9.3 ENGINEERING DESIGN DATA

Design data pertinent to waste water treatment is detailed in Tables 9-1 through 9-5 on the following pages, in the Process Flow Diagrams following Page 9/13, in the Equipment List beginning on Page 9/14, and in the Drawings following Page 9/36.

TABLE 9-1
SUMMARY OF ESTIMATED FLOWS AND CHARACTERISTICS
OF PROCESS - RELATED AND SANITARY WASTEWATER DISCHARGES

Parameters	Char Filtrate	Methanol Bottoms	Pump Seal Water	Pretreated Effluent From Loco Shop	Contaminated Process Area Runoff	Pretreated Sanitary Wastewater Discharges	Total Wastewater
Flow, GPM							
AVG	878	190	175	50	-	11	1304
MAX	-	-	-	80	340	-	1674
BOD_5, mg/l	585	5	-	30	50	100	477 (373)[1]
TOC, mg/l	380	3	-	20	30	50	265 (208)
COD, mg/l	1360	10	-	60	100	200	947 (741)
Sus. Sol, mg/l	100	20	-	50	75	100	93 (73)
TDS, mg/l	1500	-	-	200	200	350	1073 (842)
Phenol, mg/l	5	-	-	-	-	-	3.4 (2.7)
Chloride, mg/l	760	-	-	-	-	-	512 (400)
Thiocyanate, mg/l	5	-	-	-	-	-	3.4 (2.7)
Cyanide, mg/l	46	-	-	-	-	-	31 (24)
Ammonia-N, mg/l	17	-	-	-	-	-	11.5 (9)

1 Concentrations indicated are for maximum flow condition.

8/6

TABLE 9-2

SUMMARY OF COAL AREA WASTEWATER CHARACTERISTICS

(Based on EPA Development Document for the Steam Electric Point Category)

Parameter	Concentration (mg/l except pH)
pH	3
Acidity, as $CaCo_3$	600
Sulfate	1000
Dissolved Solids	1500
Suspended Solids	300
Iron	180
Manganese	5
Copper	0.2
Zinc	1.2
Aluminum	40
Nickel	0.4

TABLE 9-3
SUMMARY OF BOILER CLEANING WASTEWATER CHARACTERISTICS[1]

Parameters	Boiler Tube	Boiler Fireside	Air Preheater	Total Cleaning Wastes [2]
Total Solids, mg/l	11,000	13,400	12,075	11,695
Dissolved Solids, mg/l	9,200	10,430	8,850	9,330
Suspended Solids, mg/l	80	616	1,990	615
Chromium, mg/l	4.4	2.5	6	4
Copper, mg/l	166	1.25	3.4	90
Iron, mg/l	1,077	150	974	820
Nickel, mg/l	76	5	61	55
Zinc, mg/l	36	7.5	7	22

1 Based on information from the EPA Development Document for Steam Power Generating Point Source Category.

2 Characteristics of combined cleaning wastewaters are based on estimated flow and characteristics of individual discharges.

TABLE 9-4

ESTIMATED CONTAMINATED PROCESS AREA RUNOFF CHARACTERISTICS

Parameter	Concentration, mg/l
BOD	50
TOC	30
COD	100
Suspended Solids	75
Total Dissolved Solids	200

TABLE 9-5
SUMMARY OF PROJECTED EFFLUENT CHARACTERISTICS

Parameters[1]	Treated Bio Effluent	Boiler Blowdown	Treated Coal Pile Runoff and Boiler Cleaning Wastes	Ion-Exchange Regenerant Wastes	Water Treatment Plant Sludge Centrate	Cooling Tower Blowdown	Total Plant[3] Effluent
Flow, GPM							
AVG	1304	187	298	185	123	3660	5757
MAX	1674	-	321	-	-	4660	7150
BOD_5	40	-	-	-	-	-	9
TOC	25	-	-	-	-	-	6
COD	200	-	-	-	-	-	45 (47)[2]
Suspended Solids	25	30	75	-	500	100	84
Total Dissd. Solids	1073 (845)[2]	350	2000 (2550)[2]	7000	1000	1800	1750 (1700)
Phenol	0.001	-	-	-	-	-	Neg
Chloride	512 (400)	-	-	-	-	8	125 (102)
Thiocyanate	0.5	-	-	-	-	-	0.12
Cyanide[4]	14 (11)	-	-	-	-	-	3
Ammonia Nitrogen	5	-	-	-	-	-	1
Total Heavy Metals[5]	-	-	0.5 (0.7)	-	-	-	0.03
Iron	-	-	9	-	-	2	1.75 (1.70
Aluminum	-	-	1	-	-	-	0.06 (0.05
pH	7-7.5	9^+	9^+	5-6	9^+	7-7.5	7-8

1 All contaminant concentrations are expressed as mg/l except pH
2 Concentration during maximum flow condition
3 Proposed to be discharged to Cook Inlet
4 Estimated to be present as complex cyanide
5 Includes copper, nickel and zinc

