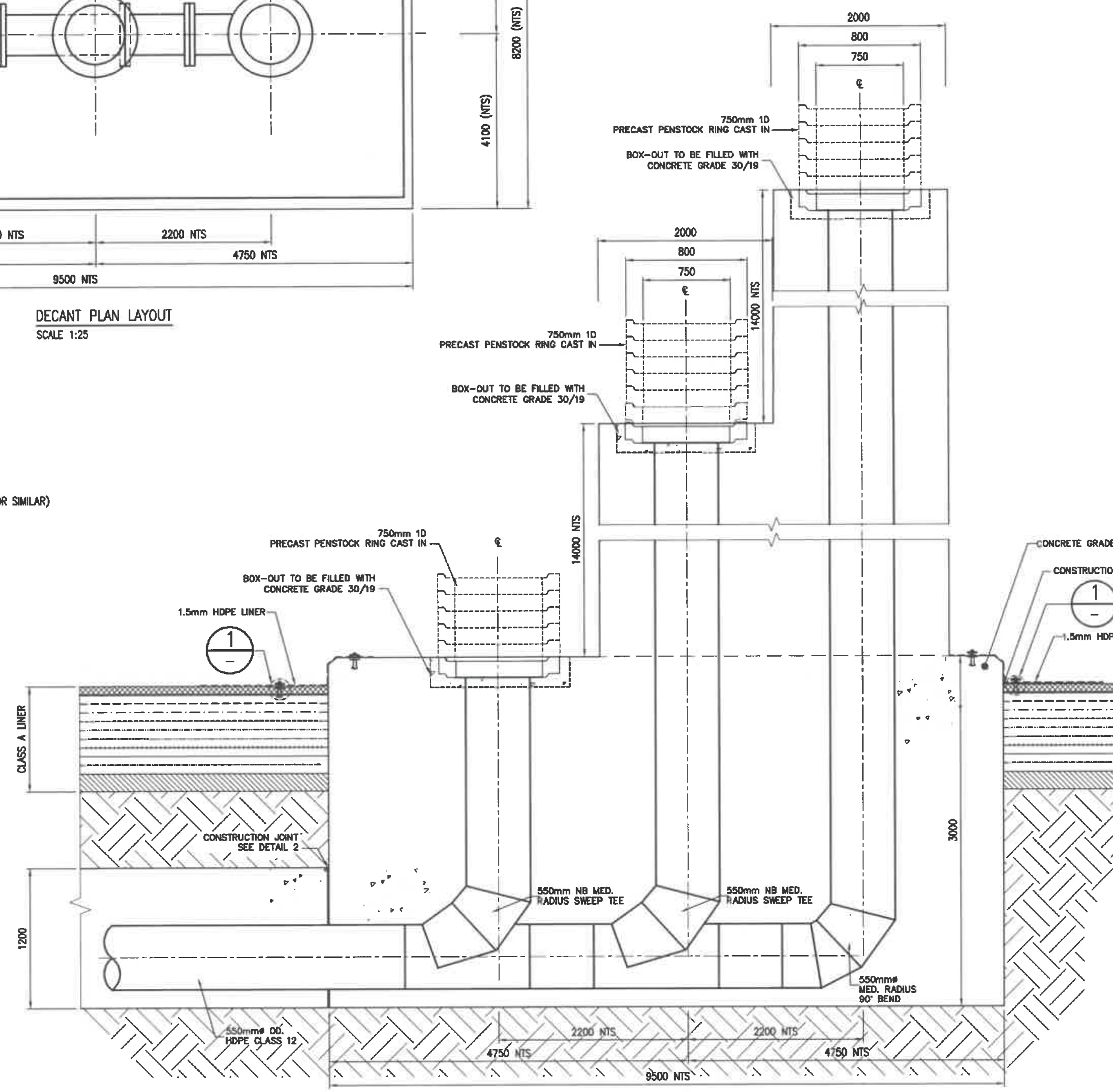
DECANT PLAN LAYOUT
SCALE 1:25



1 TYPICAL LINER/CONCRETE DETAIL
SCALE 1:2



2 TYPICAL CONSTRUCTION JOINT DETAIL
SCALE 1:2



A TYPICAL SECTION THROUGH DECANT
SCALE 1:25

500 0 500 1000 1500
MILLIMETRES 1:25

Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CML	
DRAWN	ME	31/08/2018
DRAWING CHECK	RG	31/08/2018
DESIGN	AS	31/08/2018
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	-

20090268

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	21.09.18	ISSUED FOR INFORMATION	ME	RG	AS
C	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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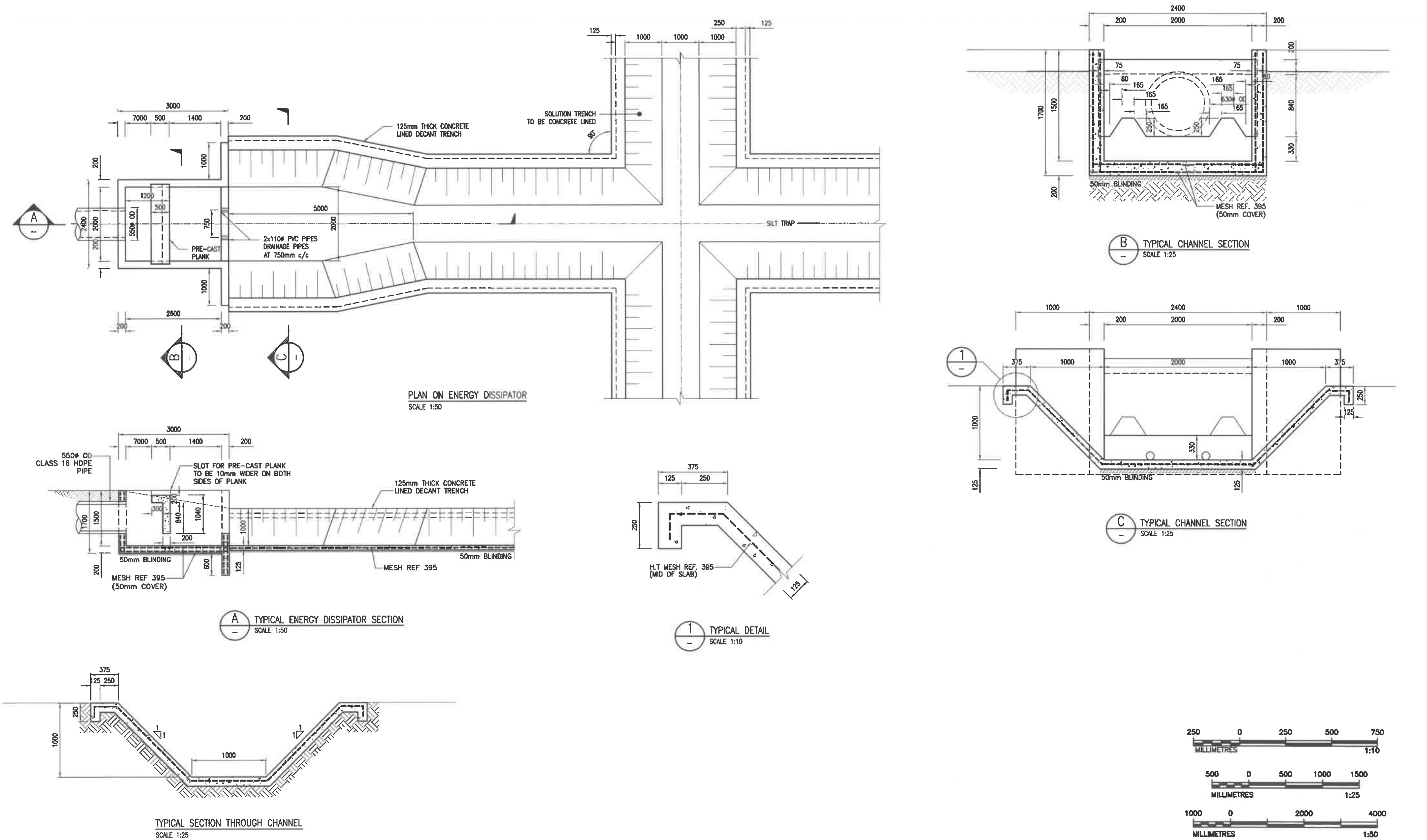
-	-	-
-	-	-

LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
PHASE 1 AND 2
DECANT TOWER
LAYOUT, SECTIONS AND DETAILS

DRAWING NUMBER	SCALE	REV.
301-00592/07-020	AS SHOWN	C

P:\301-00592\07\4\DRAWINGS\KP\For Tender\301-00592-07-020 Rev C.dwg



PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/2018
DRAWING CHECK	RG	31/08/2018
DESIGN	AS	31/08/2018
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	–

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	21.09.18	ISSUED FOR INFORMATION	ME	RG	AS
C	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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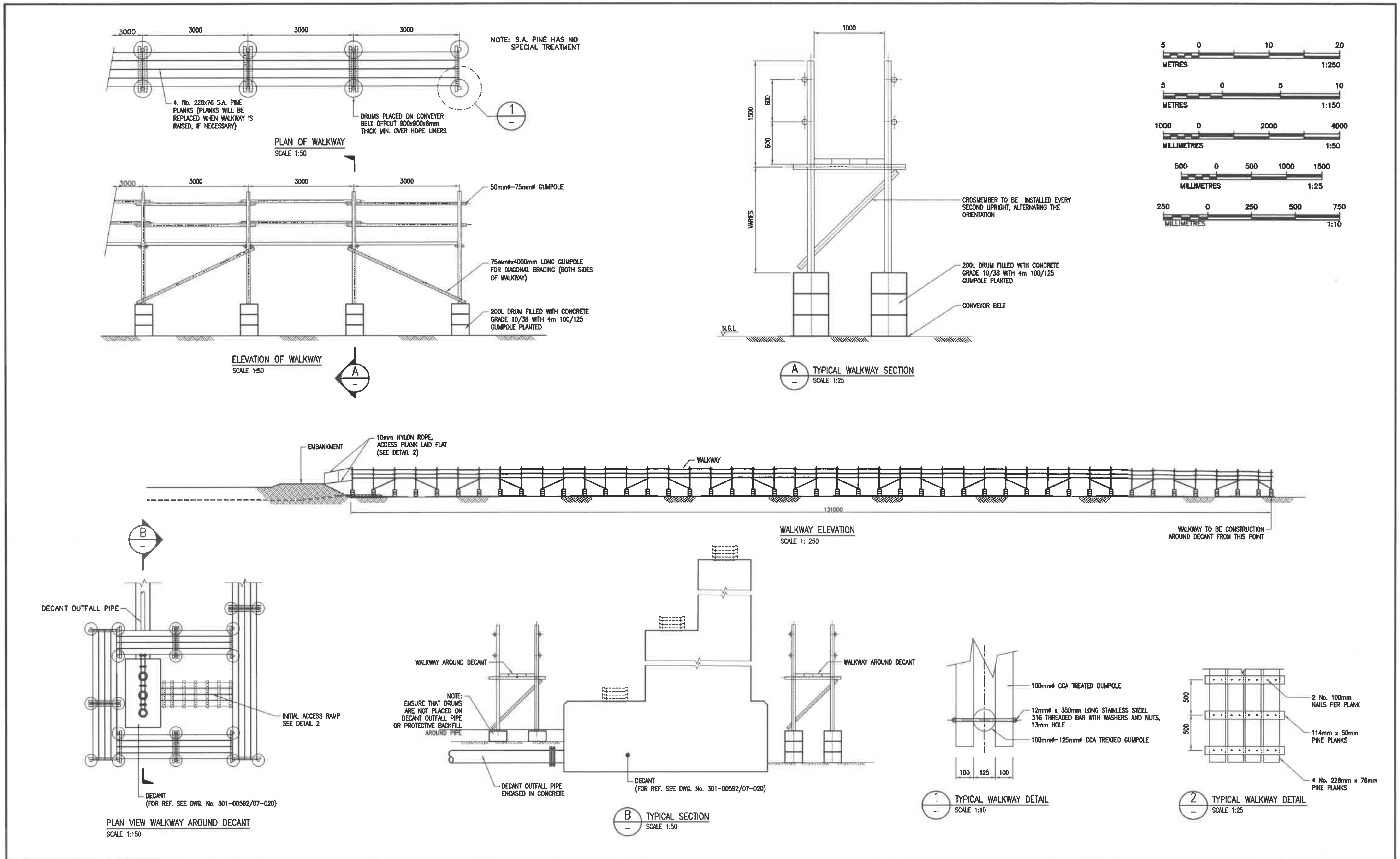
Knight Piésold CONSULTING

LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
PHASE 1 AND 2
ENERGY DISSIPATOR
LAYOUT, SECTIONS AND DETAILS

DRAWING NUMBER	SCALE	REV.
301-00592/07-026	AS SHOWN	C

P:\301-00592\07\...\301-00592-07-026 Rev C.dwg



Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/18
DRAWING CHECK	RG	31/08/18
DESIGN	AS	31/08/18
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	–
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REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	21.09.18	ISSUED FOR INFORMATION	ME	RG	AS
C	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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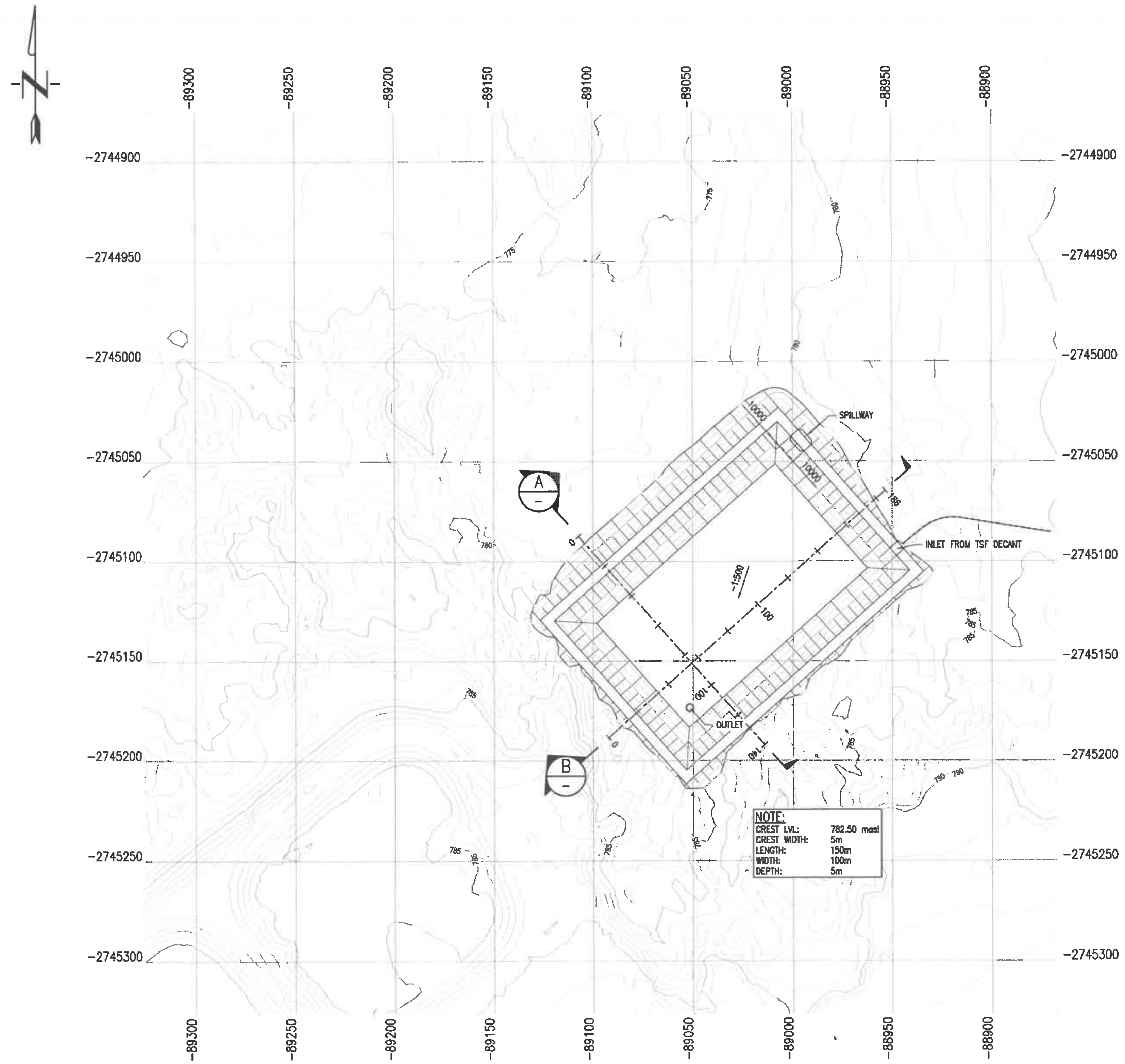
LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
PHASE 1 AND 2
CATWALK
LAYOUT, SECTIONS AND DETAILS

DRAWING NUMBER	SCALE	REV.
301-00592/07-029	AS SHOWN	C

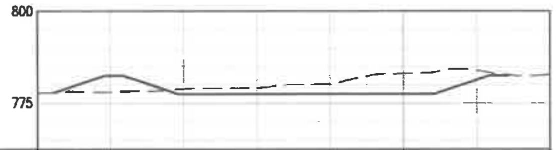
P:\301-00592\07\...\301-00592-07-029 Rev C.dwg



PLAN LAYOUT
SCALE 1:1250

SCALES:
Horizontal 1:1000
Vertical 1:1000

DATUM 762.50

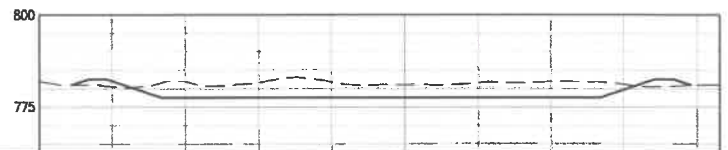


CHAINAGE (m)	20.00	40.00	60.00	80.00	100.00	120.00		140.00
EXISTING GROUND LEVELS (m)	778.00	778.77	778.99	779.99	782.98	783.84		782.90
DESIGN LEVELS (m)	782.50	777.50	777.50	777.50	777.50	781.34	782.64	

A – TYPICAL SECTION
SCALE 1:1000

SCALES:
Horizontal 1:1000
Vertical 1:1000

DATUM 762.50



CHAINAGE (m)	20.00	40.00	60.00	80.00	100.00	120.00	140.00	160.00	180.00	186.07
EXISTING GROUND LEVELS (m)	780.41	781.95	781.60	781.78	781.03	781.51	781.86	781.18	780.92	780.98
DESIGN LEVELS (m)	782.00	777.50	777.50	777.50	777.50	777.50	777.50	779.67	780.89	

B – TYPICAL SECTION
SCALE 1:1000

5 0 5 10
METRES 1:125

25 0 25 50 75
METRES 1:1000

Knight Piésold CONSULTING

20090268

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/2018
DRAWING CHECK	RG	31/08/2018
DESIGN	AS	31/08/2018
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	–
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REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
TSF RETURN WATER DAM
PLAN LAYOUT
SECTIONS AND DETAILS

DRAWING NUMBER	SCALE	REV.
301-00592/07-030	AS SHOWN	B

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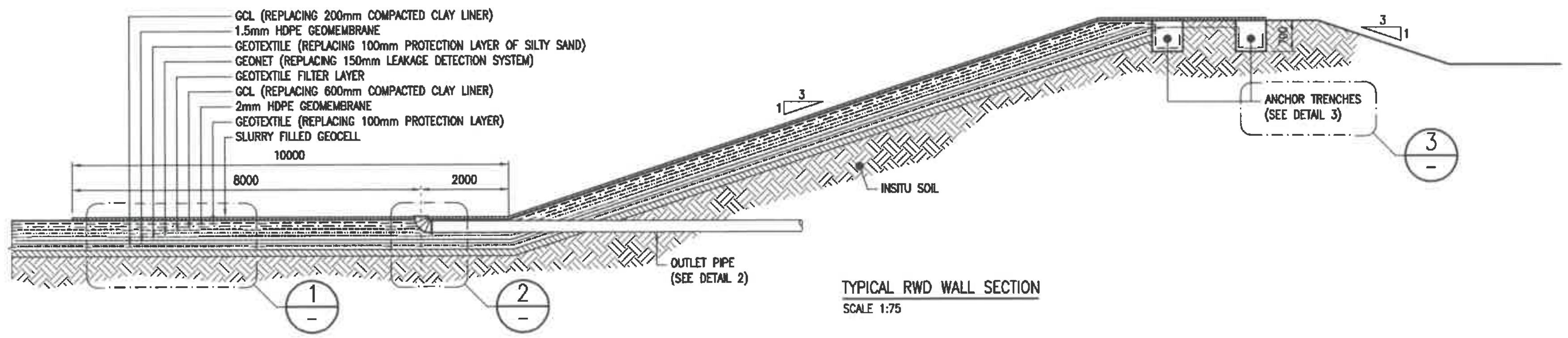
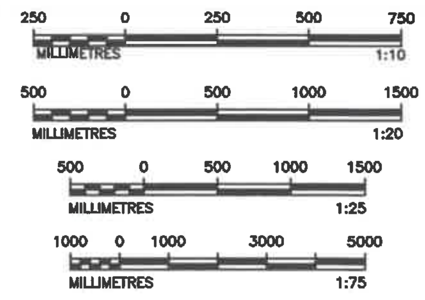
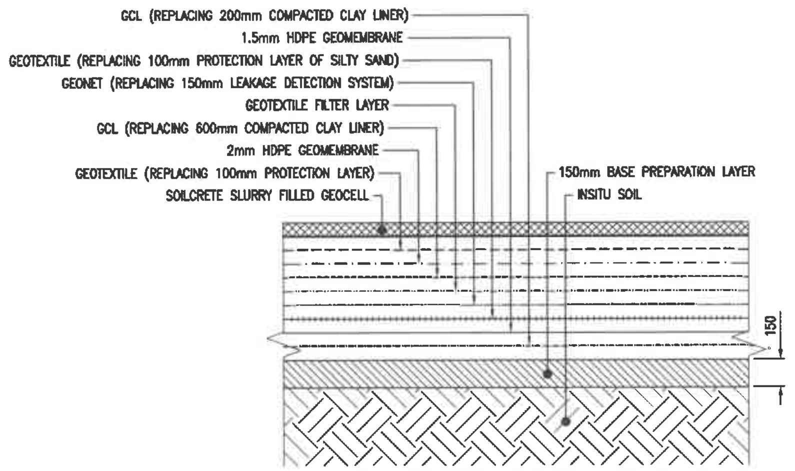
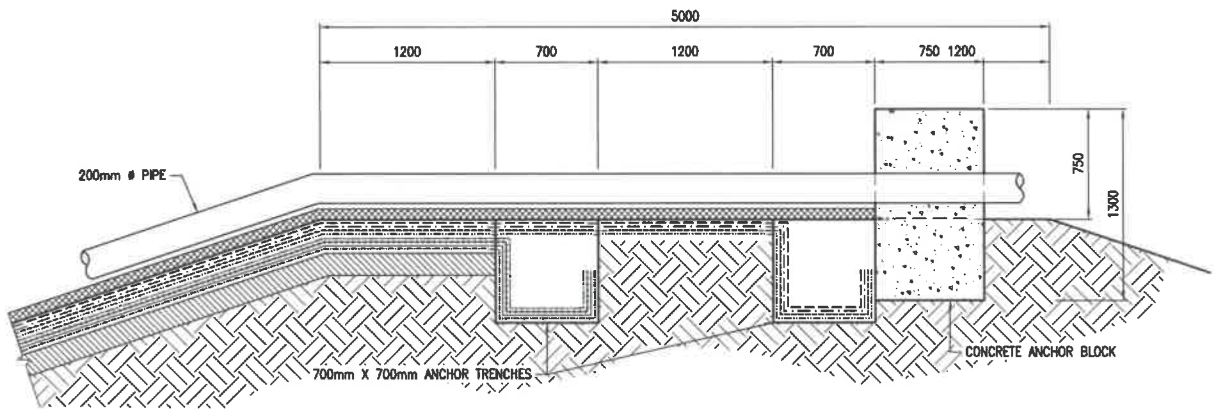