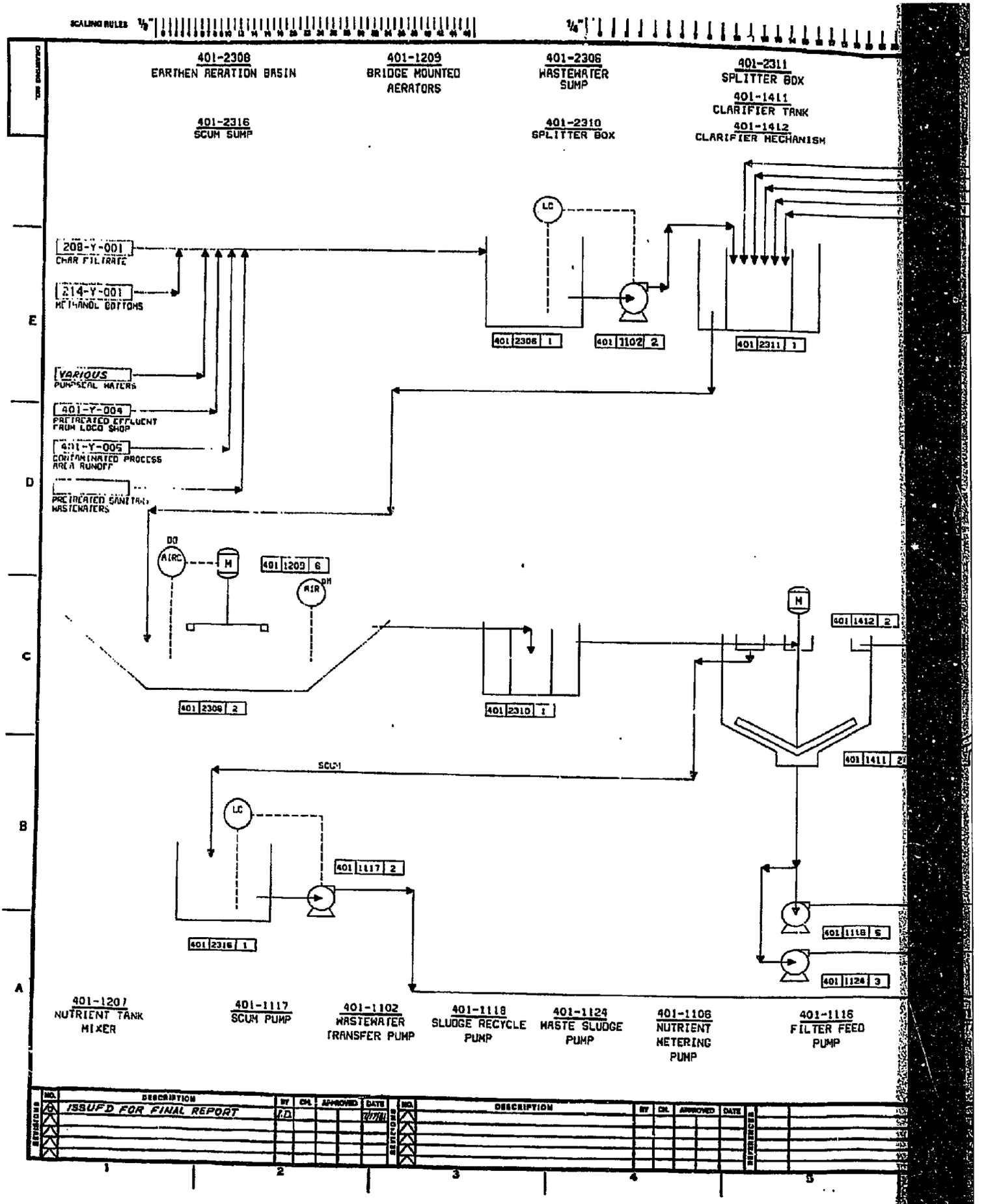
1068R

DRAWINGS RELATING TO WASTE WATER TREATMENT

DRAWING NO.	TITLE
5530-401-Y-001	Waste Water Treatment
5530-401-Y-002	Waste Water Treatment
5530-401-Y-003	Waste Water Treatment
5530-401-Y-004	Waste Water Treatment
5530-401-Y-005	Waste Water Treatment
5530-401-Y-006	Plant Construction Site Storm Water Treatment
5530-401-Y-007	Coal Handling and Storage Facilities - Wash Down Water

EQUIPMENT LIST

5530-401-P-001	Waste Water Treatment - General Arrangement
5530-401-P-002	Waste Water Treatment - Plan at Grade
5530-401-P-003	Waste Water Treatment - Sections A-A, B-B
5530-401-P-004	Boiler Cleaning & Coal Storage Area Waste Water Treatment - Plan at Grade
5530-401-P-005	Railroad Maintenance & Shop Areas Waste Water Treatment - Plan at Grade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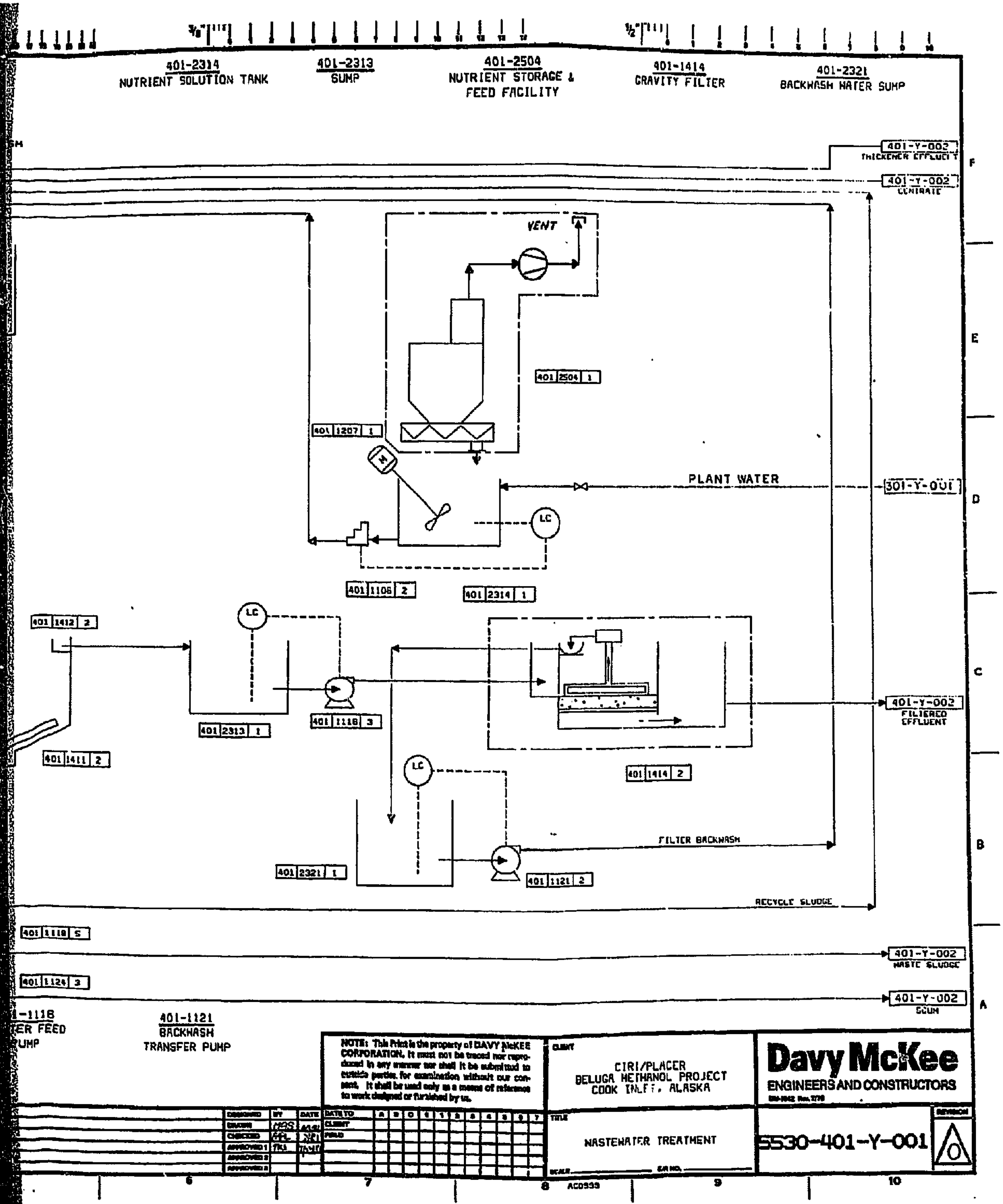