TYPICAL RWD WALL SECTION
SCALE 1:75

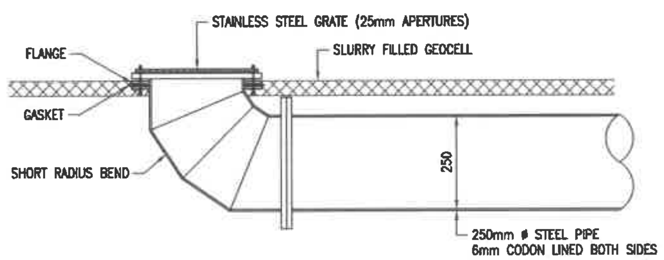




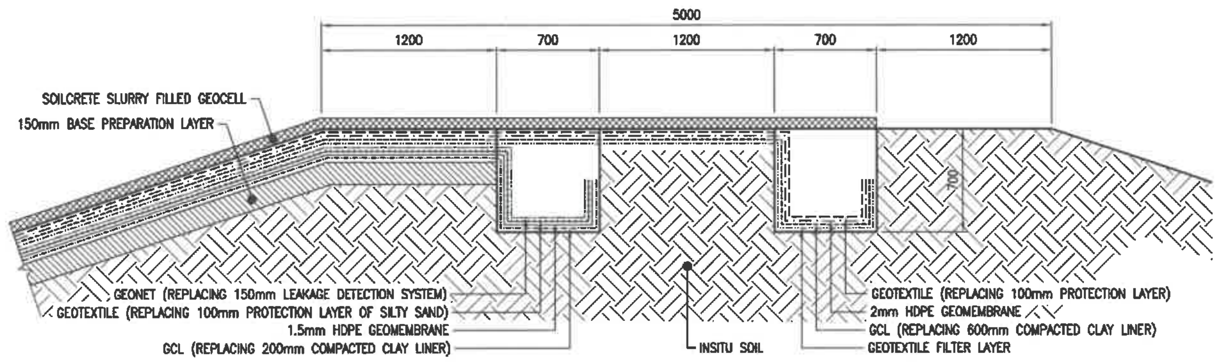
1 CLASS-A LINER TYPICAL DETAIL
SCALE 1:20



INLET FROM TSF DECANT WATER TYPICAL DETAIL
SCALE 1:25



2 TYPICAL OUTLET DETAIL
SCALE 1:10



3 ANCHOR TRENCH TYPICAL DETAIL
SCALE 1:25

Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31.08.18
DRAWING CHECK	RG	31.08.18
DESIGN	AS	31.08.18
DESIGN CHECK	AS	31.08.18
PROJECT ENGINEER	AS	–
–		

Zoo90268

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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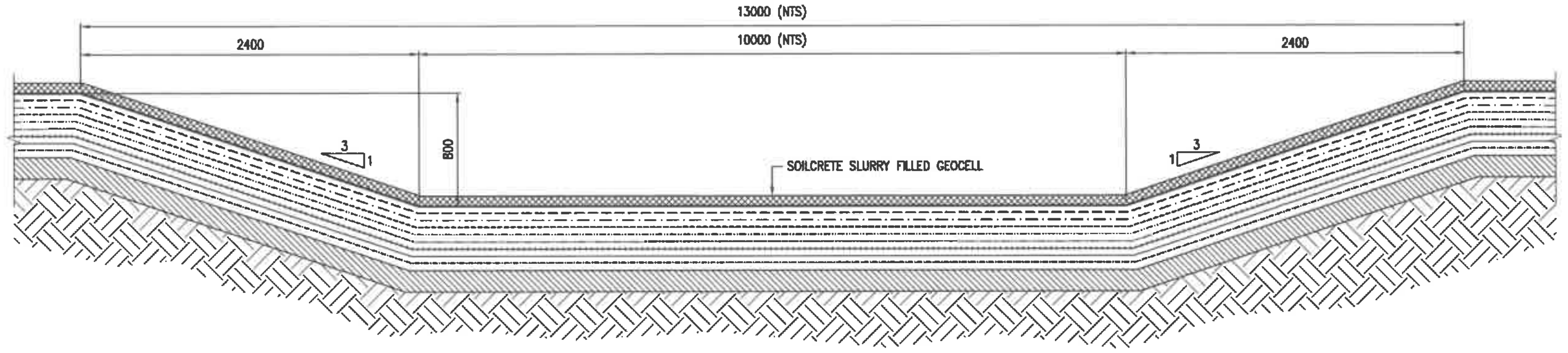
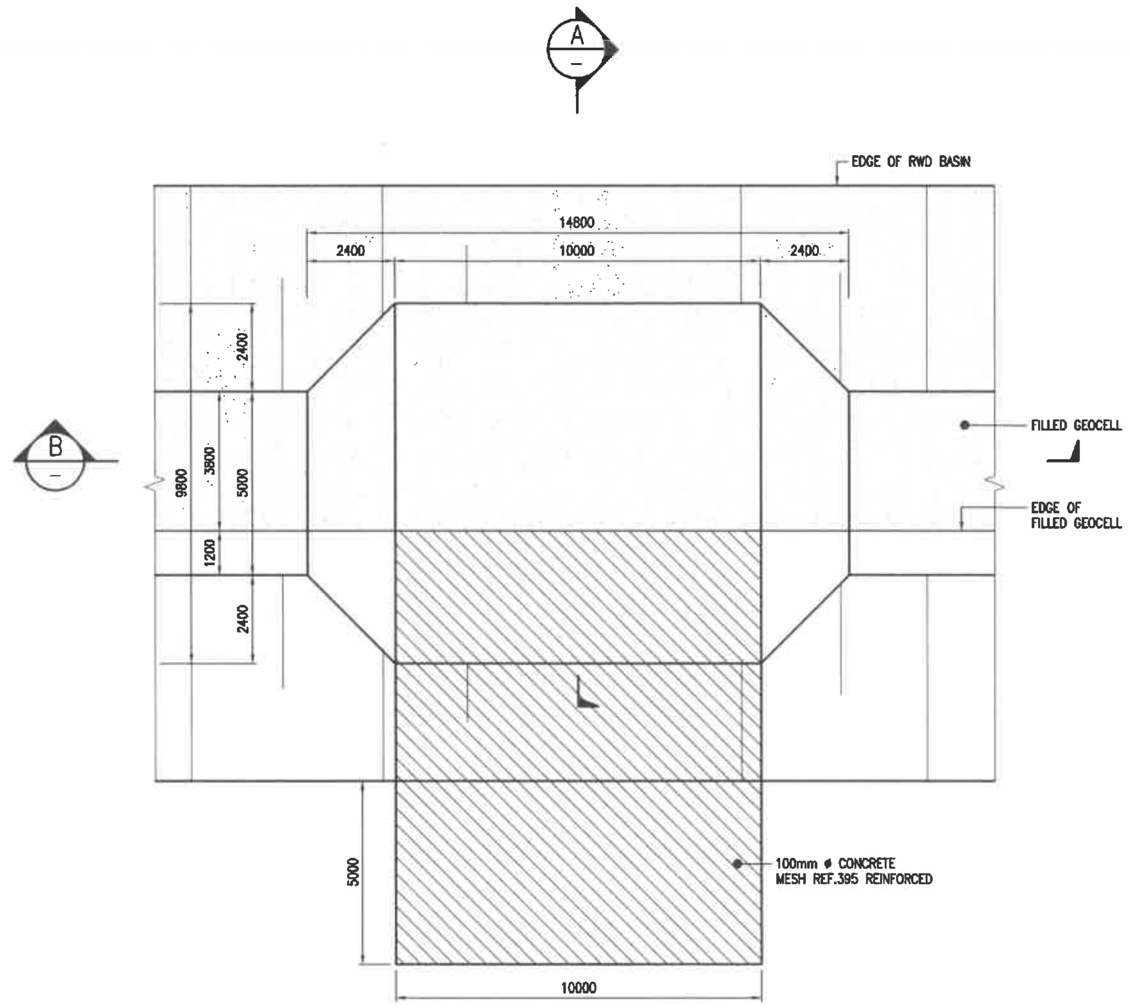
LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
TSF RETURN WATER DAM
SECTIONS AND DETAILS

DRAWING NUMBER	SCALE	REV.
301-00592/07-031	AS SHOWN	B

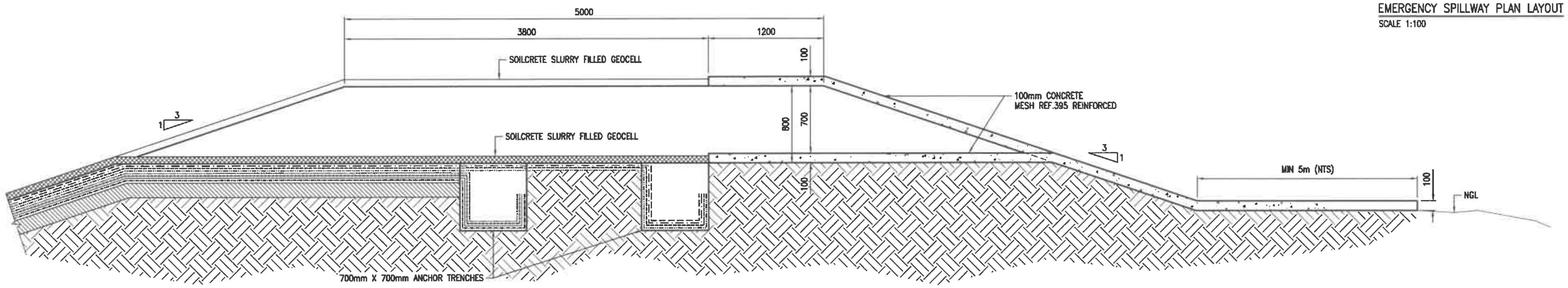
P:\301-00592\07\...\For Tender\301-00592-07-031, 032, 041, 040 Rev B.dwg



B
–
EMERGENCY SPILLWAY
TYPICAL SECTION
SCALE 1:25



EMERGENCY SPILLWAY PLAN LAYOUT
SCALE 1:100



A
–
EMERGENCY SPILLWAY
TYPICAL SECTION
SCALE 1:25

500 0 500 1000 1500
MILLIMETRES 1:25

2500 0 2500 5000 7500
MILLIMETRES 1:100

Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/18
DRAWING CHECK	RG	31/08/18
DESIGN	AS	31/08/18
DESIGN CHECK	AS	31/08/18
PROJECT ENGINEER	AS	–
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REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	21.09.18	ISSUED FOR INFORMATION	ME	RG	AS
C	11.10.18	ISSUED FOR INFORMATION	ME	RG	AS
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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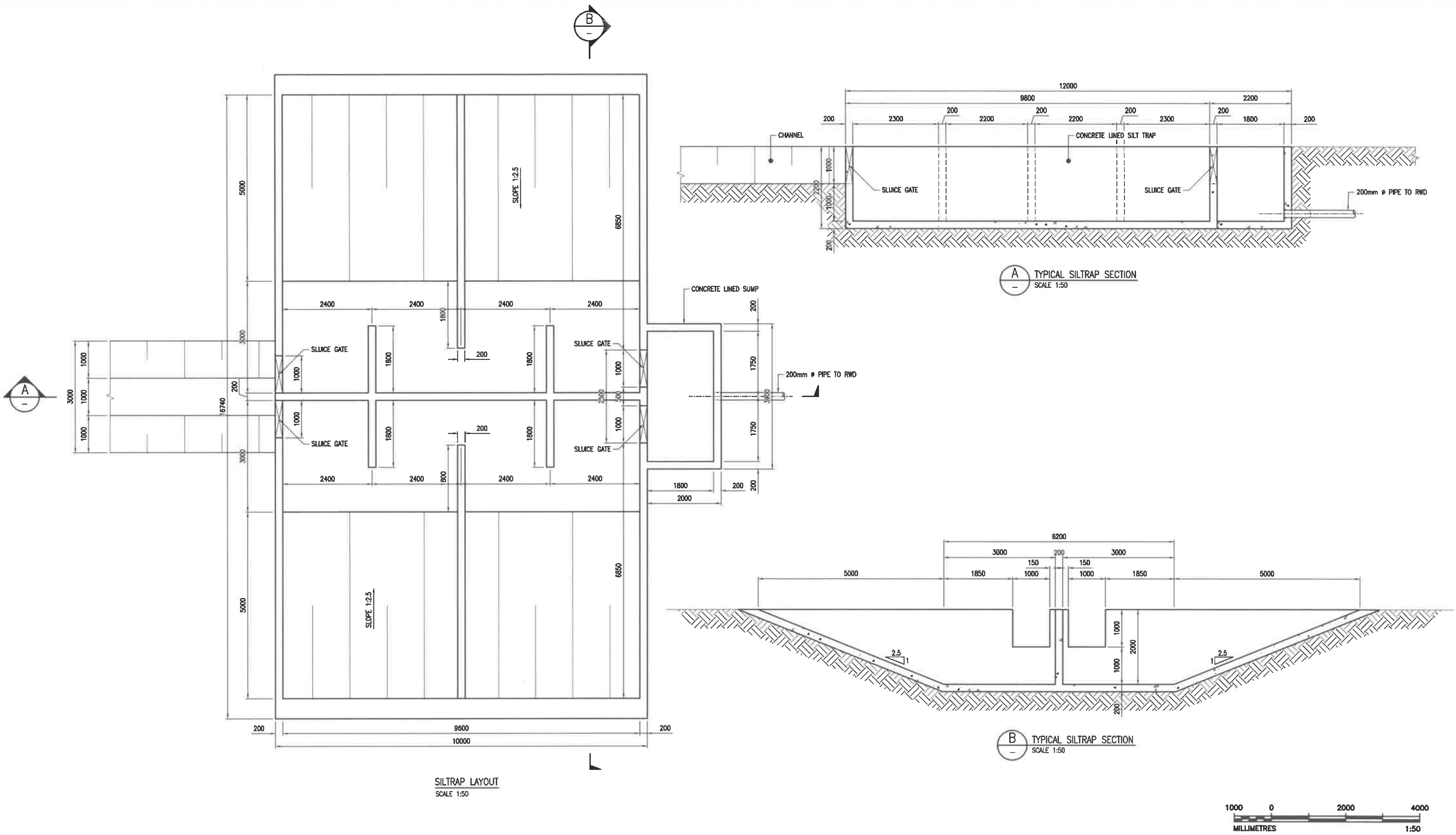
LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
TSF RETURN WATER DAM
EMERGENCY SPILLWAY
LAYOUT AND SECTIONS

DRAWING NUMBER	SCALE	REV.
301-00592/07-032	AS SHOWN	C

P:\301-00592\07\A\DRAWINGS\KP\For Tender\301-00592-07-031, 032, 041, 040 Rev B.dwg



Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/18
DRAWING CHECK	RG	31/08/2018
DESIGN	AS	31/08/2018
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	–
–		

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	21.09.18	ISSUED FOR INFORMATION	ME	RG	AS
C	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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–	–	–	–	–	–
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
PHASE 1 AND 2
SILT TRAP
LAYOUT AND SECTIONS

DRAWING NUMBER	SCALE	REV.
301-00592/07-037	1: 50	C

P:\301-00592\07\I\DRAWINGS\KP\For Tender\301-00592-07-037 Rev C.dwg

NOTE:

CREST LVL:	813.00 masl
CREST WIDTH:	4m
CELL A LENGTH:	100m
CELL A WIDTH:	51m
CELL B LENGTH:	100m
CELL B WIDTH:	51m
DEPTH:	4.8m

SLAG DUMP POLLUTION CONTROL DAM LAYOUT
SCALE 1:1000

SCALES:
Horizontal 1:1000
Vertical 1:1000

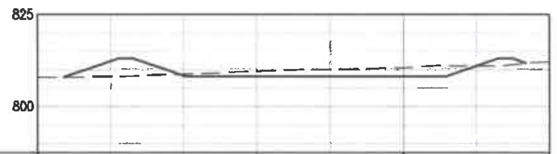
DATUM 787.50

CHAINAGE (m)	20.00	40.00	60.00	80.00	100.00	120.00	140.00	160.00	180.00		200.00
EXISTING GROUND LEVELS (m)	810.50	810.61	810.53	810.00	810.00	810.01	810.26	810.35	809.85		809.99
DESIGN LEVELS (m)	813.00	808.20	808.24	812.76	808.20	808.20	808.20	808.20	813.00	809.95	

A – TYPICAL POLLUTION CONTROL DAM SECTION
SCALE 1:1000

SCALES:
Horizontal 1:1000
Vertical 1:1000

DATUM 787.50

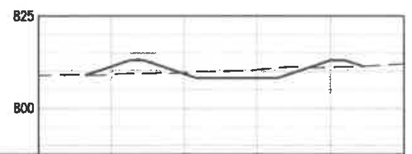


CHAINAGE (m)	0.00	20.00	40.00	60.00	80.00	100.00	120.00		140.00
EXISTING GROUND LEVELS (m)	808.00	808.00	808.78	809.49	809.99	810.55	811.00		812.18
DESIGN LEVELS (m)	808.00	812.31	808.35	808.20	808.20	808.20	810.98	811.78	

B – TYPICAL POLLUTION CONTROL DAM SECTION
SCALE 1:1000

SCALES:
Horizontal 1:1000
Vertical 1:1000

DATUM 787.50



CHAINAGE (m)	0.00		20.00	40.00	60.00	80.00		100.00
EXISTING GROUND LEVELS (m)	809.00		809.11	809.60	810.32	810.99		811.99
DESIGN LEVELS (m)		809.00	811.35	809.32	808.20	813.00	811.35	

C – TYPICAL POLLUTION CONTROL DAM SECTION
SCALE 1:1000

25 0 25 50 75
METRES 1:1000

Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/2018
DRAWING CHECK	RG	31/08/2018
DESIGN	AS	31/08/2018
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	–

–

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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–	–	–	–	–	–
–	–	–	–	–	–
–	–	–	–	–	–
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–	–	–	–	–	–

REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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–	–	–

LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
SLAG DUMP POLLUTION CONTROL DAM
LAYOUT
AND SECTIONS

DRAWING NUMBER	SCALE	REV.
301-00592/07-039	1: 1000	B

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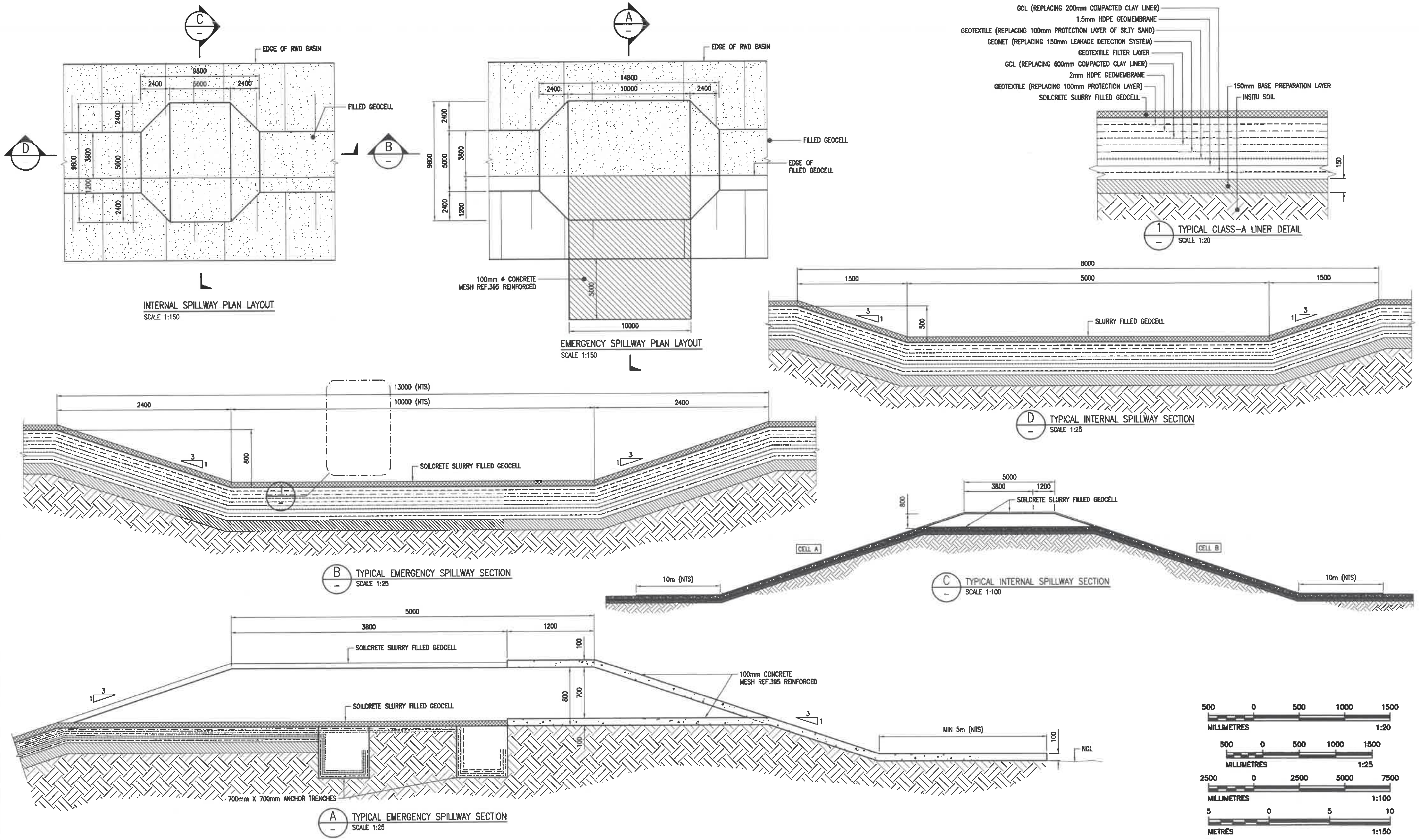

Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/18
DRAWING CHECK	RG	31/08/18
DESIGN	AS	31/08/18
DESIGN CHECK	AS	31/08/18
PROJECT ENGINEER	AS	-

Ahrens 2009/0268

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	21.09.18	ISSUED FOR INFORMATION	ME	RG	AS
C	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
SLAG DUMP POLLUTION CONTROL DAM
SPILLWAY LAYOUT
TYPICAL SECIONS AND DETAILS

DRAWING NUMBER	SCALE	REV.
301-00592/07-040	AS SHOWN	C

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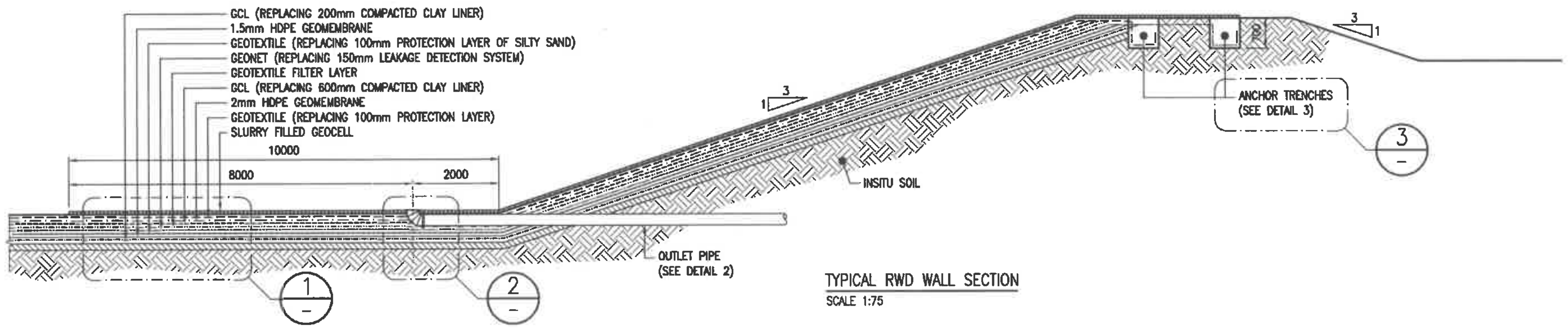
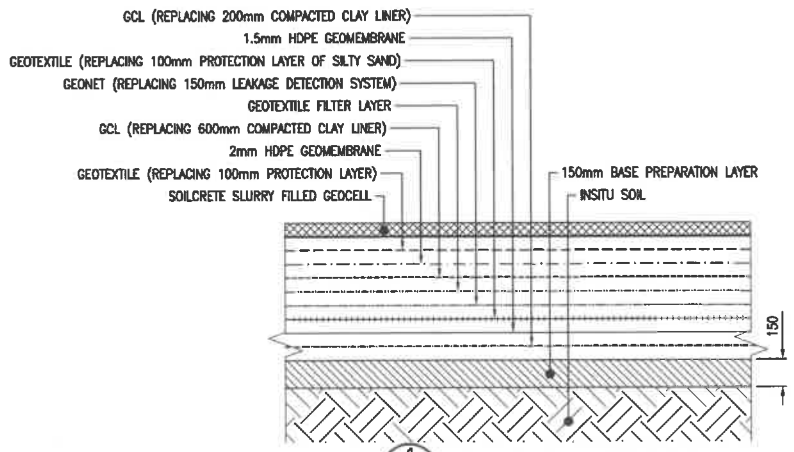
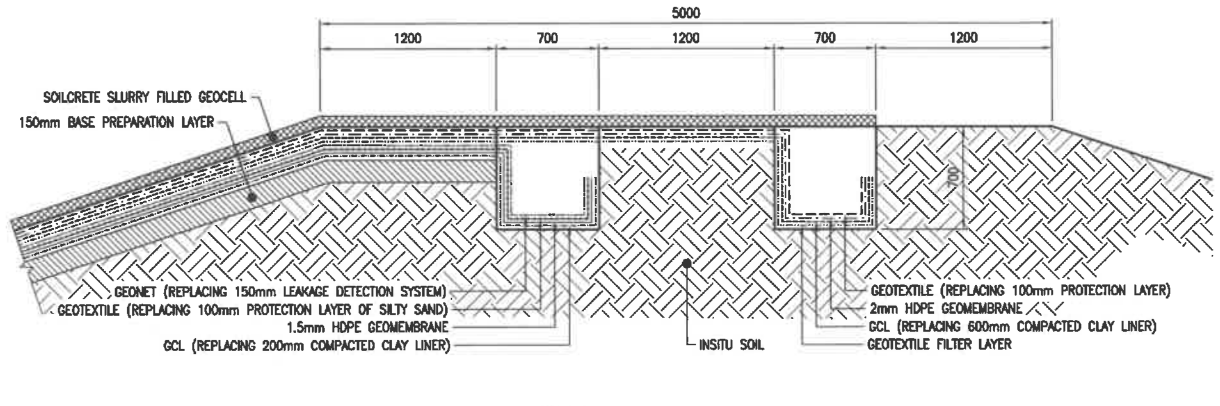


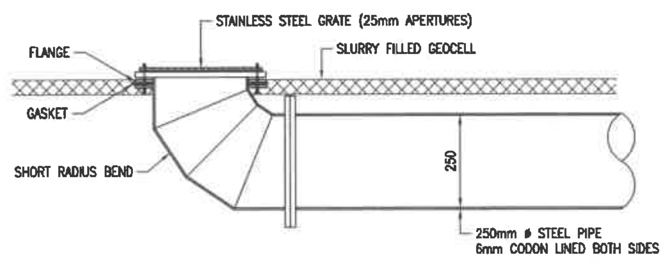
TYPICAL RWD WALL SECTION
SCALE 1:75



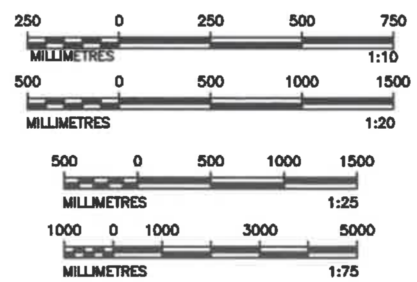
1 TYPICAL CLASS-A LINER DETAIL
SCALE 1:20



3 TYPICAL ANCHOR TRENCH DETAIL
SCALE 1:25



2 TYPICAL OUTLET DETAIL
SCALE 1:10



Knight Piésold CONSULTING

20090268

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/18
DRAWING CHECK	RG	31/08/18
DESIGN	AS	31/08/18
DESIGN CHECK	AS	31/08/18
PROJECT ENGINEER	AS	-
-		

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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-	-	-
-	-	-
-	-	-
-	-	-

LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
SLAG DUMP POLLUTION CONTROL DAM
SECTIONS AND DETAILS

DRAWING NUMBER	SCALE	REV.
301-00592/07-041	AS SHOWN	B

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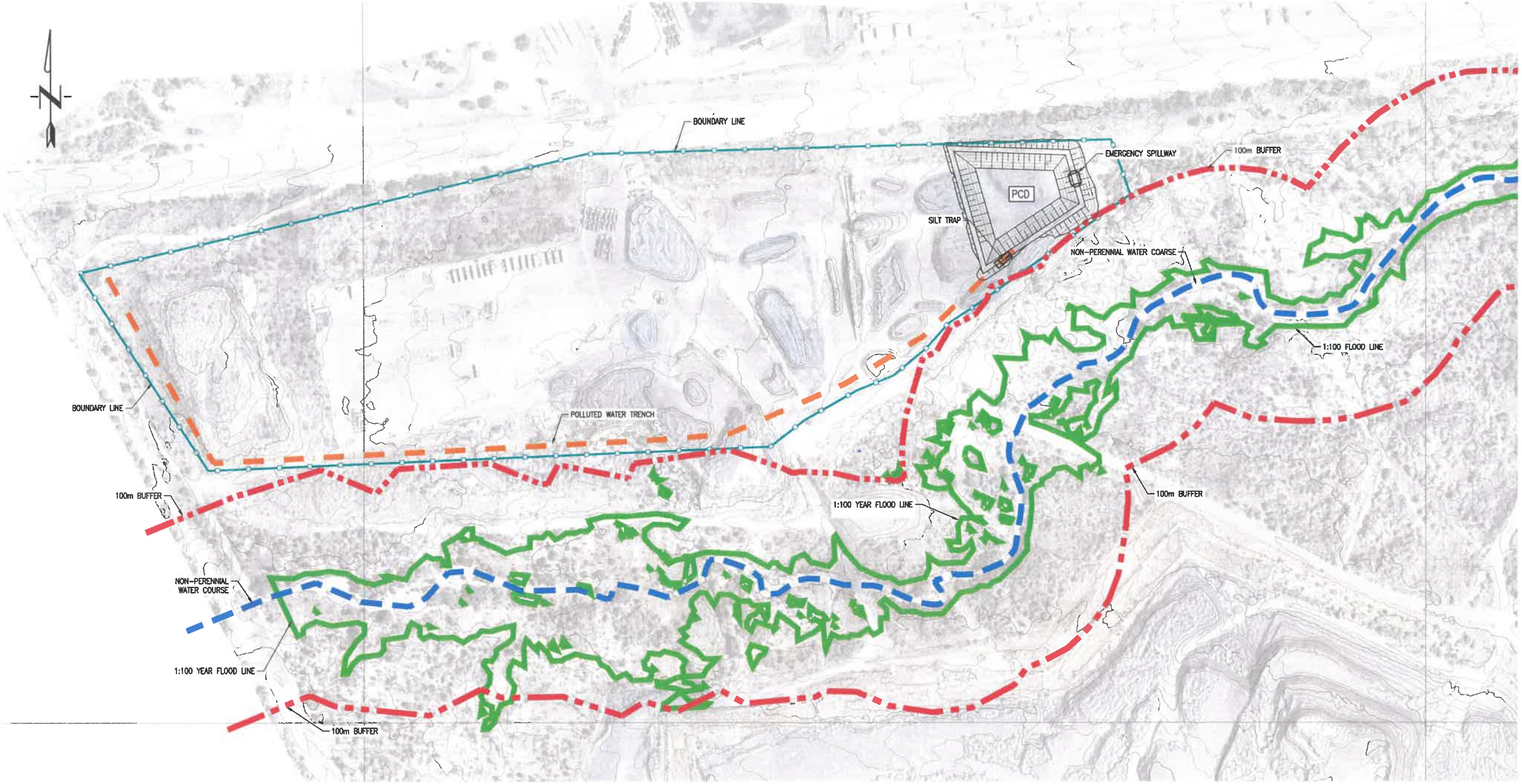

POLLUTION CONTROL DAM LAYOUT
SCALE 1: 2000

50 0 50 100 150
METRES 1:2000

Knight Piésold CONSULTING

J. L. MAUDE'
Pr.ENG 900255
27/06/17

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/2018
DRAWING CHECK	RG	31/08/2018
DESIGN	AS	31/08/2018
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	–
–		

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
–	–	–	–	–	–
–	–	–	–	–	–
–	–	–	–	–	–
–	–	–	–	–	–
–	–	–	–	–	–
–	–	–	–	–	–

REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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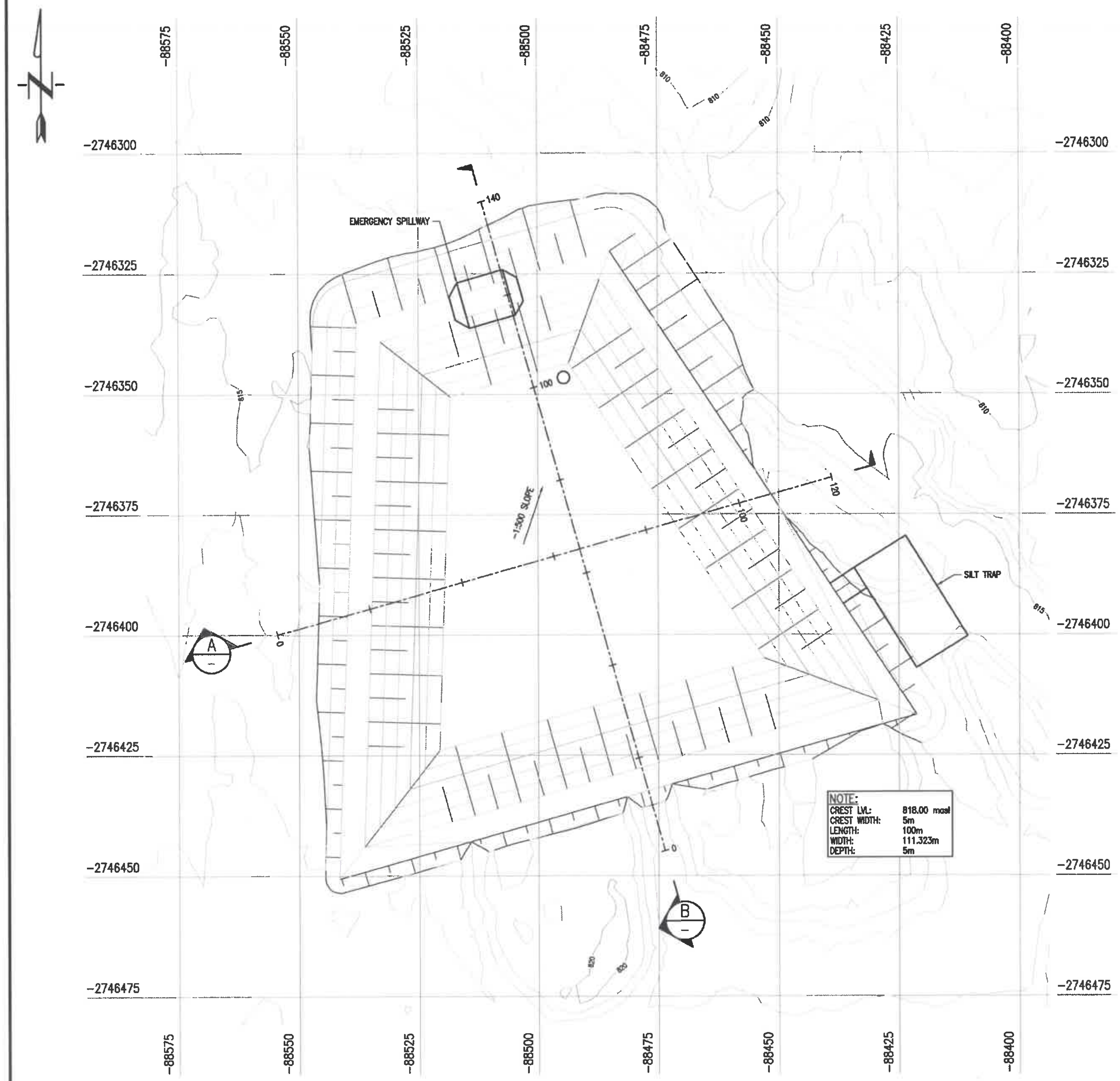
LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
GENERAL ARRANGEMENT
POLUTION CONTROL DAM
PLAN LAYOUT

DRAWING NUMBER	SCALE	REV.
301-00592/07-042	1: 2000	B

P:\301-00592\...\301-00592-07-042 Rev A.dwg

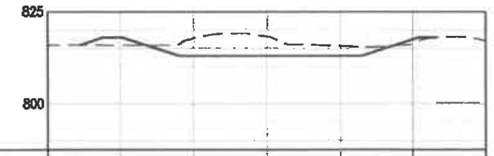


POLLUTION CONTROL DAM LAYOUT

SCALE 1:500

SCALES:
Horizontal 1:1000
Vertical 1:1000

DATUM 787.50



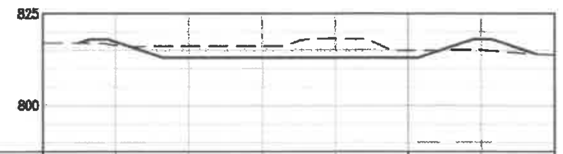
CHAINAGE (m)	0.00	20.00	40.00	60.00	80.00	100.00	120.00
EXISTING GROUND LEVELS (m)	815.99	815.89	817.68	818.04	815.55	816.33	817.12
DESIGN LEVELS (m)	816.01	818.00	813.00	813.00	813.00	817.46	818.00

A — TYPICAL POLLUTION CONTROL DAM SECTION

SCALE 1:1000

SCALES:
Horizontal 1:1000
Vertical 1:1000

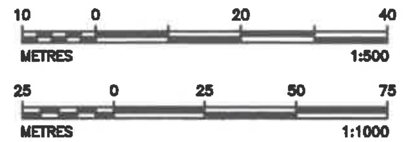
DATUM 787.50



CHAINAGE (m)	0.00	20.00	40.00	60.00	80.00	100.00	120.00	140.00
EXISTING GROUND LEVELS (m)	816.99	816.41	815.98	815.98	816.05	815.00	814.94	813.64
DESIGN LEVELS (m)	816.98	817.30	813.00	813.00	813.00	813.00	818.00	813.96

B — TYPICAL POLLUTION CONTROL DAM SECTION

SCALE 1:1000



Knight Piésold CONSULTING

20090264

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/2018
DRAWING CHECK	RG	31/08/2018
DESIGN	AS	31/08/2018
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	-

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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-	-	-
-	-	-
-	-	-
-	-	-

LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
POLLUTION CONTROL DAM
PLAN LAYOUT
AND SECTIONS

DRAWING NUMBER	SCALE	REV.
301-00592/07-043	AS SHOWN	B

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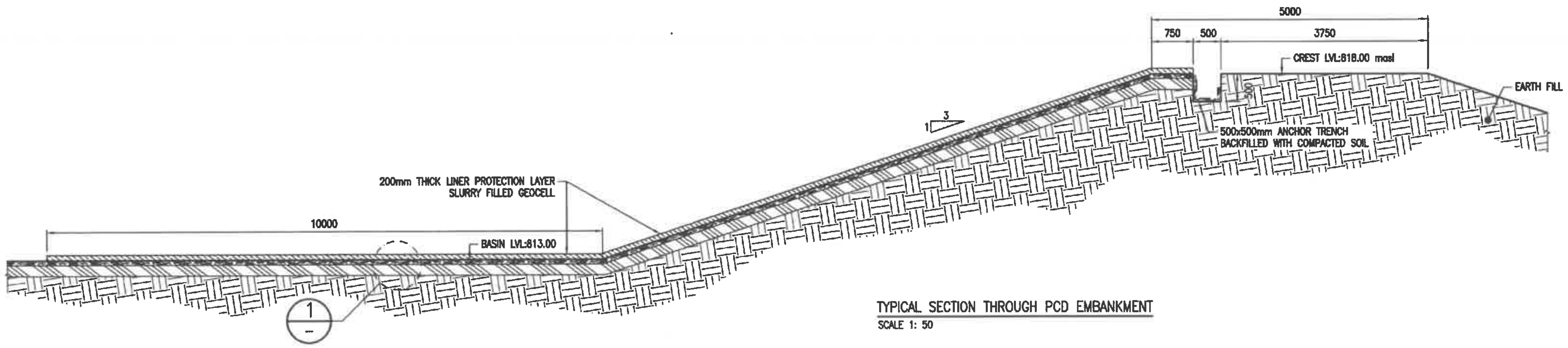
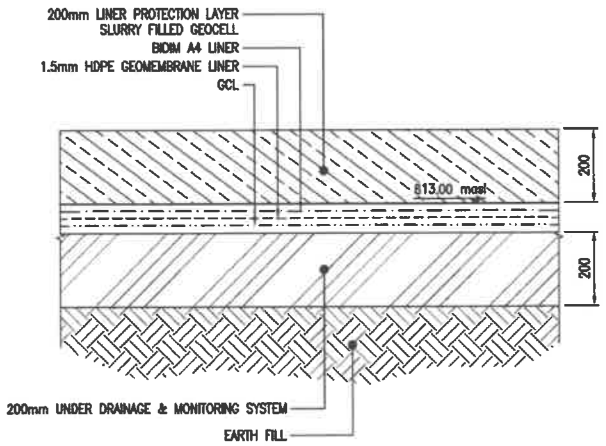
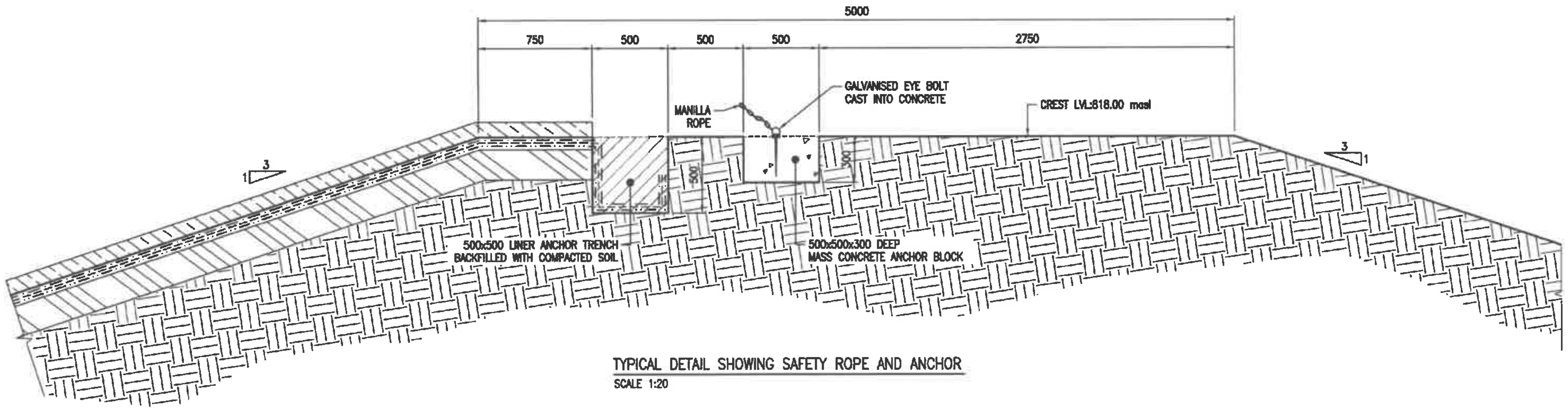


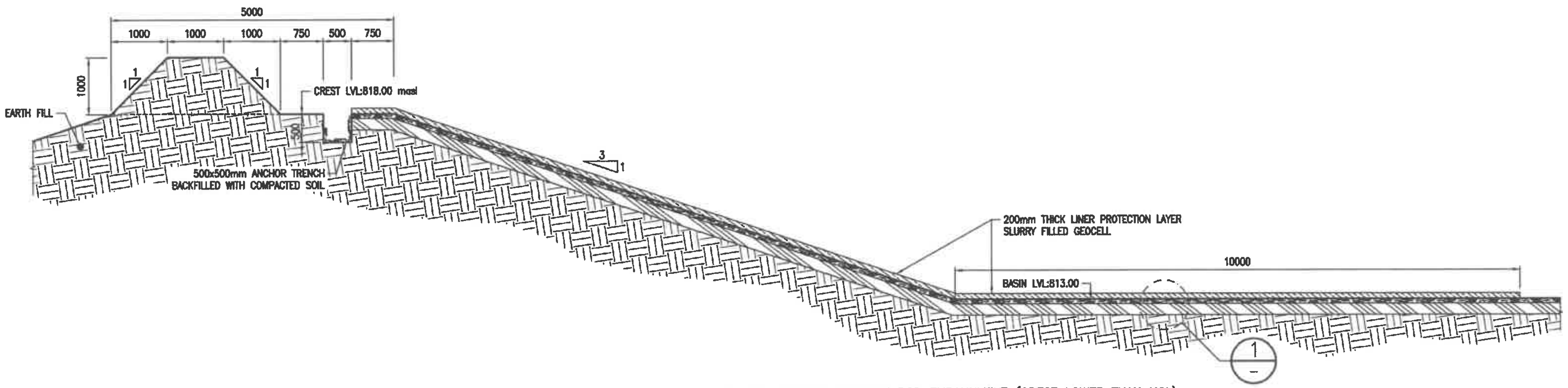
TYPICAL SECTION THROUGH PCD EMBANKMENT
SCALE 1: 50



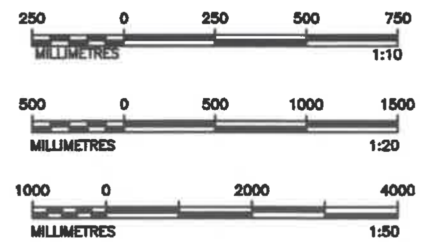
1 TYPICAL LINER DETAIL
SCALE 1:10



TYPICAL DETAIL SHOWING SAFETY ROPE AND ANCHOR
SCALE 1:20



TYPICAL SECTION THROUGH PCD EMBANKMENT (CREST LOWER THAN NGL)
SCALE 1: 50



Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/2018
DRAWING CHECK	RG	31/08/2018
DESIGN	AS	31/08/2018
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	–
–		

Straun 20040268

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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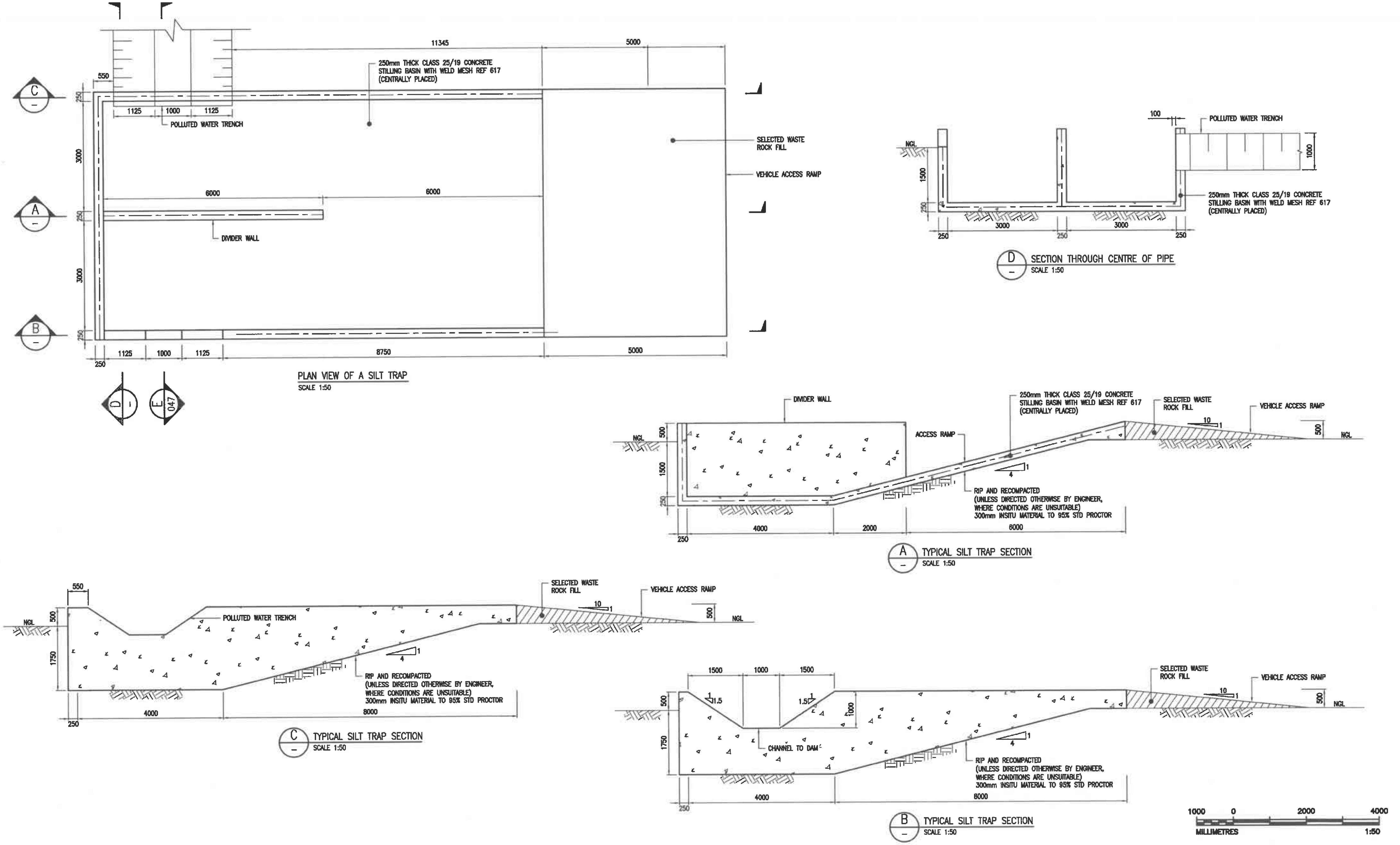
LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
POLUTION CONTROL DAM
SECTIONS
AND DETAILS

DRAWING NUMBER	SCALE	REV.
301-00592/07-045	AS SHOWN	B

P:\301-00592\07\A\DRAWINGS\HF\For Tender\301-00592-07-045, 046, 047 Rev B.dwg



Knight Piésold CONSULTING

20090268

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/2018
DRAWING CHECK	RG	31/08/2018
DESIGN	AS	31/08/2018
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	–

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REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
–	–	–	–	–	–

REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
592-047	–	SILT TRAP SECTIONS
–	–	–

LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
POLUTION CONTROL DAM
SILT TRAP
SECTIONS AND DETAILS

DRAWING NUMBER	SCALE	REV.
301-00592/07-046	1: 50	B

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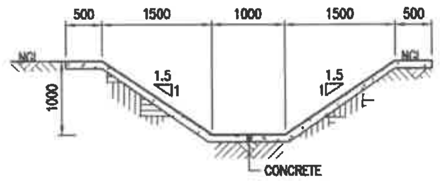

F
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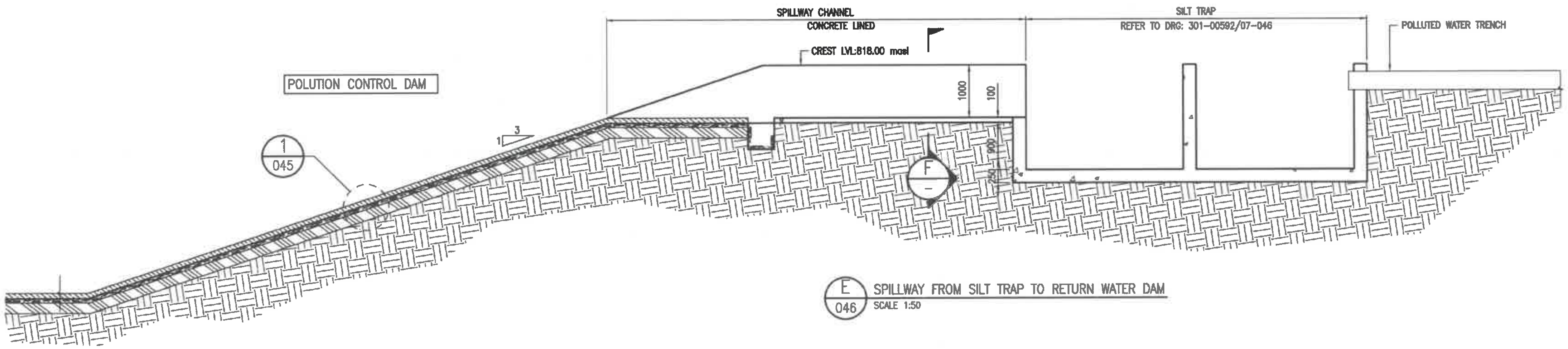
TYPICAL SECTION – SPILLWAY FROM SILT TRAP
SCALE 1:50



E
046
SPILLWAY FROM SILT TRAP TO RETURN WATER DAM
SCALE 1:50

Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CIVIL	
DRAWN	ME	31/08/2018
DRAWING CHECK	RG	31/08/2018
DESIGN	AS	31/08/2018
DESIGN CHECK	AS	31/08/2018
PROJECT ENGINEER	AS	–
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REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	31.08.18	ISSUED FOR INFORMATION	ME	RG	AS
B	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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–	–	–	–	–	–
–	–	–	–	–	–

REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
592-046	–	SILT TRAP SECTIONS AND DETAILS
–	–	–
–	–	–
–	–	–
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–	–	–
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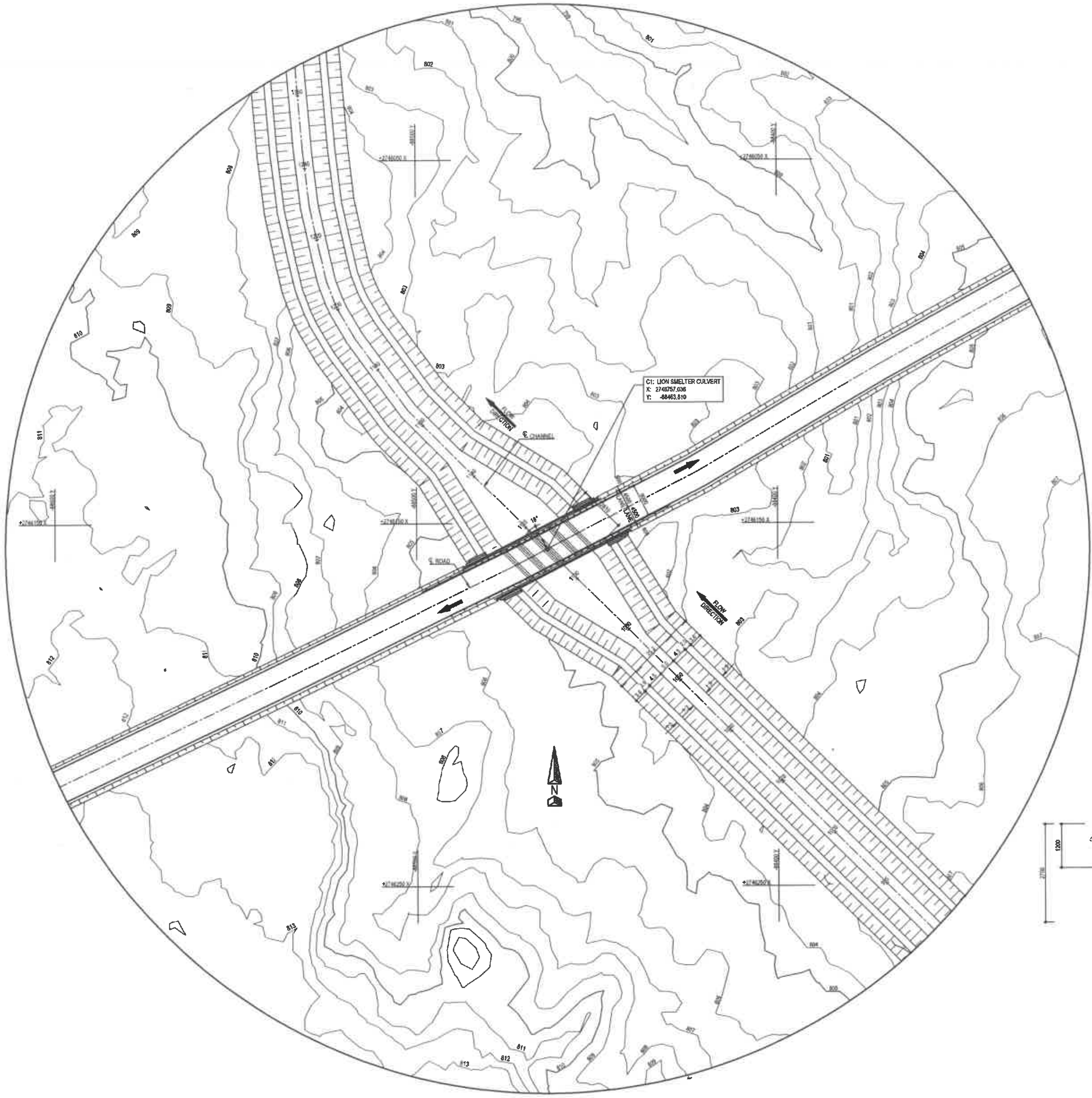
–	–	–

LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
SPILLWAY FROM SILT TRAP
SECTIONS

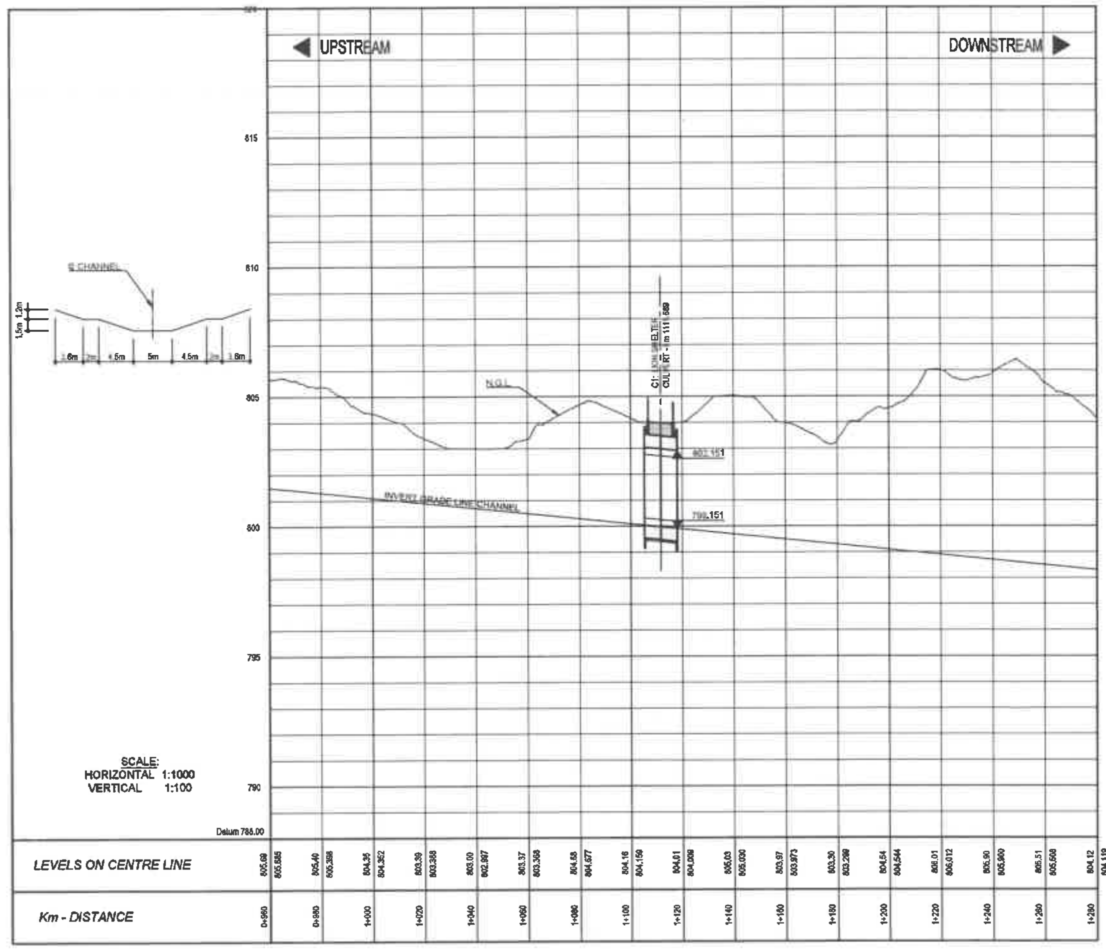
DRAWING NUMBER	SCALE	REV.
301-00592/07-047	1: 50	B

P:\301-00592\07\A\DRAWINGS\IP\For Tender\301-00592-07-045, 046, 047 Rev B.dwg



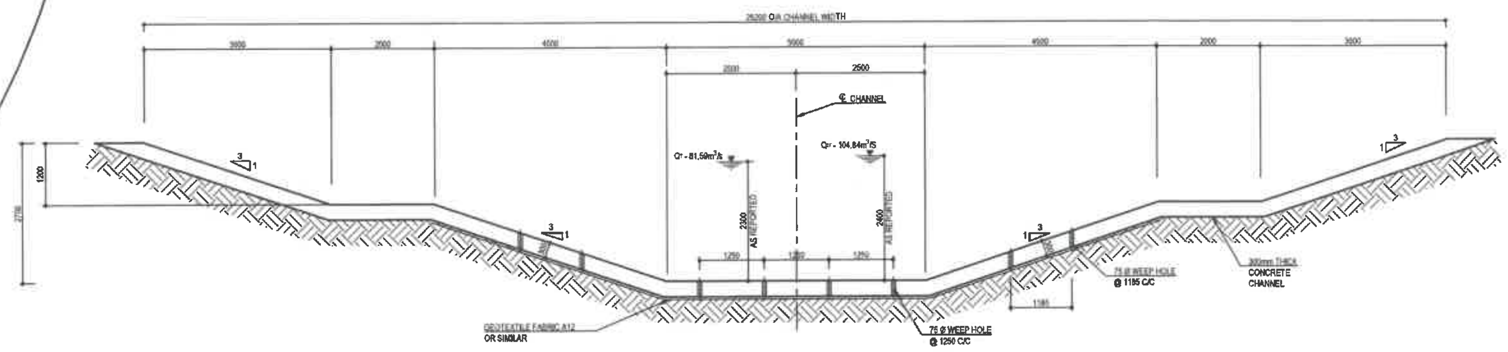
CONTOURED LOCALITY PLAN

SCALE 1:500



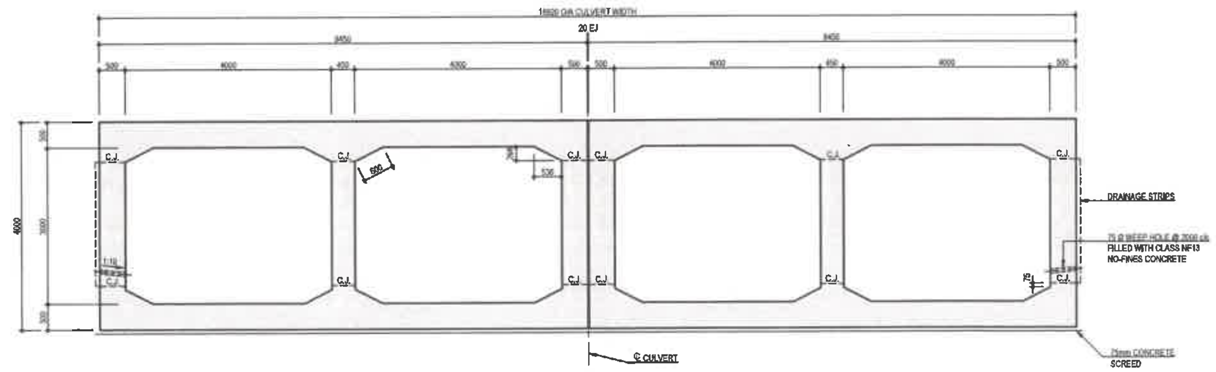
LONGITUDINAL SECTION ALONG ℄ CHANNEL

SCALE AS SHOWN



APPROACH SECTION OF CHANNEL

SCALE 1:50



SECTION A - A

SCALE 1:50

SH No.	LIST OF DRAWINGS
1	SITE PLAN

Knight Piésold CONSULTING

20180135.