EARTHEN AERATION BASIN
401-1209
BRIDGE MOUNTED AERATORS
401-2306
WASTEWATER SUMP
401-2311
SPLITTER BOX
401-1411
CLARIFIER TANK
401-1412
CLARIFIER MECHANISM
401-2316
SCUM SUMP
401-2310
SPLITTER BOX
208-Y-001
CHAR FILTRATE
214-Y-001
METHANOL BOTTOMS
VARIOUS
PUMPSEAL WATERS
401-Y-004
PRETREATED EFFLUENT FROM LOCO SHOP
401-Y-005
CONTAMINATED PROCESS AREA RUNOFF
PRETREATED SANITARY WASTEWATERS
LC
401 2306 1
401 1102 2
401 2311 1
DO
AIRC
M
401 1209 6
AIR
DM
401 2308 2
401 2310 1
401 1412 2
401 1411 2
SCUM
LC
401 1117 2
401 2316 1
401 1118 5
401 1124 3
401-1207
NUTRIENT TANK MIXER
401-1117
SCUM PUMP
401-1102
WASTEWATER TRANSFER PUMP
401-1118
SLUDGE RECYCLE PUMP
401-1124
WASTE SLUDGE PUMP
401-1106
NUTRIENT METERING PUMP
401-1116
FILTER FEED PUMP
REVISIONS
NO.
DESCRIPTION
BY
CHK.
APPROVED
DATE
ISSUED FOR FINAL REPORT
J.D.
REFERENCES