PRIMARY DISCIPLINE	CIVIL	
DRAWN	PS	24.08.18
DRAWING CHECK	DP	24.08.18
DESIGN	DP	24.08.18
DESIGN CHECK	GRJ	24.08.18
PROJECT ENGINEER	AS	24.08.18
–		

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	24.08.18	ISSUED FOR INFORMATION	PS	DP	GRJ
B	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
C	24.05.19	ISSUED FOR INFORMATION	PS	DP	GRJ
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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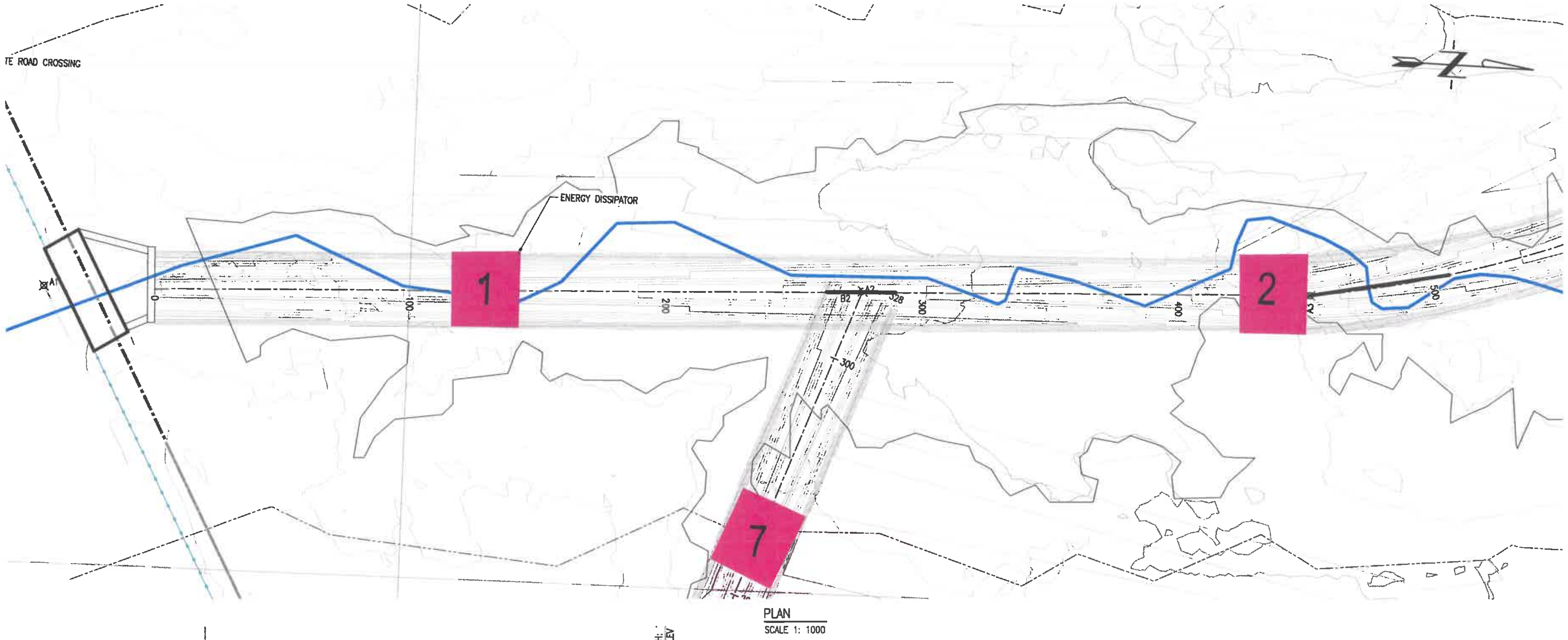
LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY

RIVER DIVERSION CHANNEL
SITE PLAN
BRIDGE CROSSING FOR OVERLAND PLANT

DRAWING NUMBER	SCALE	REV.
301-00592/07-050	AS SHOWN	C



LEGEND

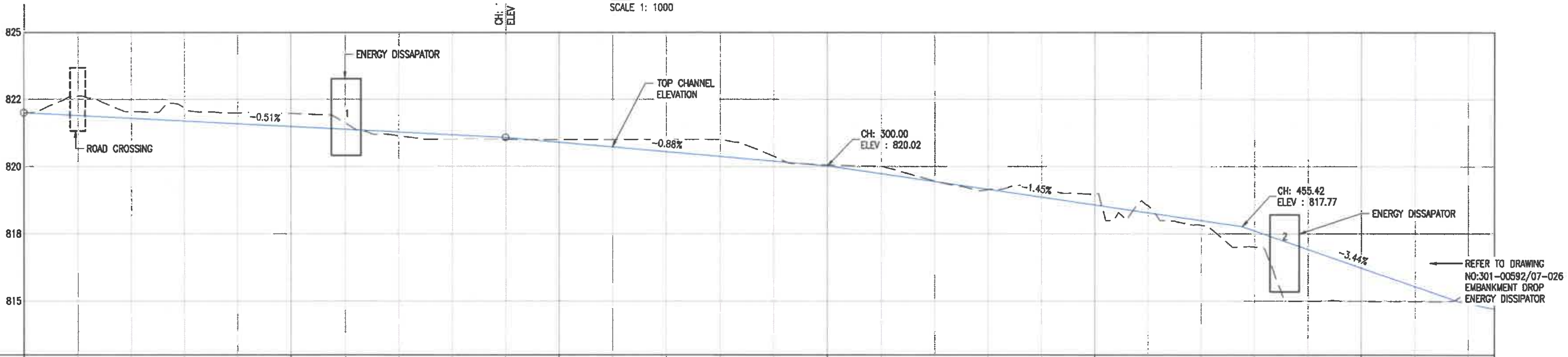
- CLEAN WATER DIVERSION TRENCH
- PERIMETER ACCESS ROAD
- CONCRETE LINED SOLUTION TRENCH
- PERIMETER FENCE
- RETURN WATER DAM PIPELINE

STREAM DIVERSION CHANNEL A SETTING OUT DATA

POINT	EASTING	NORTHING
A1	-88107.9261	-2747143.4440
A2	-88118.4522	-2746823.4607
A3	-88124.2068	-2746648.5254
A4	-88163.2032	-2746513.6703
A5	-88241.4331	-2746397.1082
A6	-88393.9101	-2746234.4800
A7	-88504.3546	-2746116.6826
A8	-88530.7453	-2746057.0078
A9	-88562.4663	-2745685.5223
A10	-88584.4856	-2745426.4564
A11	-88580.7817	-2745351.1901
A12	-88563.5404	-2745288.3449
A13	-88568.8301	-2745227.0538
A14	-88586.5882	-2745159.1553

STREAM DIVERSION CHANNEL B SETTING OUT DATA

POINT	EASTING	NORTHING
B1	-87760.5040	-2746957.0769
B2	-88118.4522	-2746823.4607



SCALES:
Horizontal 1:1000
Vertical 1:100

DATUM 813.00

CHAINAGE (m)	0.00	20.00	40.00	60.00	80.00	100.00	120.00	140.00	160.00	180.00	200.00	220.00	240.00	260.00
EXISTING GROUND LEVELS (m)	822.00	822.61	822.04	822.18	821.99	821.98	821.63	821.13	821.00	821.01	821.00	821.00	821.00	821.00
DESIGN LEVELS (m)	822.00	821.90	821.80	821.69	821.59	821.49	821.39	821.28	821.18	821.08	820.90	820.73	820.55	820.37
CUT / FILL	0.00	-0.71	-0.24	-0.49	-0.40	-0.49	-0.24	0.15	0.18	0.07	-0.10	-0.27	-0.45	-0.63

CHAINAGE (m)	280.00	300.00	320.00	340.00	360.00	380.00	400.00	420.00	440.00	460.00	480.00	500.00	520.00	540.00	550.00
EXISTING GROUND LEVELS (m)	820.37	820.06	820.00	819.46	819.15	819.22	818.98	818.54	817.81	817.01	815.00	815.00	814.99	815.27	815.11
DESIGN LEVELS (m)	820.20	820.02	819.73	819.44	819.15	818.86	818.57	818.28	817.99	817.61	816.92	816.23	815.55	814.91	814.71
CUT / FILL	-0.17	-0.04	-0.26	-0.02	0.01	-0.35	-0.41	-0.26	0.19	0.60	1.92	1.24	0.56	-0.36	-0.40

LONGITUDINAL SECTION
SCALE 1: 1000

25 0 25 50 75
METRES 1:1000

Knight Piésold CONSULTING

PRIMARY DISCIPLINE	CIVIL	
DRAWN	FB	05/11/2018
DRAWING CHECK	MS	05/11/2018
DESIGN	MS	05/11/2018
DESIGN CHECK	AS	05/11/2018
PROJECT ENGINEER	-	-

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	05.11.18	ISSUED FOR INFORMATION	FB	MS	AS

REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
-	-	-

LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
STREAM DIVERSION CHANNEL
LAYOUT AND LONGSECTION
CH: 0.00m – 540.00m

DRAWING NUMBER	SCALE	REV.
301-00592/07-055	1: 1000	A

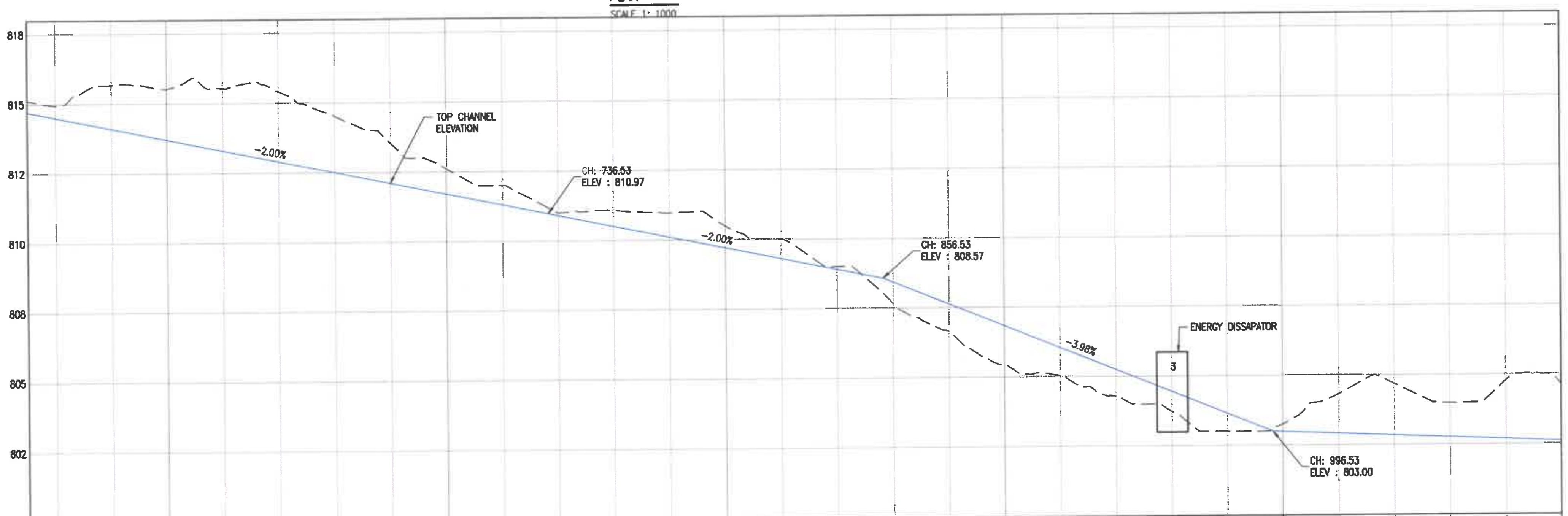
Pr. Eng 9002.55
27/06/2019

LEGEND
- CLEAN WATER DIVERSION TRENCH
- PERIMETER ACCESS ROAD
- CONCRETE LINED SOLUTION TRENCH
- PERIMETER FENCE
- RETURN WATER DAM PIPELINE

PLAN
SCALE 1: 1000

STREAM DIVERSION CHANNEL A SETTING OUT DATA		
POINT	EASTING	NORTHING
A1	-88107.9261	-2747143.4440
A2	-88118.4522	-2746823.4607
A3	-88124.2068	-2746648.5254
A4	-88163.2032	-2746513.6703
A5	-88241.4331	-2746397.1082
A6	-88393.9101	-2746234.4800
A7	-88504.3546	-2746116.6826
A8	-88530.7453	-2746057.0078
A9	-88562.4663	-2745685.5223
A10	-88584.4856	-2745426.4564
A11	-88580.7817	-2745351.1901
A12	-88563.5404	-2745288.3449
A13	-88568.8301	-2745227.0538
A14	-88586.5882	-2745159.1553

STREAM DIVERSION CHANNEL B SETTING OUT DATA		
POINT	EASTING	NORTHING
B1	-87760.5040	-2746957.0769
B2	-88118.4522	-2746823.4607



SCALES:
Horizontal 1:1000
Vertical 1:100

DATUM 800.00

CHAINAGE (m)	550.00	560.00	580.00	600.00	620.00	640.00	660.00	680.00	700.00	720.00	740.00	760.00	780.00	800.00
EXISTING GROUND LEVELS (m)	815.11	814.95	815.67	815.53	815.53	815.41	814.53	813.53	812.62	811.98	811.00	811.06	810.97	810.49
DESIGN LEVELS (m)	814.71	814.51	814.11	813.71	813.30	812.90	812.50	812.10	811.70	811.30	810.90	810.50	810.10	809.70
CUT / FILL	-0.40	-0.45	-1.56	-1.82	-2.22	-2.50	-2.02	-1.43	-0.91	-0.68	-0.10	-0.56	-0.87	-0.78

CHAINAGE (m)	820.00	840.00	860.00	880.00	900.00	920.00	940.00	960.00	980.00	1000.00	1020.00	1040.00	1060.00	1080.00	1100.00
EXISTING GROUND LEVELS (m)	809.99	809.00	807.65	806.66	805.42	805.03	804.27	803.72	803.00	803.25	804.32	804.67	803.98	804.77	804.65
DESIGN LEVELS (m)	809.30	808.90	808.44	807.64	806.84	806.05	805.25	804.45	803.66	802.99	802.91	802.84	802.76	802.69	802.62
CUT / FILL	-0.68	-0.09	0.79	0.98	1.42	1.02	0.98	0.73	0.66	-0.27	-1.40	-1.83	-1.22	-2.08	-2.03

LONGITUDINAL SECTION
SCALE 1: 1000

25 0 25 50 75
METRES 1:1000

Knight Piésold CONSULTING

J. G. HAWDE
PR. ENG 900255
27/06/2019

PRIMARY DISCIPLINE	CML	
DRAWN	FB	05/11/2018
DRAWING CHECK	MS	05/11/2018
DESIGN	MS	05/11/2018
DESIGN CHECK	AS	05/11/2018
PROJECT ENGINEER	-	-
-		

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	05.11.18	ISSUED FOR INFORMATION	FB	MS	AS
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
592-001	-	STREAM DIVERSION CHANNEL LAYOUT
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
STREAM DIVERSION CHANNEL
LAYOUT AND LONGSECTION
CH: 540.00m – 1000.00m

DRAWING NUMBER	SCALE	REV.
301-00592/07-056	1: 1000	A

Z:\301-00592\07\DRAWINGS\...\301-00592-07-...-059 Rev 0-1.dwg

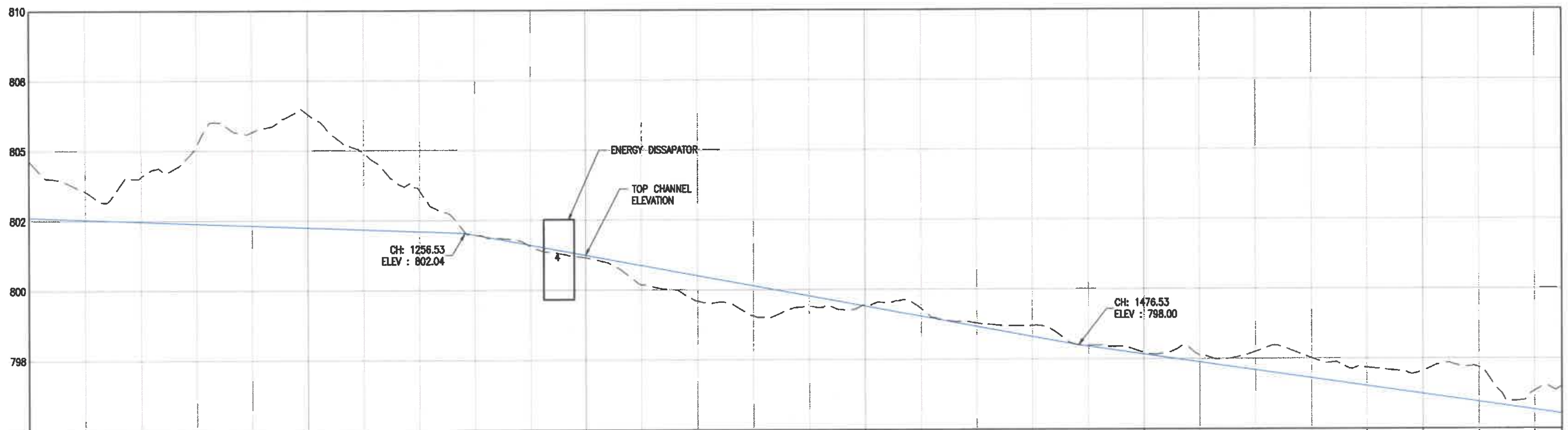
LEGEND

- CLEAN WATER DIVERSION TRENCH
- PERIMETER ACCESS ROAD
- CONCRETE LINED SOLUTION TRENCH
- PERIMETER FENCE
- RETURN WATER DAM PIPELINE

PLAN
SCALE 1: 1000

STREAM DIVERSION CHANNEL A SETTING OUT DATA		
POINT	EASTING	NORTHING
A1	−88107.9261	−2747143.4440
A2	−88118.4522	−2746823.4607
A3	−88124.2068	−2746648.5254
A4	−88163.2032	−2746513.6703
A5	−88241.4331	−2746397.1082
A6	−88393.9101	−2746234.4800
A7	−88504.3546	−2746116.8826
A8	−88530.7453	−2746057.0078
A9	−88562.4663	−2745685.5223
A10	−88584.4856	−2745426.4564
A11	−88580.7817	−2745351.1901
A12	−88563.5404	−2745288.3449
A13	−88568.8301	−2745227.0538
A14	−88586.5882	−2745159.1553

STREAM DIVERSION CHANNEL B SETTING OUT DATA		
POINT	EASTING	NORTHING
B1	−87760.5040	−2746957.0769
B2	−88118.4522	−2746823.4607



SCALES:
Horizontal 1:1000
Vertical 1:100

DATUM 795.00

CHAINAGE (m)	1100.00	1120.00	1140.00	1160.00	1180.00	1200.00	1220.00	1240.00	1260.00	1280.00	1300.00	1320.00	1340.00	1360.00	1380.00
EXISTING GROUND LEVELS (m)	804.65	803.55	804.07	805.18	805.67	806.28	804.92	803.57	801.97	801.57	801.15	800.17	799.58	799.06	799.39
DESIGN LEVELS (m)	802.62	802.54	802.47	802.39	802.32	802.25	802.17	802.10	801.97	801.61	801.24	800.87	800.51	800.14	799.77
CUT / FILL	−2.03	−1.01	−1.60	−2.79	−3.34	−4.04	−2.75	−1.47	0.00	0.03	0.08	0.70	0.93	1.08	0.38

CHAINAGE (m)	1400.00	1420.00	1440.00	1460.00	1480.00	1500.00	1520.00	1540.00	1560.00	1580.00	1600.00	1620.00	1640.00	1650.00
EXISTING GROUND LEVELS (m)	799.45	799.31	798.79	798.70	797.99	797.72	797.62	797.75	797.51	797.16	797.05	797.17	796.32	796.50
DESIGN LEVELS (m)	799.40	799.04	798.67	798.30	797.95	797.66	797.38	797.09	796.81	796.52	796.24	795.95	795.66	795.52
CUT / FILL	−0.04	−0.27	−0.12	−0.39	−0.04	−0.06	−0.24	−0.66	−0.71	−0.64	−0.81	−1.22	−0.66	−0.98

LONGITUDINAL SECTION
SCALE 1: 1000

25 0 25 50 75
METRES 1:1000

Knight Piésold CONSULTING

L NAUDE
PR. ENG 900255
27/06/19

PRIMARY DISCIPLINE	CIVIL	
DRAWN	FB	05/11/2018
DRAWING CHECK	MS	05/11/2018
DESIGN	MS	05/11/2018
DESIGN CHECK	AS	05/11/2018
PROJECT ENGINEER	–	–

REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	05.11.18	ISSUED FOR INFORMATION	FB	MS	AS

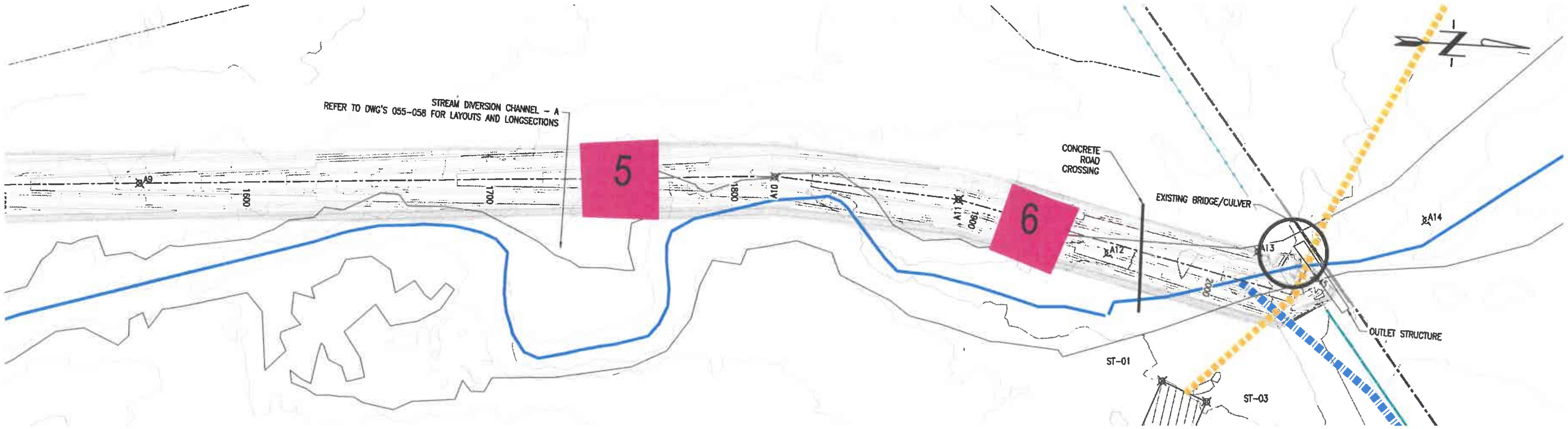
REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
592-001	–	STREAM DIVERSION CHANNEL LAYOUT

LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY

STREAM DIVERSION CHANNEL
LAYOUT AND LONGSECTION
CH: 1000.00m – 1500.00m

DRAWING NUMBER	SCALE	REV.
301-00592/07-057	1: 1000	A



PLAN

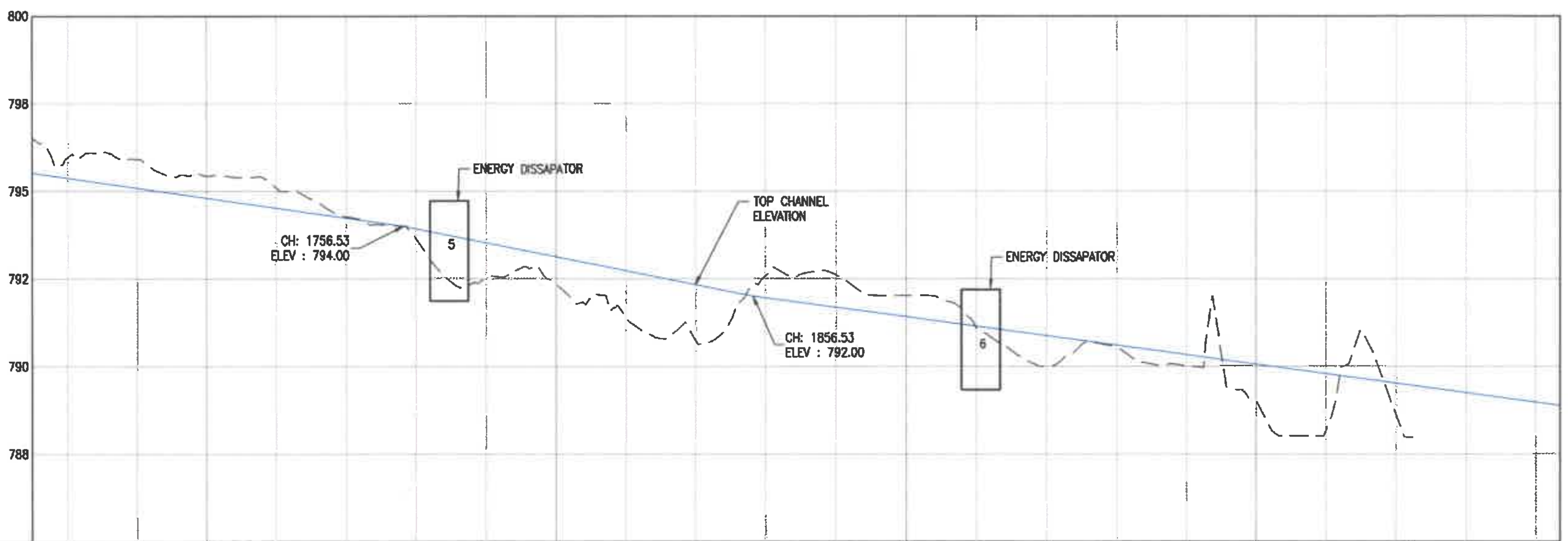
SCALE 1: 1000

LEGEND

- CLEAN WATER DIVERSION TRENCH
- PERIMETER ACCESS ROAD
- CONCRETE LINED SOLUTION TRENCH
- PERIMETER FENCE
- RETURN WATER DAM PIPELINE

STREAM DIVERSION CHANNEL A SETTING OUT DATA

POINT	EASTING	NORTHING
A1	–88107.9261	–2747143.4440
A2	–88118.4522	–2746823.4607
A3	–88124.2068	–2746648.5254
A4	–88163.2032	–2746513.6703
A5	–88241.4331	–2746397.1082
A6	–88393.9101	–2746234.4800
A7	–88504.3546	–2746116.6826
A8	–88530.7453	–2746057.0078
A9	–88562.4663	–2745685.5223
A10	–88584.4856	–2745426.4564
A11	–88580.7817	–2745351.1901
A12	–88563.5404	–2745288.3449
A13	–88568.8301	–2745227.0538
A14	–88586.5882	–2745159.1553



SCALES:
Horizontal 1:1000
Vertical 1:100

DATUM 785.00

CHAINAGE (m)	1650.00	1660.00	1680.00	1700.00	1720.00	1740.00	1760.00	1780.00	1800.00	1820.00	1840.00	1860.00
EXISTING GROUND LEVELS (m)	796.50	795.96	795.92	795.44	795.11	794.28	793.64	792.52	792.36	791.38	790.72	792.57
DESIGN LEVELS (m)	795.52	795.38	795.09	794.81	794.52	794.24	793.93	793.53	793.13	792.73	792.33	791.95
CUT / FILL	–0.98	–0.58	–0.82	–0.64	–0.59	–0.04	0.29	1.01	0.77	1.35	1.61	–0.62

CHAINAGE (m)	1880.00	1900.00	1920.00	1940.00	1960.00	1980.00	2000.00	2020.00	2040.00	2044.55	2060.00	2080.00	2086.95
EXISTING GROUND LEVELS (m)	792.60	792.02	791.09	790.00	790.54	790.02	788.98	788.16	788.59	787.98			
DESIGN LEVELS (m)	791.68	791.41	791.14	790.87	790.60	790.33	790.06	789.79	789.52	789.46	789.25	788.98	788.88
CUT / FILL	–0.92	–0.61	0.05	0.87	0.06	0.31	1.08	1.63	0.93				

LONGITUDINAL SECTION

SCALE 1: 1000

25 0 25 50 75
METRES 1:1000

Knight Piésold CONSULTING

L. NAUDE
PR. ENG 900255
27/06/17

PRIMARY DISCIPLINE	CIVIL	
DRAWN	FB	05/11/2018
DRAWING CHECK	MS	05/11/2018
DESIGN	MS	05/11/2018
DESIGN CHECK	AS	05/11/2018
PROJECT ENGINEER	–	–
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REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	05.11.18	ISSUED FOR INFORMATION	FB	MS	AS
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
592-001	–	STREAM DIVERSION CHANNEL LAYOUT
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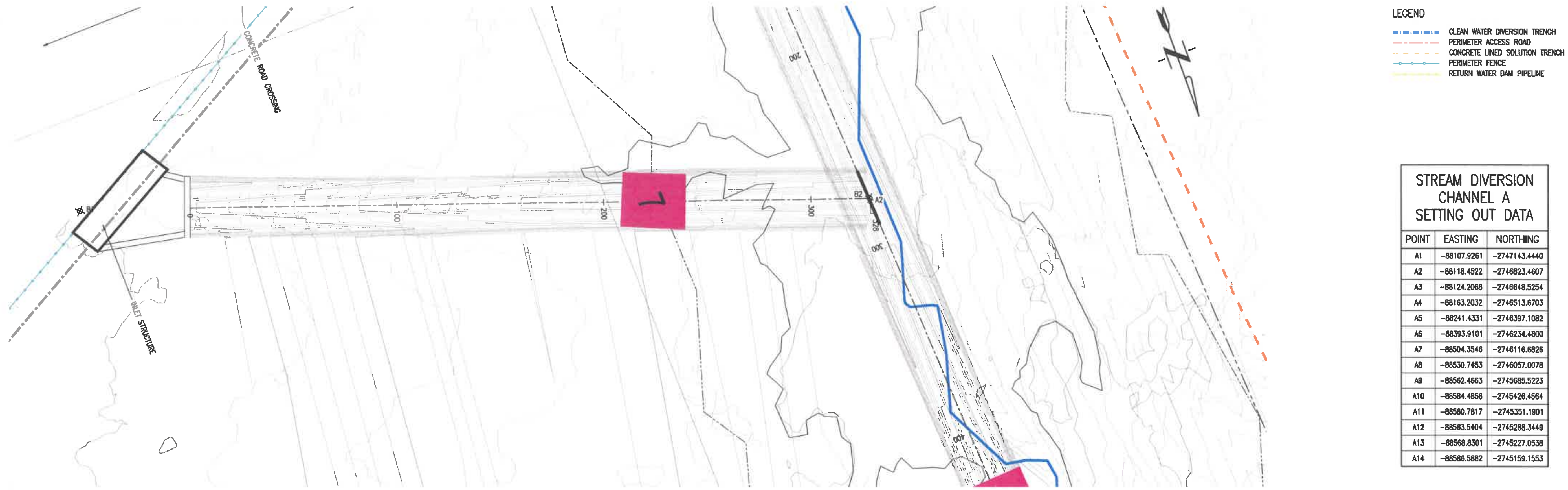
–	–	–
–	–	–
–	–	–
–	–	–
–	–	–

LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
STREAM DIVERSION CHANNEL
LAYOUT AND LONGSECTION
CH: 1500.00m – 2068.00m

DRAWING NUMBER	SCALE	REV.
301-00592/07-058	1: 1000	E

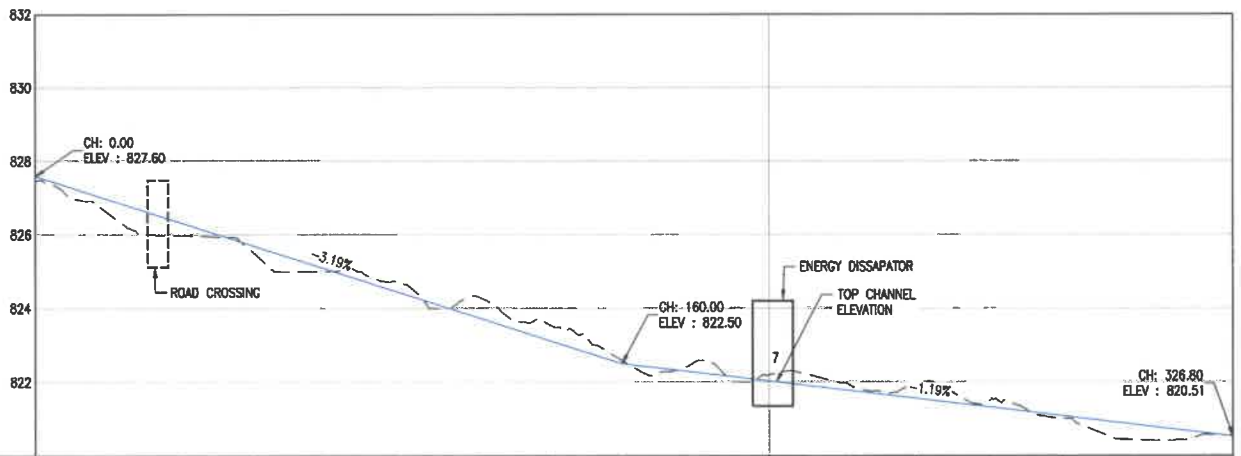
Z:\301-00592\07\A\DRAWINGS\KP\For Tender\DWG\301-00592-07-001-055-058 Rev E-1.dwg



PLAN
SCALE 1: 1000

STREAM DIVERSION CHANNEL A SETTING OUT DATA		
POINT	EASTING	NORTHING
A1	-88107.9261	-2747143.4440
A2	-88118.4522	-2746823.4607
A3	-88124.2068	-2746648.5254
A4	-88163.2032	-2746513.6703
A5	-88241.4331	-2746397.1082
A6	-88393.9101	-2746234.4800
A7	-88504.3546	-2746116.6826
A8	-88530.7453	-2746057.0078
A9	-88562.4663	-2745685.5223
A10	-88584.4856	-2745426.4564
A11	-88580.7817	-2745351.1901
A12	-88563.5404	-2745288.3449
A13	-88568.8301	-2745227.0538
A14	-88586.5882	-2745159.1553

STREAM DIVERSION CHANNEL B SETTING OUT DATA		
POINT	EASTING	NORTHING
B1	-87760.5040	-2746957.0769
B2	-88118.4522	-2746823.4607



SCALES:
Horizontal 1:1000
Vertical 1:100

DATUM 820.00

CHAINAGE (m)	0.00	20.00	40.00	60.00	80.00	100.00	120.00	140.00	160.00	180.00	200.00	220.00	240.00	260.00	280.00	300.00	320.00	326.80
EXISTING GROUND LEVELS (m)	827.45	826.57	825.98	825.47	825.00	824.69	824.34	823.56	822.58	822.55	822.20	821.97	821.95	821.48	821.00	820.42	820.57	820.52
DESIGN LEVELS (m)	827.60	826.96	826.32	825.69	825.05	824.41	823.77	823.14	822.50	822.26	822.02	821.79	821.55	821.31	821.07	820.83	820.60	820.51

LONGITUDINAL SECTION
SCALE 1: 1000

25 0 25 50 75
METRES 1:1000

Knight Piésold CONSULTING

L. NAUDE
Pr. ENG 900255
27/06/19

PRIMARY DISCIPLINE	CIVIL	
DRAWN	FB	05/11/2018
DRAWING CHECK	MS	05/11/2018
DESIGN	MS	05/11/2018
DESIGN CHECK	AS	05/11/2018
PROJECT ENGINEER	-	-
-		

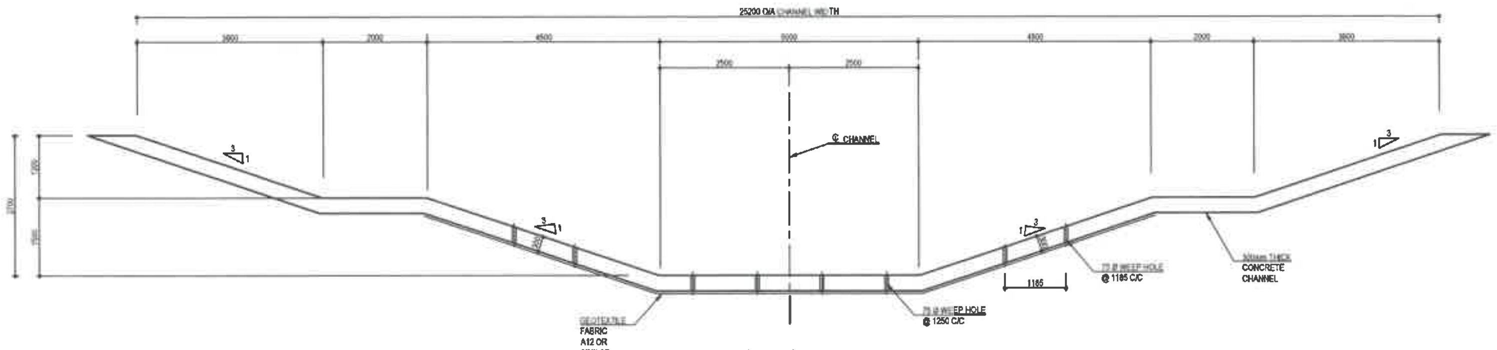
REVISION					
REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	05.11.18	ISSUED FOR INFORMATION	FB	MS	AS
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

REFERENCE DRAWINGS		
DRAWING No.	MAKERS No.	TITLE
592-001	-	STREAM DIVERSION CHANNEL LAYOUT
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

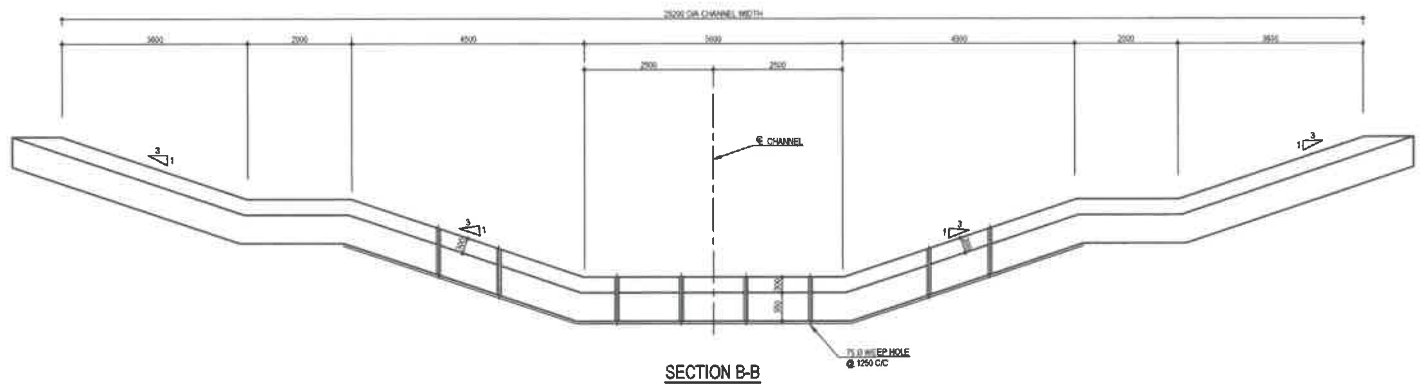
LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
STREAM DIVERSION CHANNEL – B
LAYOUT AND LONGSECTION
CH: 0.00m – 381.00m

DRAWING NUMBER	SCALE	REV.
301-00592/07-059	1: 1000	A

Z:\301-00592\07\A\DRAWINGS\KP\For Tender\DWG\301-00592-07-001-055-059 Rev C-1.dwg



SECTION A-A



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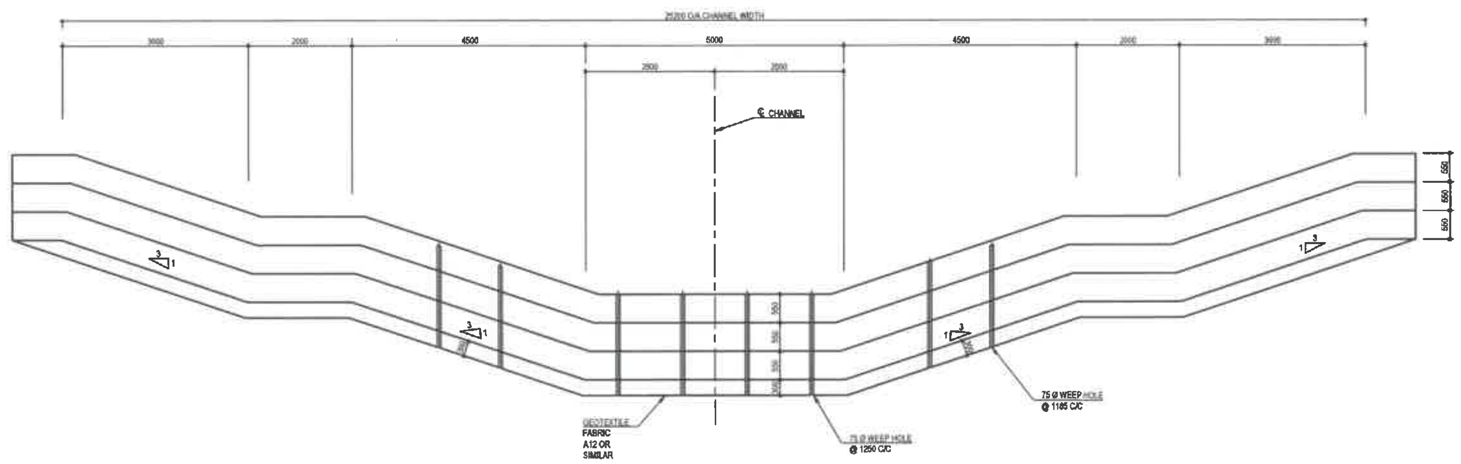

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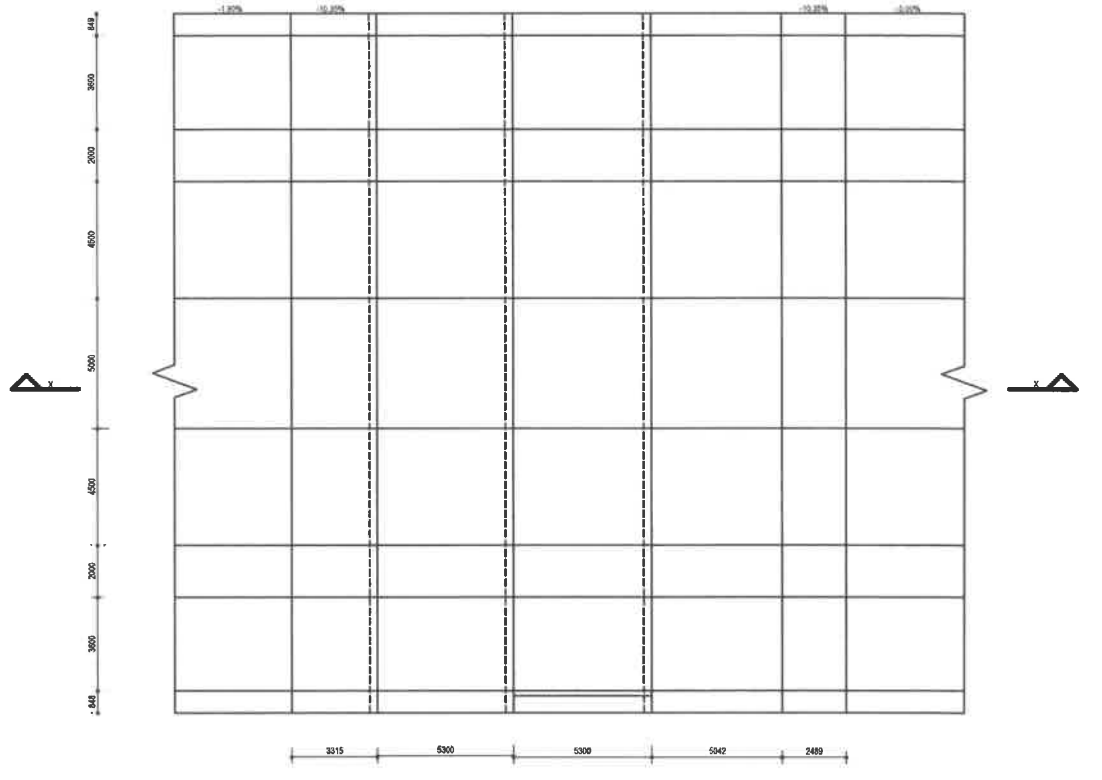
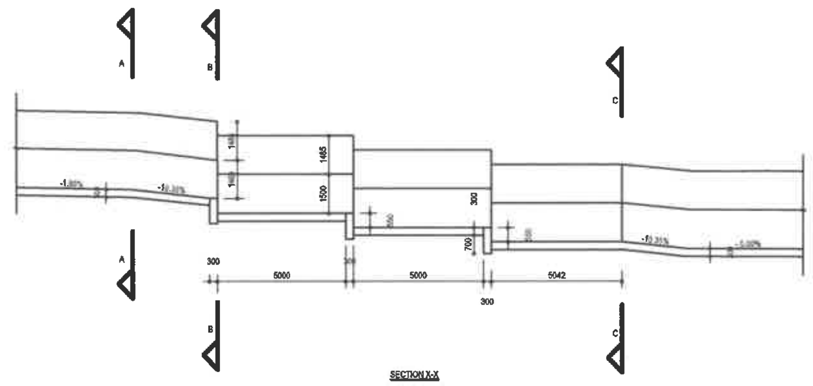


ENERGY DISSIPATOR 5 (EMBANKMENT DROP ENERGY DISSIPATOR)

PLAN VIEW



SECTION X-X

DWG No	LIST OF DRAWINGS
2	GENERAL ARRANGEMENT PLAN
1	SITE PLAN

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J. L. NAUDÉ
PR. ENG 900255
27/06/2019

PRIMARY DISCIPLINE	CIVIL	
DRAWN	PS	24.08.18
DRAWING CHECK	DP	24.08.18
DESIGN	DP	24.08.18
DESIGN CHECK	GRJ	24.08.18
PROJECT ENGINEER	–	–