401-2314
NUTRIENT SOLUTION TANK
401-2313
SUMP
401-2504
NUTRIENT STORAGE &
FEED FACILITY
401-1414
GRAVITY FILTER
401-2321
BACKWASH WATER SUMP
401-Y-002
THICKENER EFFLUENT
401-Y-002
CENTRATE
VENT
401 2504 1
401 1207 1
PLANT WATER
301-Y-001
LC
401 1106 2
401 2314 1
401 1412 2
401 2313 1
401 1118 3
401-Y-002
FILTERED
EFFLUENT
401 1411 2
401 1414 2
FILTER BACKWASH
401 2321 1
401 1121 2
RECYCLE SLUDGE
401 1118 5
401-Y-002
WASTE SLUDGE
401 1124 3
401-Y-002
SCUM
1-1118
TER FEED
PUMP
401-1121
BACKWASH
TRANSFER PUMP
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BELUGA METHANOL PROJECT
COOK INLET, ALASKA
Davy McKee
ENGINEERS AND CONSTRUCTORS
TITLE
WASTEWATER TREATMENT
5530-401-Y-001
REVISION
0
DESIGNED
DRAWN
CHECKED
APPROVED 1
APPROVED 2
APPROVED 3
BY
DATE
DATE TO
CLIENT
FIELD
SCALE
ER NO.
AC0939
6
7
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9
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D
E
F

401-2342
POLYMER SOLUTION TANK

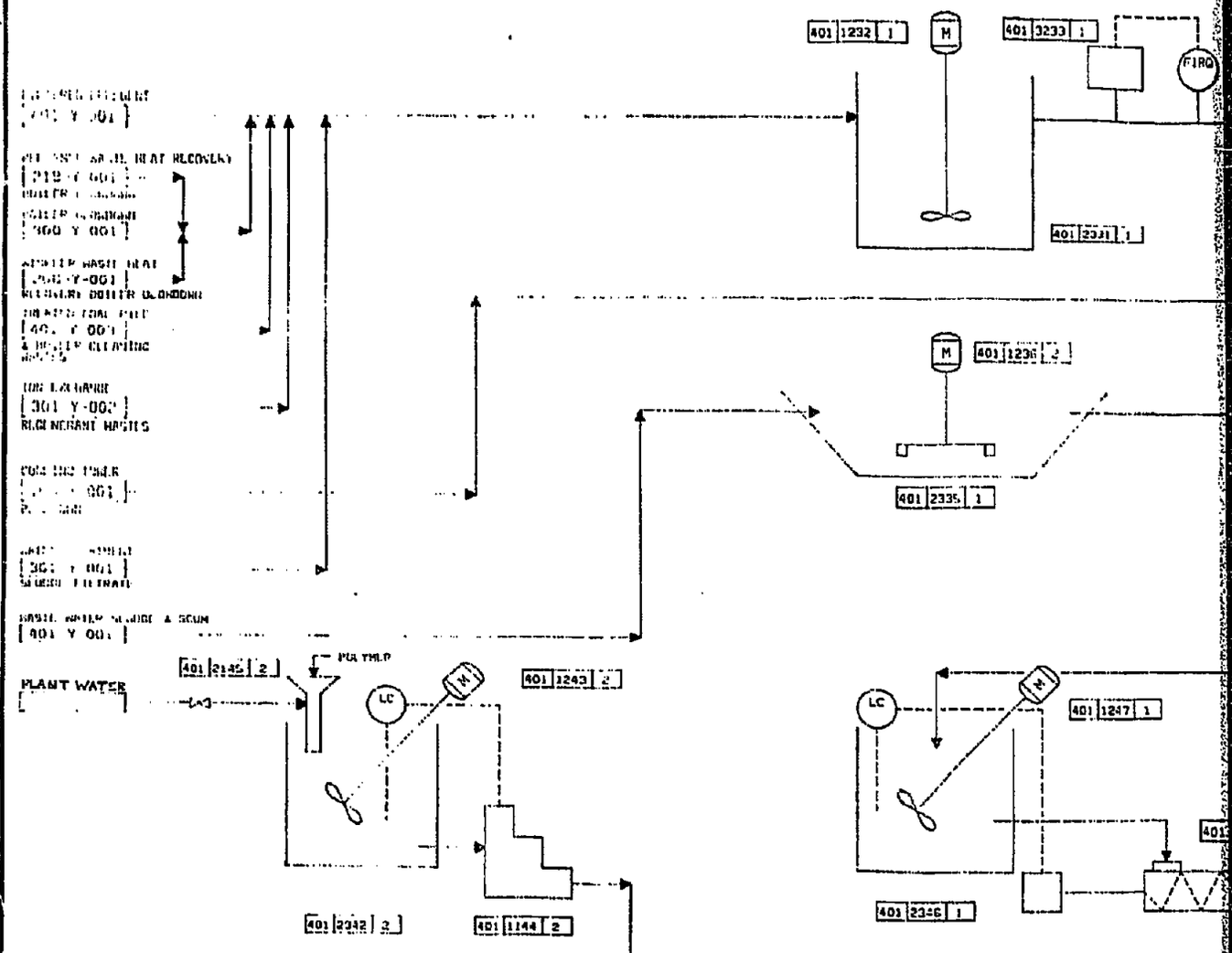
401-2345
POLYMER DISPERSING FUNNEL

401-3231
EFFLUENT MIX TANK

401-3233
EFFLUENT SAMPLER

401-2335
AEROBIC DIGESTOR BASIN

401-1236
BRIDGE MOUNTED AERATOR



401-1243
POLYMER TANK MIXER

401-1232
MIXER

401-1247
MIXER

401-1144
POLYMER METERING PUMP

401-1138
CENTRIFUGE FEED PUMP

401-1139
THICKENED SLUDGE TRANSFER PUMP

401-1141
THICKENER EFF... TRANSFER PU...

REVISIONS NO.	DESCRIPTION	BY	CH.	APPROVED	DATE
	ISSUED FOR FINAL REPORT	J.D.			7/28/

REVISIONS NO.	DESCRIPTION	BY	CH.	APPROVED	DATE

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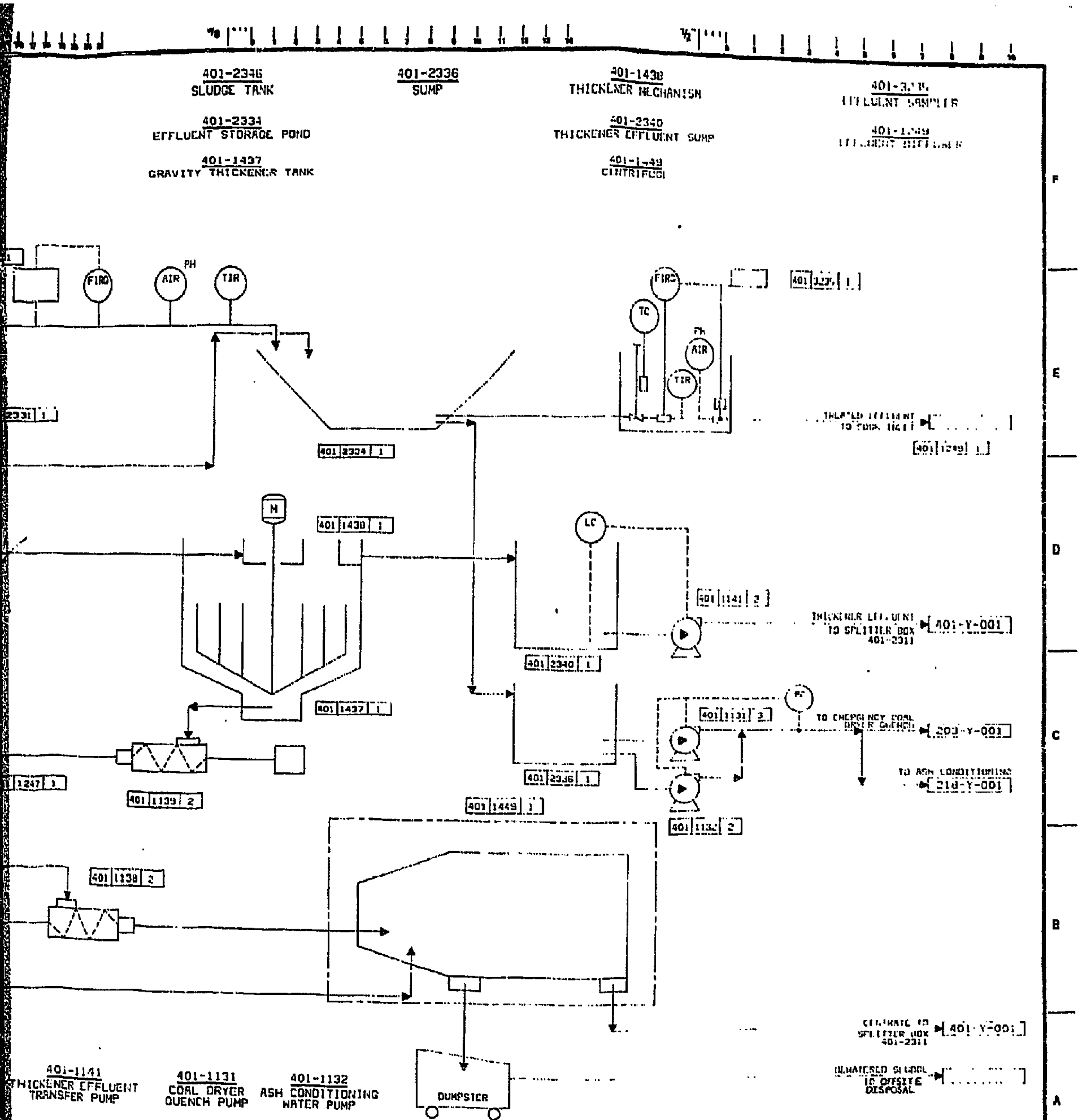

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Davy McKee ENGINEERS AND CONSTRUCTORS