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A	24.08.18	ISSUED FOR INFORMATION	PS	DP	GRJ
B	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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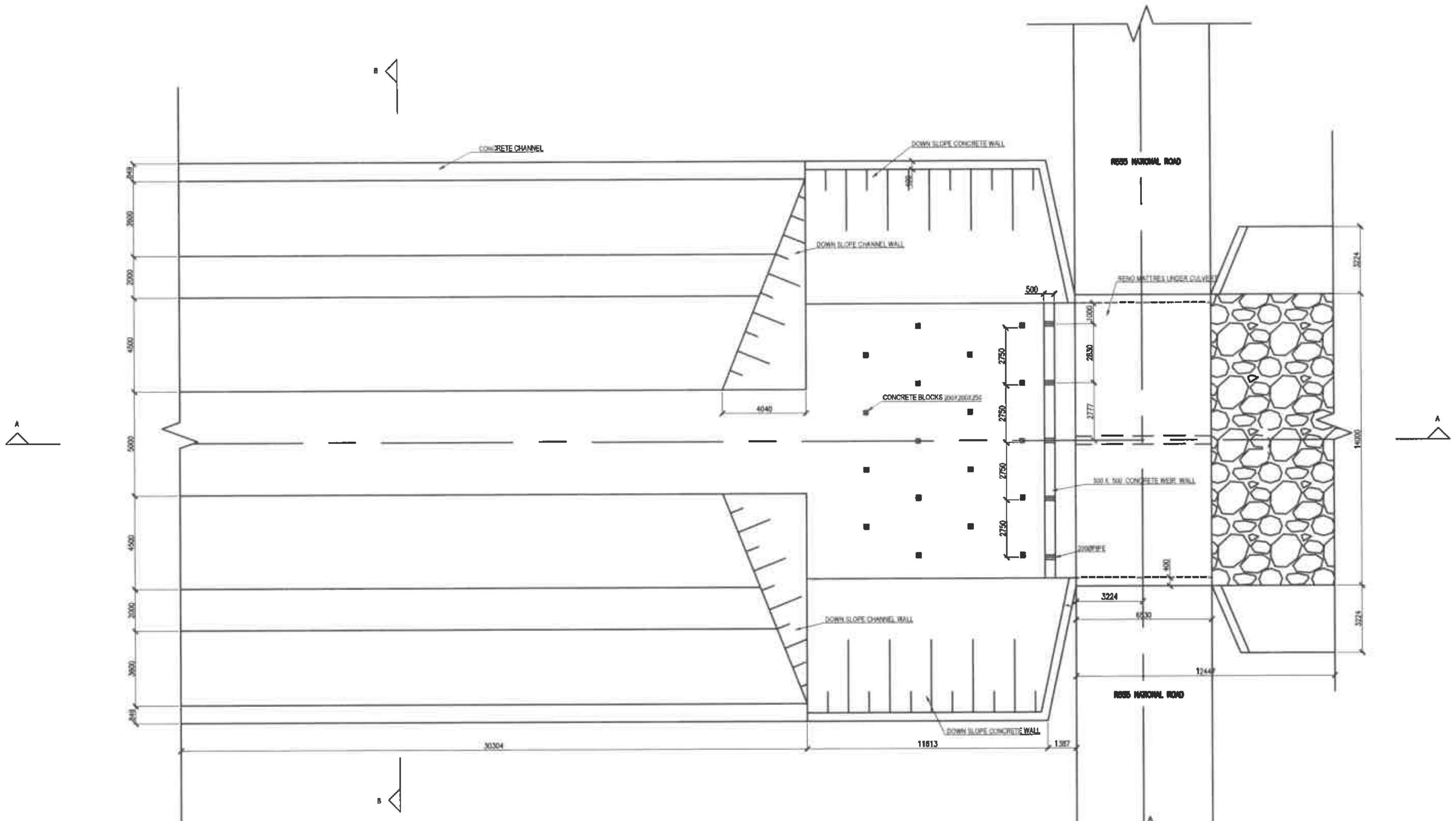
LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
STREAM DIVERSION CHANNEL ENERGY DISSIPATORS

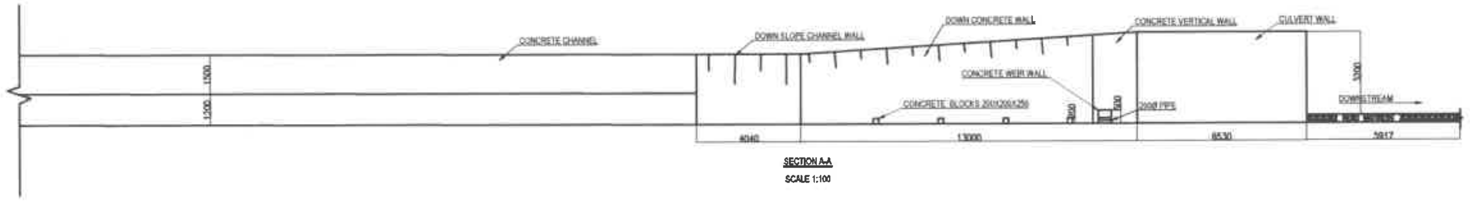
PLAN LAYOUT, SECTIONS & DETAILS

DRAWING NUMBER	SCALE	REV.
301-00592/07-060	AS SHOWN	B



OUTLET DRAWING PLAN VIEW

SCALE 1:100



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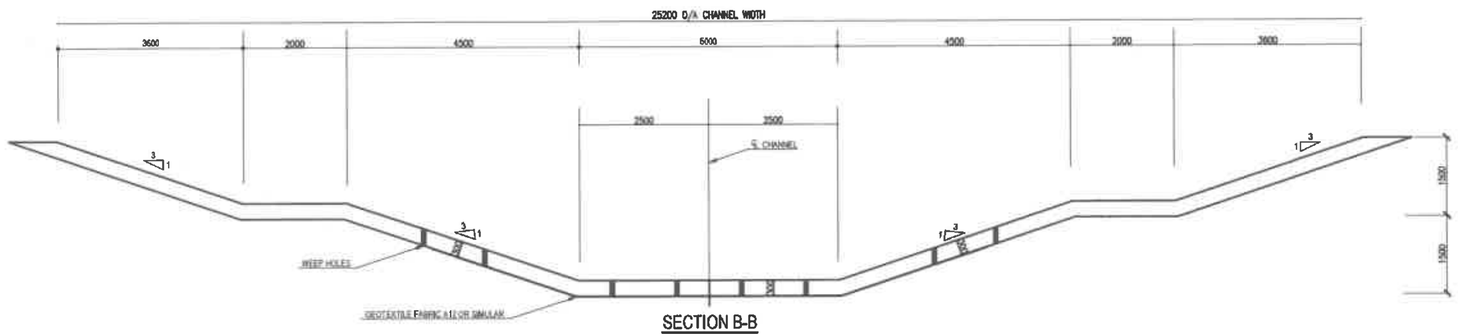

SECTION B-B

SCALE 1:50

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PR. ENG 960255
27/06/2019

PRIMARY DISCIPLINE	CML	
DRAWN	PS	24.08.18
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DESIGN	DP	24.08.18
DESIGN CHECK	GRJ	24.08.18
PROJECT ENGINEER	–	–

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REVISION

REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
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B	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
OUTLET
TYPICAL LAYOUT, SECTIONS AND DETAILS

DRAWING NUMBER	SCALE	REV.
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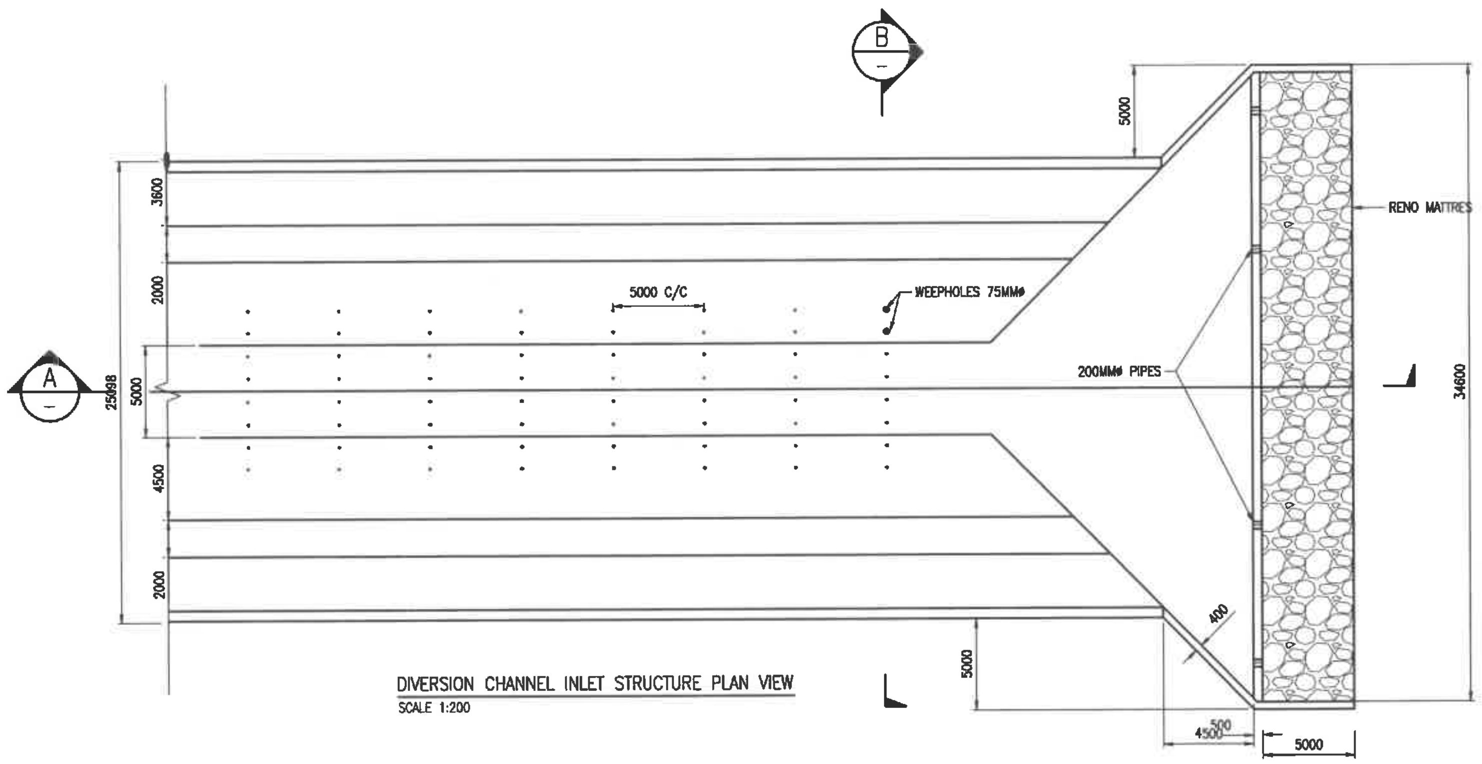
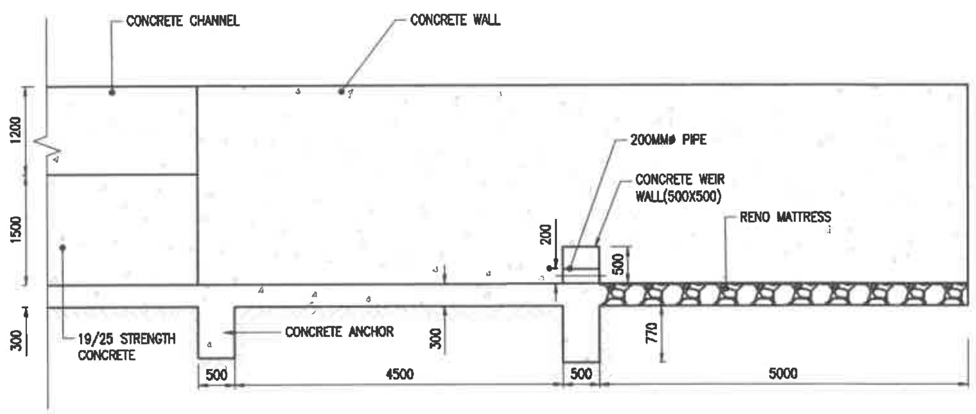


DIVERSION CHANNEL INLET STRUCTURE PLAN VIEW
SCALE 1:200



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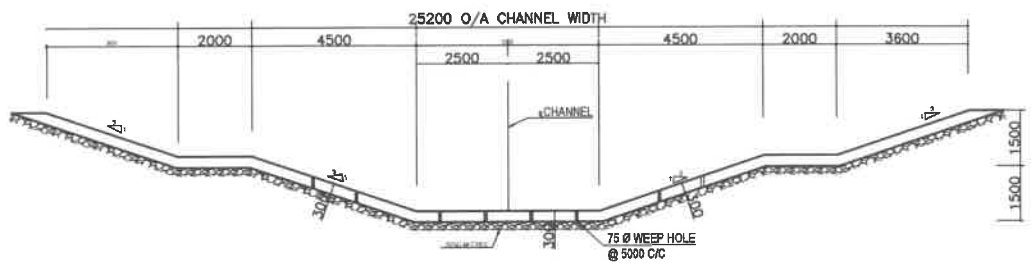

B DIVERSION CHANNEL SECTION B – B
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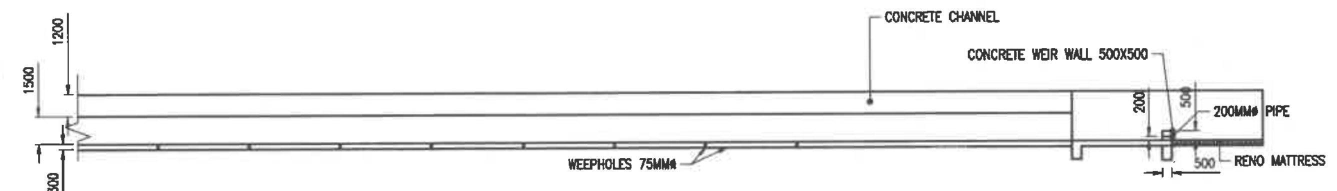

A DIVERSION CHANNEL SECTION A – A
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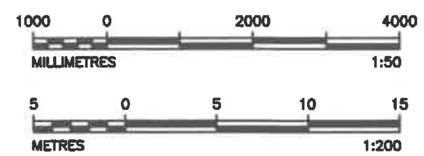

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L. NAUDE'
Pr.ENG 900285
27/06/2019

PRIMARY DISCIPLINE	CIVIL	
DRAWN	FB	21/01/2019
DRAWING CHECK	RG	21/01/2019
DESIGN	RG	21/01/2019
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PROJECT ENGINEER	AS	–

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REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
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DRAWING No.	MAKERS No.	TITLE
592-07-015	B	STORMWATER DIVERSION CHANNEL LAYOUT PLAN AND SECTIONS
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LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
STORMWATER DIVERSION CHANNEL
INLET STRUCTURE PLAN VIEW
AND TYPICAL SECTION

DRAWING NUMBER	SCALE	REV.
301-00592/07-063	AS SHOWN	A

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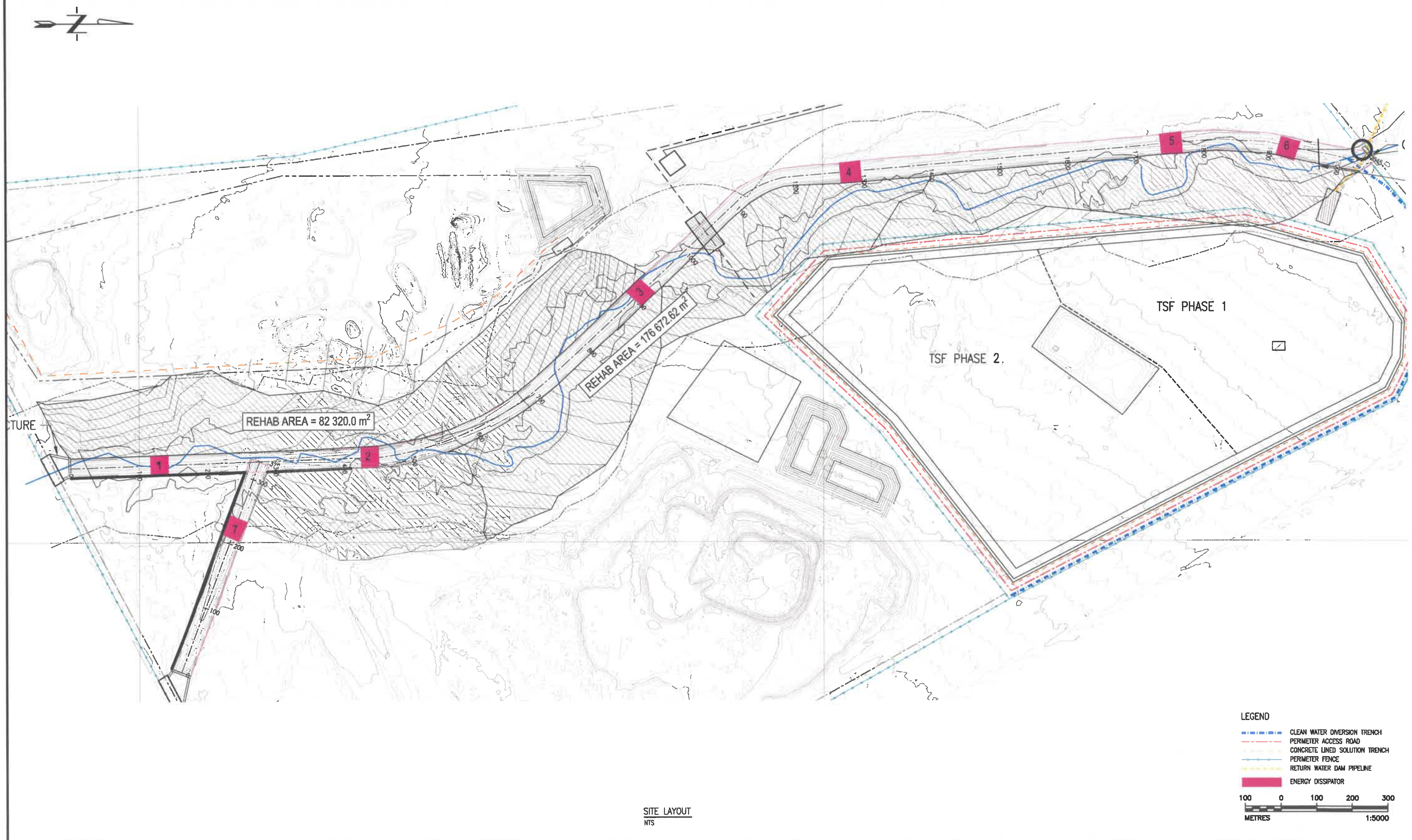

SITE LAYOUT
NTS

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J. L. NAUDE' Pr. ENG. 900255 27/06/2019

PRIMARY DISCIPLINE	CML	
DRAWN	ME	10/05/2019
DRAWING CHECK	RG	10/05/2019
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REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
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592-56	–	RETURN WATER DAM CH: 540.00m – 1000.00m
592-57	–	RETURN WATER DAM CH: 1000.00m – 1500.00m
592-58	–	RETURN WATER DAM CH: 1500.00m – 2068.00m
592-59	–	RETURN WATER DAM CH: 0.00m – 381.00m
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LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
REHABILITATION AREA – PLAN LAYOUT

DRAWING NUMBER	SCALE	REV.
301-00592/07-064	AS SHOWN	A

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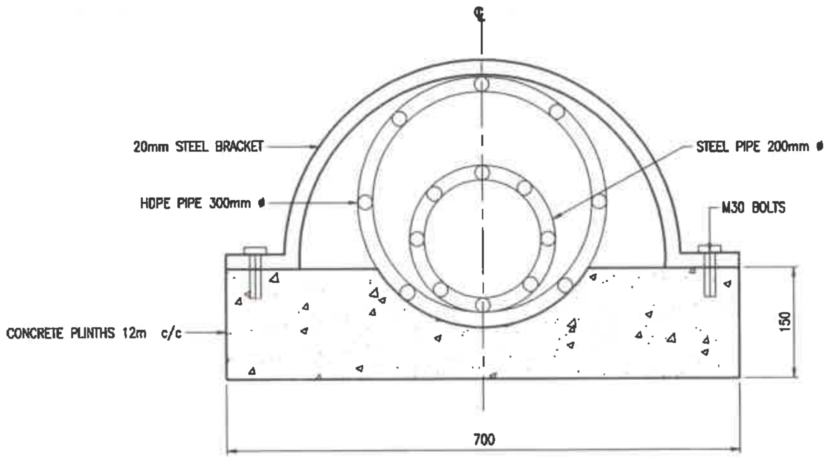
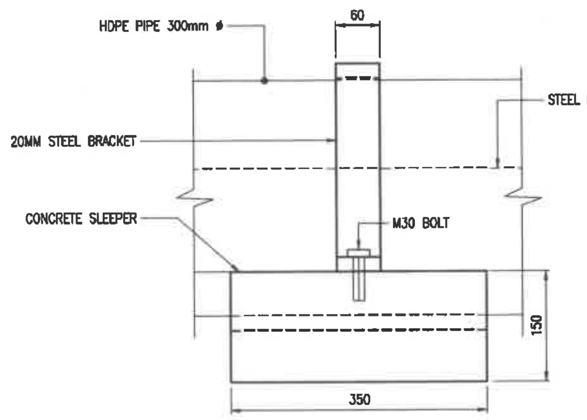
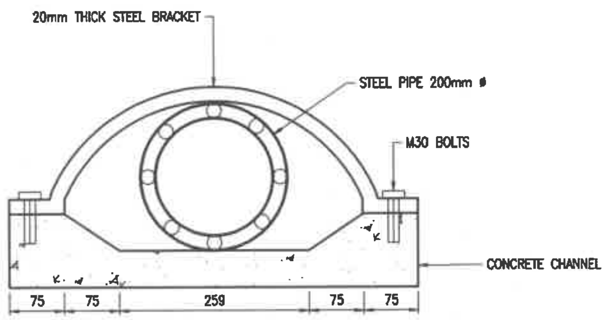


A — TYPICAL SECTION OF PIPELINE
SCALE 1:5



SIDE VIEW OF CONCRETE PLINTHS
SCALE 1: 5



B — TYPICAL SECTION OF PIPELINE
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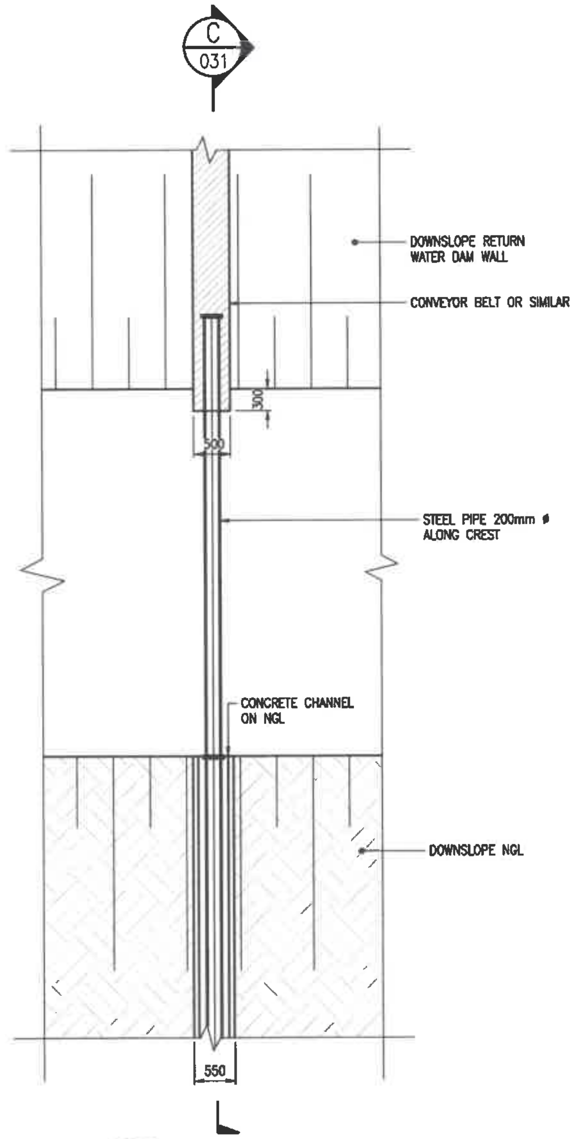
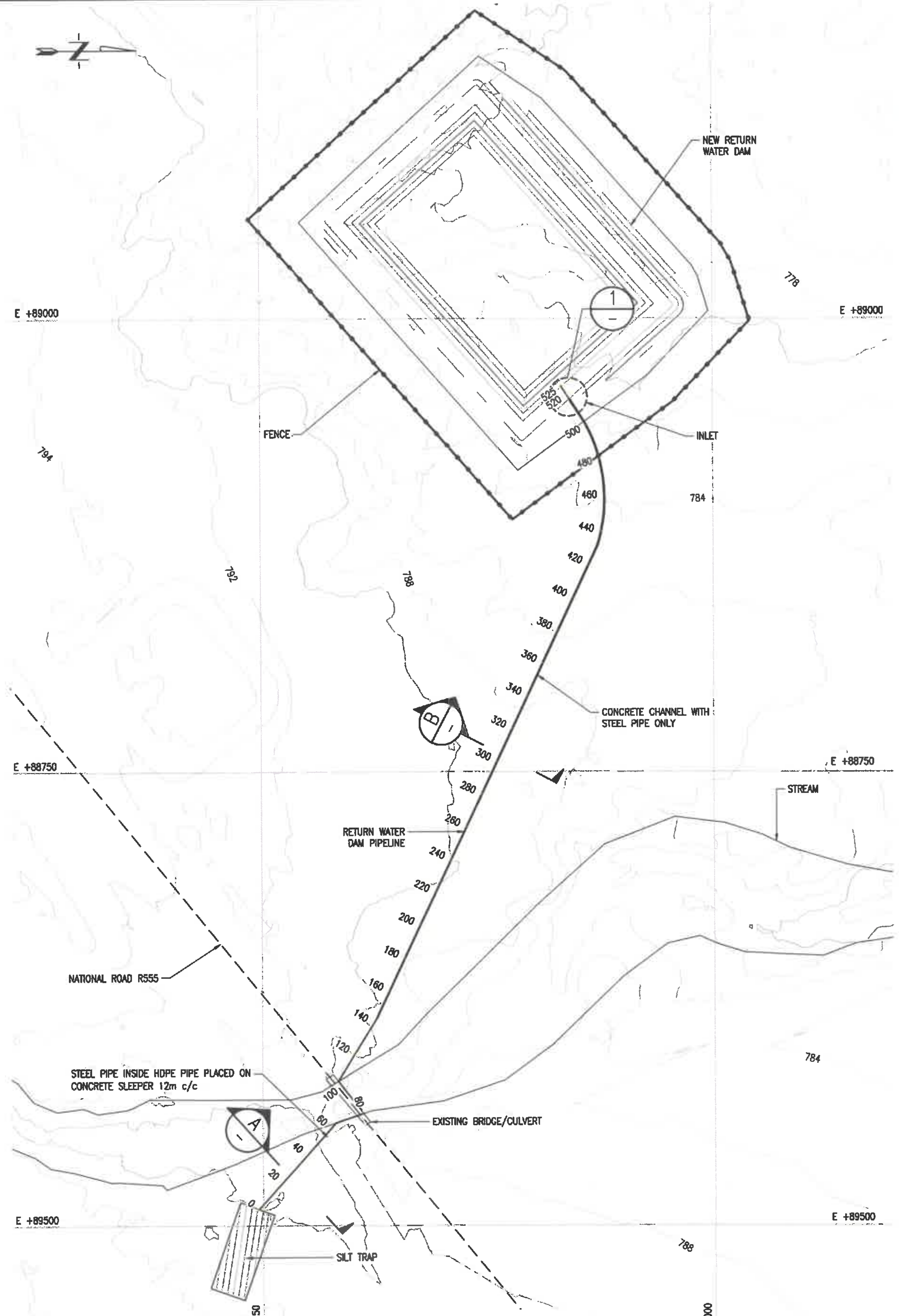
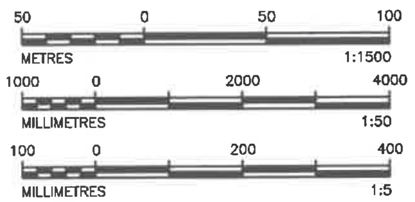


1 — TYPICAL INLET DETAIL
SCALE 1:50



SILT-TRAP TO RETURN WATER DAM PIPING LAYOUT
SCALE 1: 1500

PAGE SIZE A1



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PRIMARY DISCIPLINE		
DRAWN	FB	01/23/2019
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DESIGN CHECK	AS	01/23/2019
PROJECT ENGINEER	AS	01/23/2019

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A	01.23.19	ISSUED FOR TENDER	FB	RG	AS
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REFERENCE DRAWINGS

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592-07-15	B	STORMWATER DIVERSION CHANNEL LAYOUT PLAN AND SECTIONS
592-07-31	B	TSF RETURN WATER DAM SECTIONS AND DETAILS
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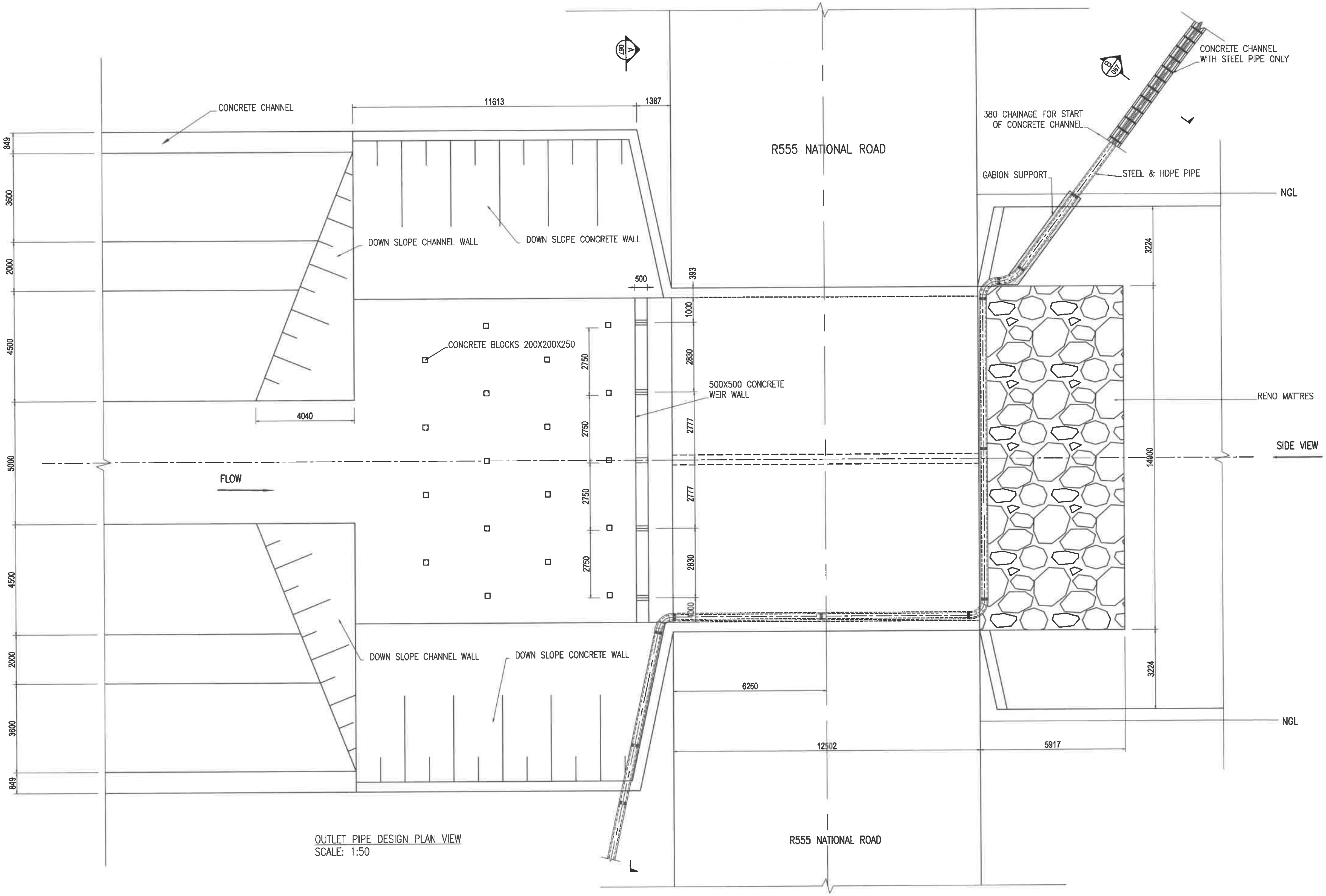
LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY

PIPELINE FROM SILT TRAP TO RETURN WATER DAM
LAYOUT, SECTIONS AND DETAILS

DRAWING NUMBER	SCALE	REV.
301-00592/07-065	AS SHOWN	B



OUTLET PIPE DESIGN PLAN VIEW
SCALE: 1:50

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G. NAUDÉ
PL. ONG-200255
27/06/2019

PRIMARY DISCIPLINE	CIVIL	
DRAWN	PS	24.08.18
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DESIGN	DP	24.08.18
DESIGN CHECK	GRJ	24.08.18
PROJECT ENGINEER	–	–

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REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
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B	11.10.18	ISSUED FOR INFORMATION	RW	RG	AS
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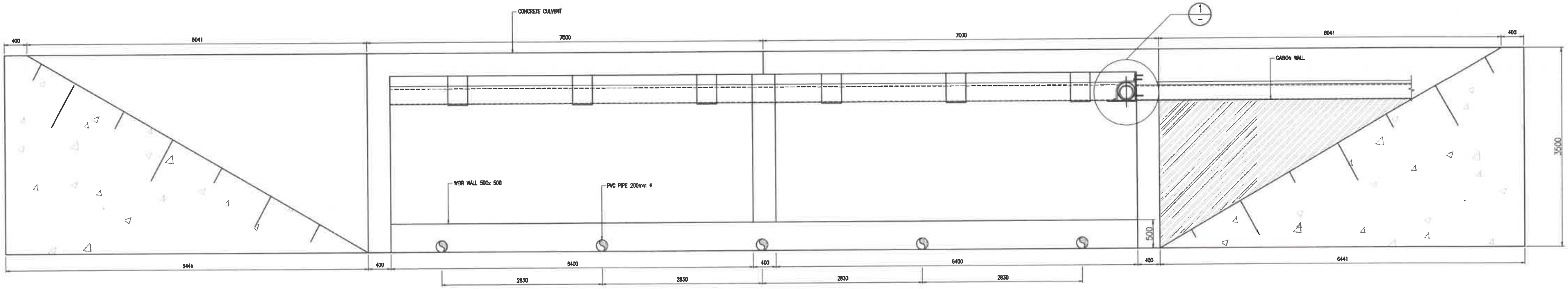
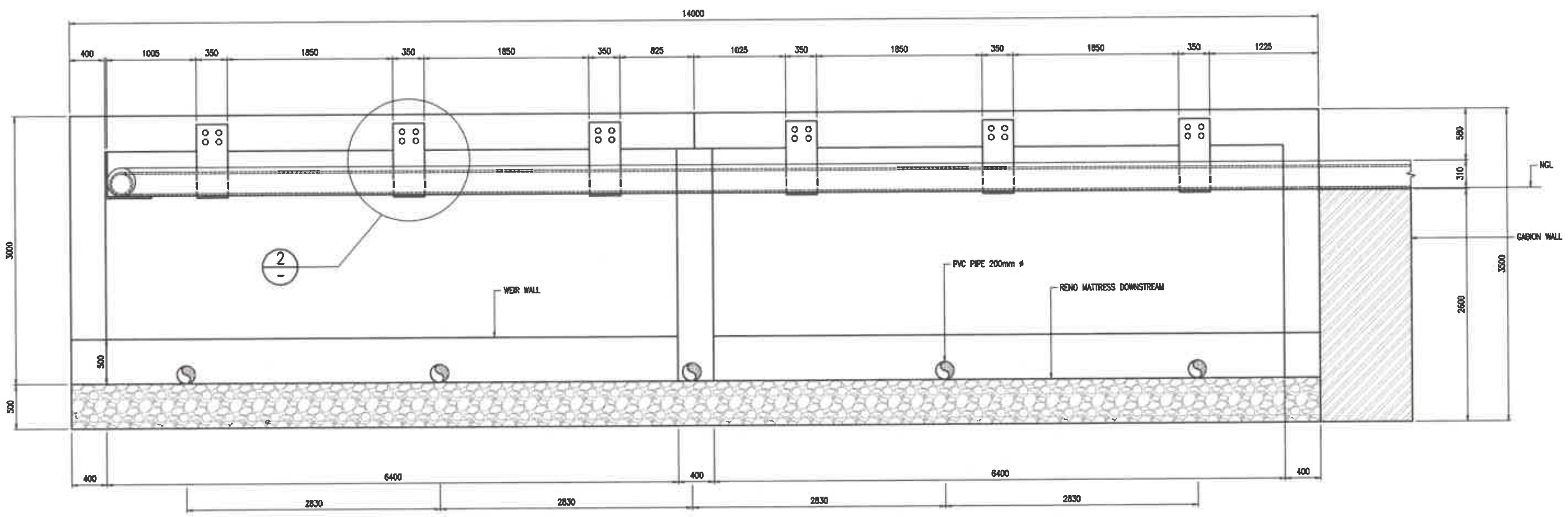
LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY
PIPELINE FROM SILT TRAP TO RETURN WATER DAM

LAYOUT, SECTIONS AND DETAILS

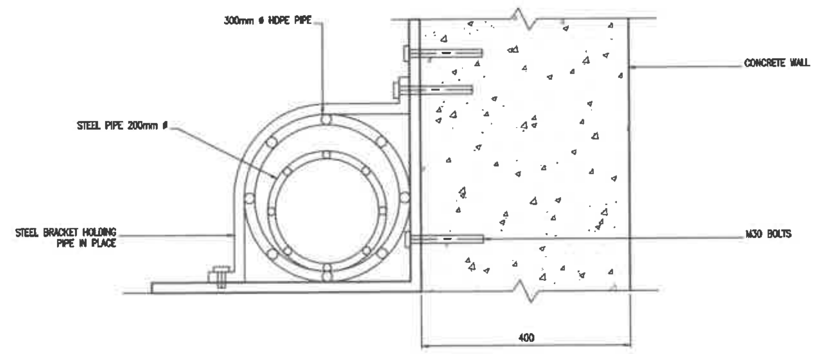
DRAWING NUMBER	SCALE	REV.
301-00592/07-066	AS SHOWN	A



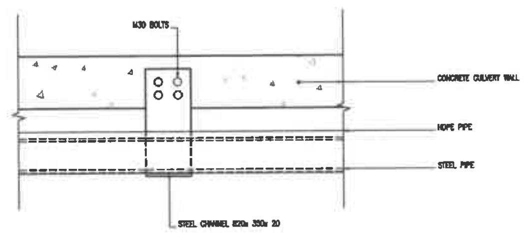
A / 066 TYPICAL SECTION UPSTREAM R555 BRIDGE
SCALE 1:25



TYPICAL SECTION DOWNSTREAM R555 BRIDGE
SCALE 1: 25



1 TYPICAL DETAIL 1
SCALE 1: 5



2 TYPICAL DETAIL 2
SCALE 1: 20

PAGE SIZE A0

MILLIMETRES 1:25

MILLIMETRES 1:20

MILLIMETRES 1:5

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PRIMARY DISCIPLINE	CIVIL	
DRAWN	PS	24.08.18
DRAWING CHECK	DP	24.08.18
DESIGN	DP	24.08.18
DESIGN CHECK	GRJ	24.08.18
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REV.No.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
A	24.08.18	ISSUED FOR INFORMATION	PS	DP	GRJ
B	13.06.19	ISSUED FOR TENDER	TS	RW	AS

REFERENCE DRAWINGS

DRAWING No.	MAKERS No.	TITLE
592-07-066	A	PIPELINE FROM SILT TRAP TO RETURN WATER DAM

LION SMELTER – FEASIBILITY STUDY
NEW TAILINGS STORAGE FACILITY

PIPELINE FROM SILT TRAP TO RETURN WATER DAM
LAYOUT, SECTIONS AND DETAILS

DRAWING NUMBER	SCALE	REV.
301-00592/07-067	AS SHOWN	B

APPENDIX D

Site selection memo

Knight Piésold (Pty) Ltd
Reg. No. 1995/012742/07
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Our Ref: 301-00592/01/Memo 1

Contact: Sdu Dladla

Memo

To:	H. Venter/ A. Mboweni	**Client:**	Fraser Alexander Tailings
From:	S.D Dladla, PrEng	**Project No:**	301-00592/01
Reviewed By:	A Strauss	**Date:**	29 August 2016

Subject: **Glencore Lion Smelter: New TSF Site Selection Study and Laydown Area PCD Options**

1. INTRODUCTION

This memo summarises the work that has been undertaken by Knight Piésold (KP) as part of the new tailings storage facility (TSF) site selection study. This memo also briefly discusses options for a proposed Pollution Control Dam (PCD) at the existing lay down area.

The key points of this memo will be presented during a meeting to be held at the Lion Smelter on the 30th of August 2016, which is aimed at informing and supporting decision-making with regards to the selection of preferred options.

The detailed technical reports will be issued after the selection of the preferred options.

2. TSF SITE SELECTION STUDY

2.1. Site Option Analysis

Three potential TSF sites within Glencore's boundaries were evaluated, and these are shown in Figure 1. The following tasks were completed for all three sites as part of the site selection study:

- Basic layouts,
- Capacity analysis,
- Geotechnical investigation (test pitting & laboratory assessment), and
- Flood analysis.

The results of these will form part of the detailed technical report. Further detailed specialist investigations will be undertaken during the EIA/EMP phase of the project to assess the baseline environmental data, sensitivities around the site and the suitability for the intended application.

The tailings volume requiring storage for all sites was 25,000 tonnes per month at an insitu density of 1.7 t/m^3. The daywall paddock method of deposition (as at the current TSF) was assumed for all the dams, and the maximum Rate of Rise was limited to between 2 and 2.5 m/year for "self-raising" tailings dam, i.e. upstream construction using tailings material. In all cases dams were assumed to have compacted starter walls with an overall slope of 1Vertical: 4Horizontal. Based on these conceptual design criteria, preliminary stage capacity curves were developed for each option, which was used to establish dam heights and associated construction volumes. As per Glenore's Jan Gloss' briefing, it was important for the Smelter to have a TSF with as high storage capacity as possible because of the planned future expansions.

A Weighted Accounts Matrix for identification of the preferred sites was drawn up and is attached to this memo. In this matrix, each of the identified sites is allocated a score for various criteria affecting the construction, operation and closure of the TSF. These criteria are in turn weighted, to enable the most important criteria pertaining to the TSF to have the greatest influence on the final score. The criteria considered are grouped into technical, economic, environmental and social categories, with each grouping accounting for a certain percentage of the final score.

Based on the overall weighted scores of the site selection matrix, Site 2 is the preferred site. The possible development of this site is discussed in the next section

2.2. Development of the Preferred Option

In addition to the site selection study, Knight Piésold has carried out detailed capacity and layout studies for the preferred option. The shape of the proposed TSF is dictated by the following:

a) <u>Flood-lines & 100 m Stream Boundary</u>

Regulation 704 of the National Water Act (NWA) no 36 of 1998 schedule 4(a) which deals with restriction on locality states the following:

"*No person in control of a mine or activity may locate or place any residue deposit, dam, reservoir, together with any associated structure or any other facility within the 1:100 year flood-line or within a horizontal distance of 100 m from any watercourse or estuary, borehole or well, excluding boreholes or wells drilled specifically to monitor the pollution of groundwater, or on water-logged ground, or on ground likely to become water-logged, undermined unstable or cracked*"

As a best management practice the proposed infrastructure should be located outside the 1:100 year flood-line, or 100 m buffer, whichever is greater.

Option 1A (see Figure 2) and Option 1B (see Figure 3) which provide practical storage volumes and have potential of phased development (Phase 1 & Phase 2) are located within the 100 m buffer, These options will require stream diversion/ re-alignment. Option 2 (see Figure 4) is located outside of the 100 m buffer and will not need any stream diversion, however the total storage capacity is greatly reduced, and the phased development is not practical because of high ROR.

b) Existing Infrastructure

Return-water Dams

There are two lined return-water dams within the preferred site (North of the slag dump). The phasing of the TSF is such that these do not need to be relocated initially, and shall remain operational for some time during Phase 1 operations, until commencement of Phase 2 construction.

Conveyor Infrastructure

Also found on site is slag conveyor infrastructure. If the conveyer infrastructure remains in place, the layout of the TSF will be as shown in Figure 3 (Option 1B). The storage capacity will be reduced by 1.4 million tons (4 years less)

The TSF layout options for Site 2 are summarised in Table 1 below.

Table 1: TSF Layout Options for Site 2

	Option 1A	**Option 1B**	**Option 2**
Total Storage Capacity	9.4 million tons 5.5 million m^3	8.0 million tons 4.7 million m^3	5.2 million tons 3.2 million m^3
Phasing	Practical	Practical	Not practical
Relocation of Infrastructure	Existing slag return water dams and conveyor system to be relocated after 4 years	Existing slag return water dams to be relocated after 4 years	Phase 1 area too small, existing dams to be relocated before commencement of Phase 1 construction.
Total life of TSF	30 years	26 years	16 years
Stream Diversion	Required	Required	Not required

3. LAYDOWN AREA PCD OPTIONS

The pollution control measures at the laydown area have been designed (i.e. sized and located) to satisfy Regulation 704 of the National Water Act (NWA) no 36, as described in Section 2.2 (a) above.

The following two options were considered for pollution control at the laydown area:

a) Option 1: Single PCD

Option 1 consists of a single 16,500 m^3 PCD, located north of the laydown area as shown in Figure 5. A major disadvantage for this option is that a much more elaborate and expensive liner system (Class A, per regulation R636) will be required for the entire PCD footprint because of the Type 1 waste that is sometimes dumped at some places within the laydown area (as per our discussion with Jan Gloss). The different types of liners are shown in Figure 7.

b) Option 2: Two Separate PCD's

Option 2, as shown in Figure 6, consists of two separate PCD's. A smaller 3,500 m^3 dam (PCD 1) is located north of the laydown area, and a larger 13,000 m^3 dam (PCD 2) is located north east of the laydown area. The concept assumes that Type 1 material will only be placed within the catchment of PCD1; thus only PCD 1 will require Class A liner. It is also assumed only Type 4 material (i.e. inert material) will be placed within the PCD 2 catchment, thus a cheaper Class D liner system will be required for PCD 2.

The initial cost estimate for the liner system show a significant cost difference between the two types of liners proposed for this project (Figure 7). Class A costs approximately R500/m^2, and Class D costs approximately R200/m^2. The geotechnical investigation test results indicated that the in-situ material is not suitable to use as clay liner due to high dispersity, therefore a geosynthetic clay liner (GCL) is to be used, and thus the high costs for the liner system.

A plastic lined storm water channel and an earth berm (Figure 8) will be required as part of the pollution control infrastructure at the laydown area. A detailed pollution control plan will form part of the design report.

Because of the current stream alignment and slag dump layout, the diversion or re-alignment of the stream adjacent to the laydown area will not add any value.

The summary of the PCD options is shown in Table 2 below.