TITLE: WASTEWATER TREATMENT

5530-401-Y-002

REVISION: 0

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APPROVED		

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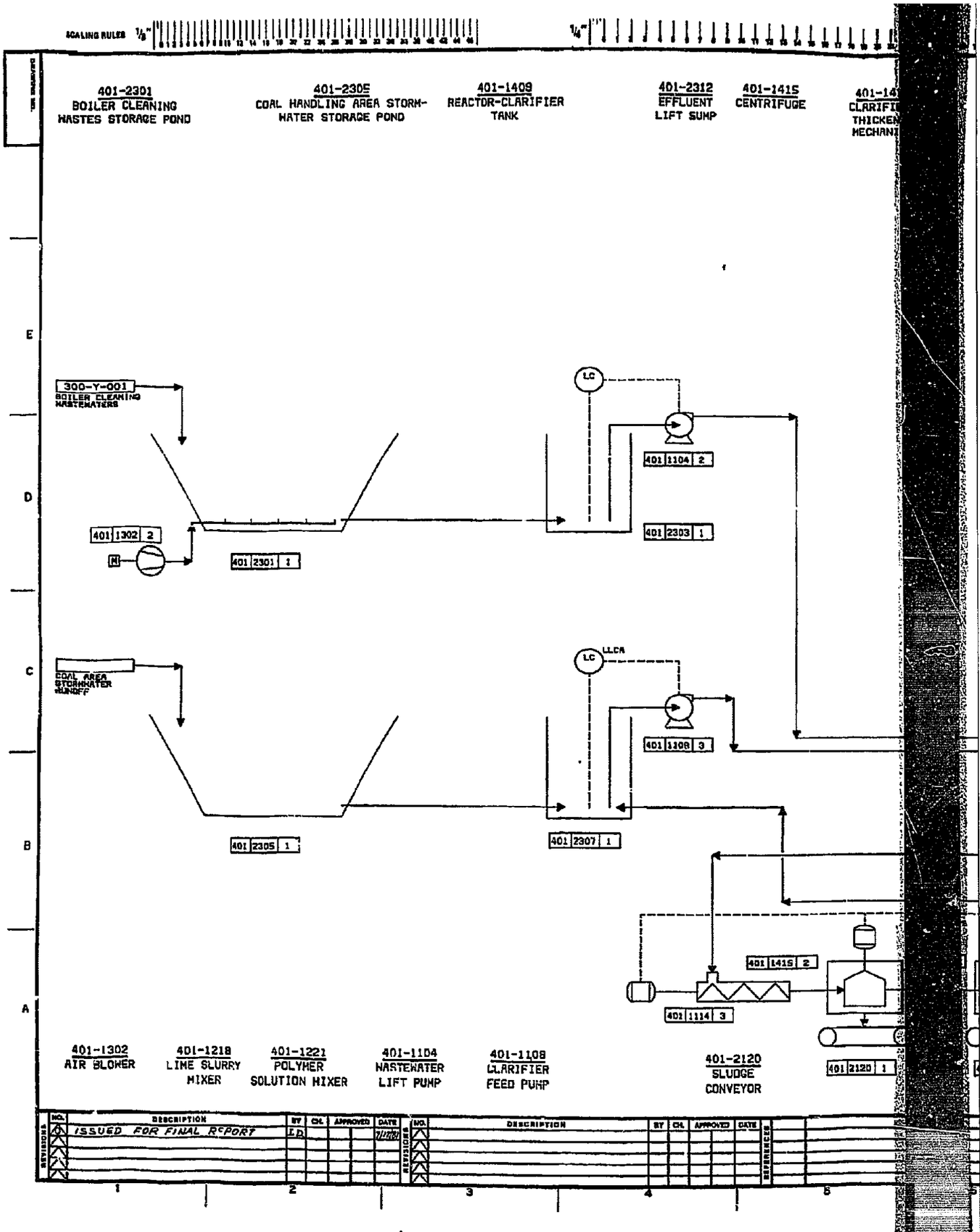
401-2301
BOILER CLEANING
WASTES STORAGE POND
401-2305
COAL HANDLING AREA STORM-
WATER STORAGE POND
401-1409
REACTOR-CLARIFIER
TANK
401-2312
EFFLUENT
LIFT SUMP
401-1415
CENTRIFUGE
401-14
CLARIFI
THICKEN
MECHANI
300-Y-001
BOILER CLEANING
WASTEWATERS
401 1104 2
401 1302 2
401 2303 1
401 2301 1
COAL AREA
STORMWATER
RUNOFF
401 1108 3
401 2305 1
401 2307 1
401 1415 2
401 1114 3
401 2120 1
401-1302
AIR BLOWER
401-1218
LIME SLURRY
MIXER
401-1221
POLYMER
SOLUTION MIXER
401-1104
WASTEWATER
LIFT PUMP
401-1108
CLARIFIER
FEED PUMP
401-2120
SLUDGE
CONVEYOR
ISSUED FOR FINAL REPORT
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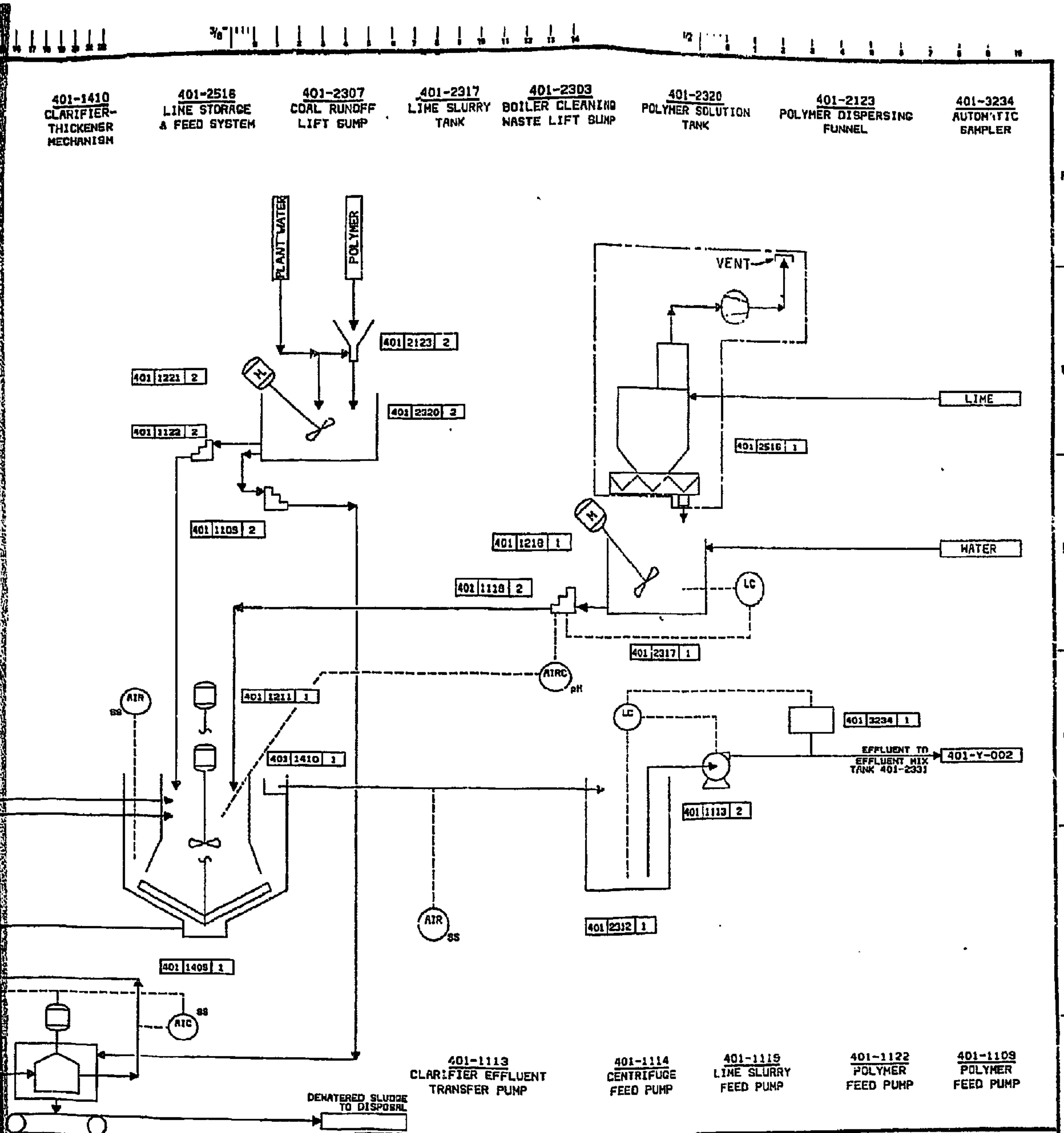

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Davy McKee ENGINEERS AND CONSTRUCTORS

TITLE: WASTEWATER TREATMENT

5530-401-Y-003

REVISION: 0

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SCALE / B/M NO.

AC1000

SCALING RULER

401-2304 STORMWATER STORAGE POND

401-2305 STORMWATER LIFT SUMP

401-1406 OIL SEPARATOR

401-1413 CLARIFIER-THICKENER MECHANISM

401-1404 GRIT REMOVAL CHAMBER

401-1407 BELT OIL SKIMMER

401-1416 REACTOR-CLARIFIER TANK

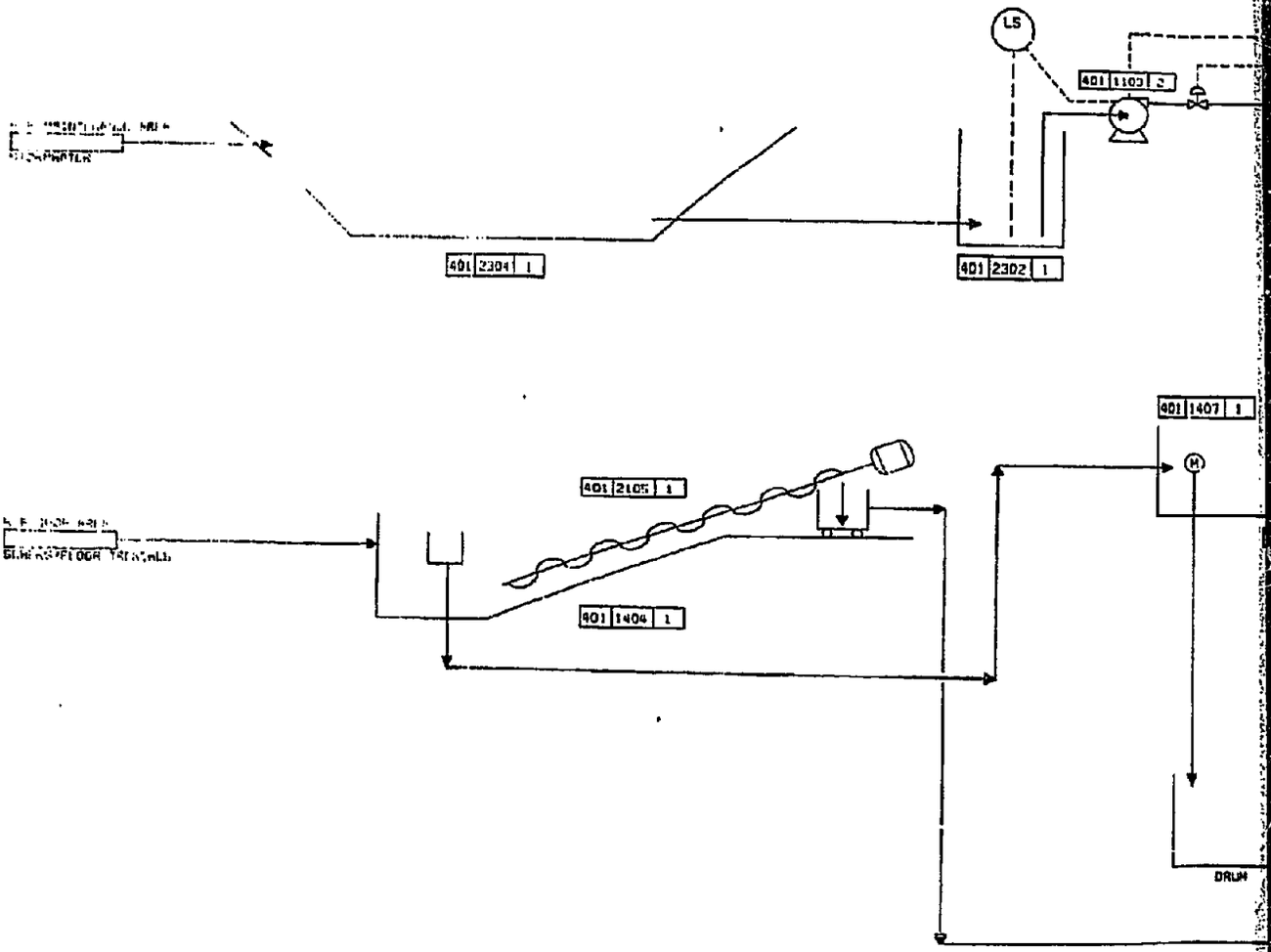
401-1417 CENTRIFUGE

401-2515 LIME STORAGE AND FEED SYSTEM

401-2318 LIME SLURRY TANK

401-2315 POLYMER SOLUTION TANK

401-2121 POLYMER DISPERSING FUNNEL



401-1103 STORMWATER LIFT PUMP

401-1107 WASTEWATER LIFT PUMP

401-1115 CENTRIFUGE FEED PUMP

401-1120 LIME SLURRY FEED PUMP

401-1123 POLYMER FE PUMP

401-1213 FLOCCULATION MIXER

401-2105 GRIT COLLECTOR

401-1217 LIME SLURRY MIXER

401-1222 POLYMER SOLUTION MIXER

401-1125 POLYMER FE PUMP

PC1001

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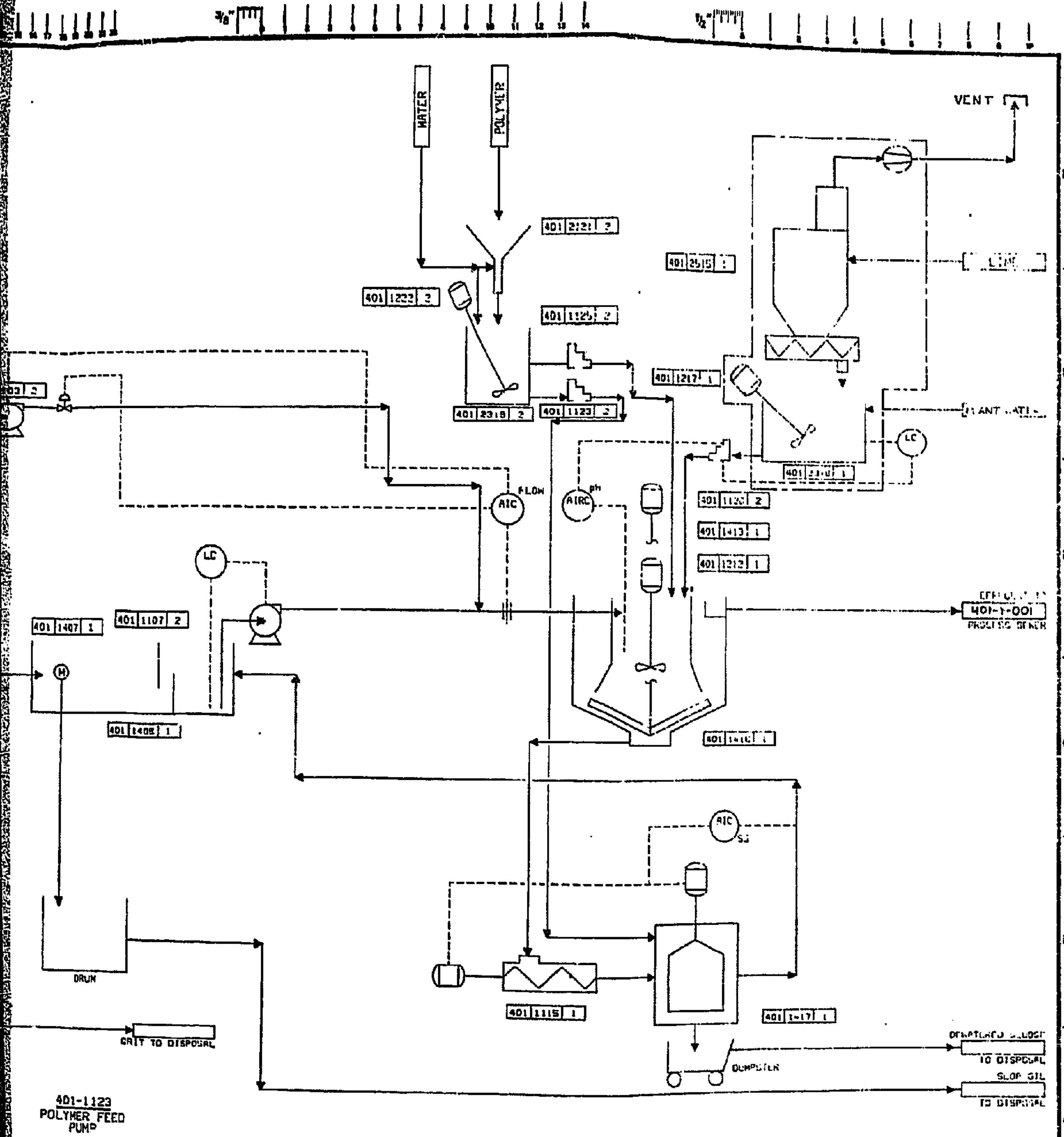

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COOK INLET, ALASKA

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APPROVED 3		

TITLE
WASTEWATER TREATMENT

SCALE ______ DR NO. ______

5530-401-Y-004

REVISION 0

SCALING RULER 1/8" 1/4"

401-2347
STORMWATER
RECEIVING SUMP

401-1452
TRASH
RACK

401-2348
PRIMARY
STORMWATER BASIN

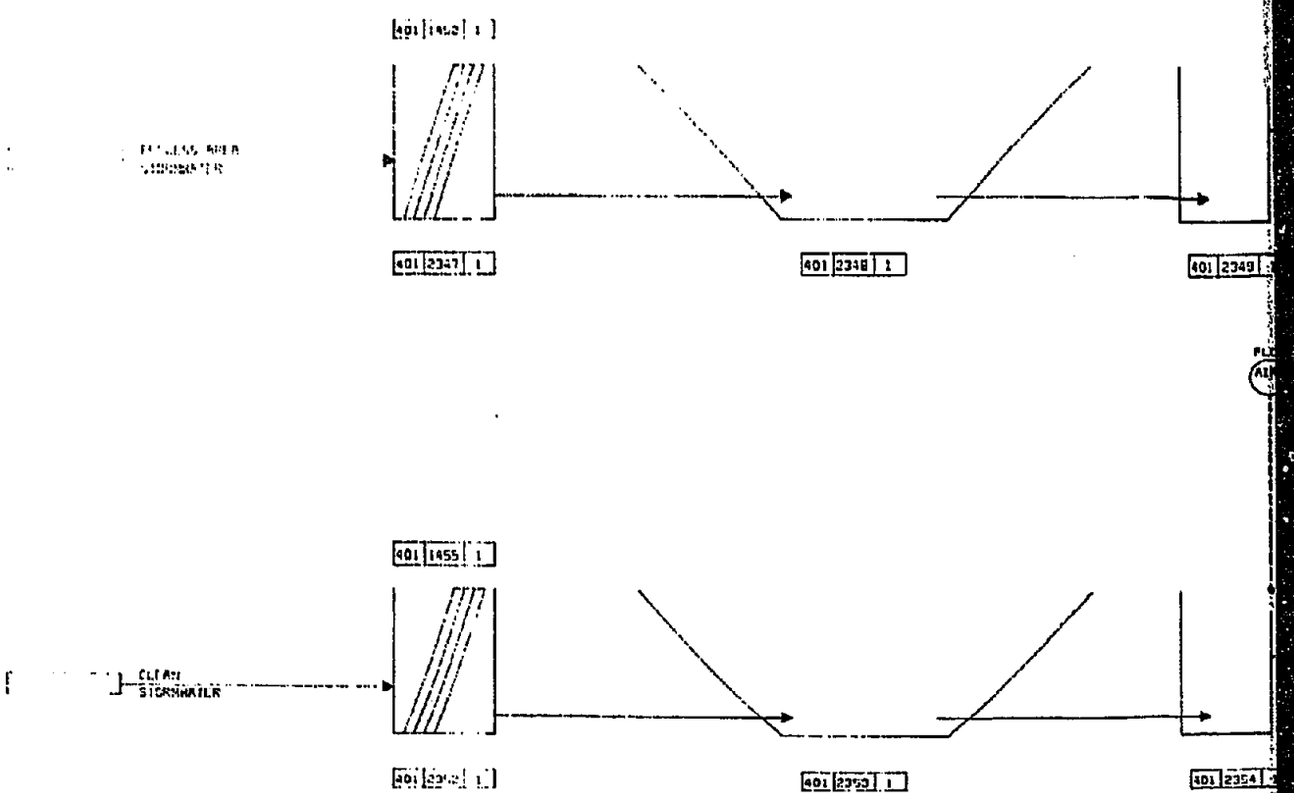
401-23
OVERFL
CHAMBE

401-2352
CLEAN STORMWATER
RECEIVING SUMP

401-1455
TRASH
RACK

401-2353
PRIMARY
STORMWATER BASIN

401-23
OVERFL
CHAMBE



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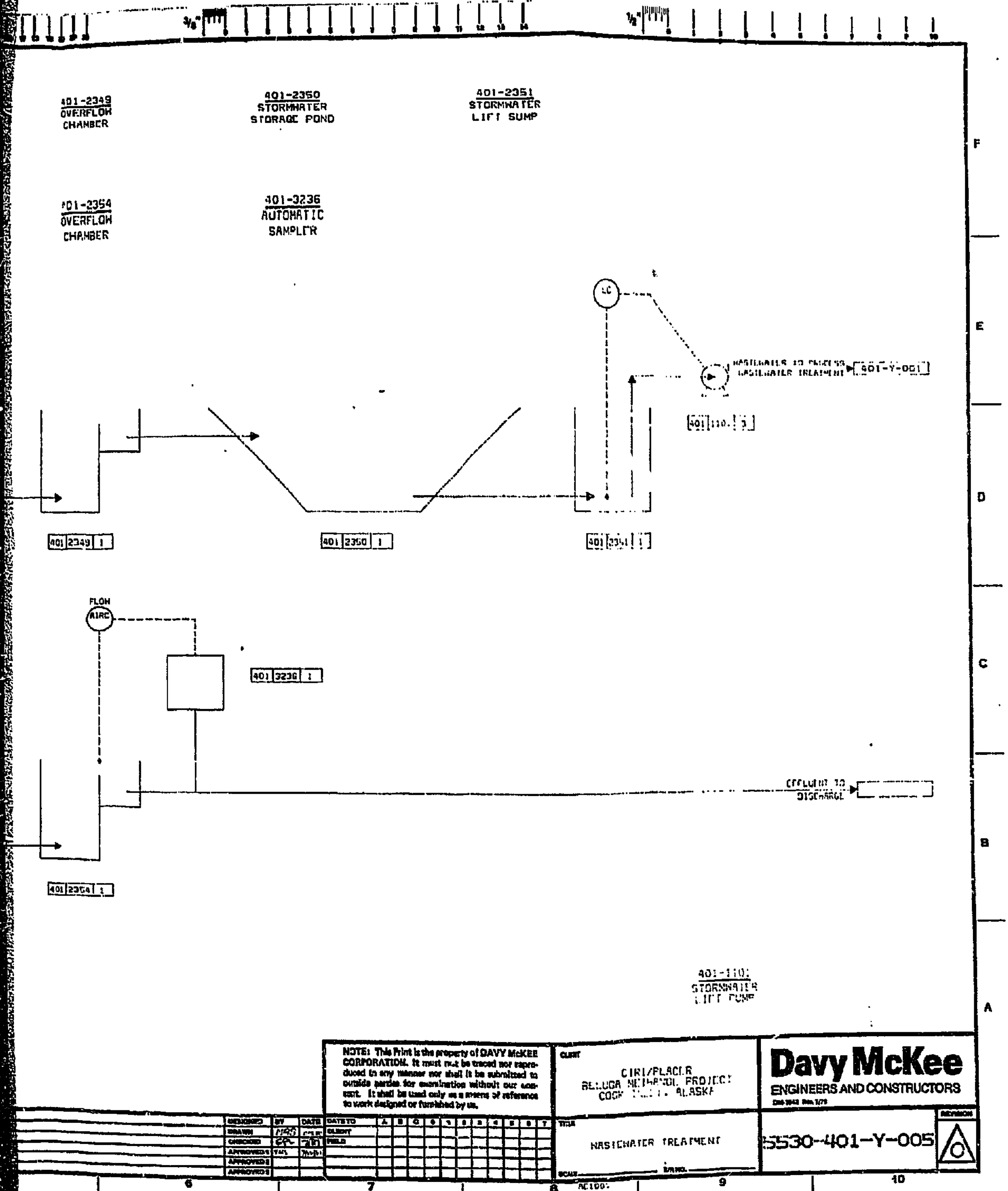

401-2349
OVERFLOW CHAMBER
401-2350
STORMWATER STORAGE POND
401-2351
STORMWATER LIFT SUMP
401-2354
OVERFLOW CHAMBER
401-3236
AUTOMATIC SAMPLER
LC
WASTEWATER TO PROCESS WASTEWATER TREATMENT
401-Y-001
401 2349 1
401 2350 1
401 2351 1
FLOW
AIRC
401 3236 1
EFFLUENT TO DISCHARGE
401 2354 1
STORMWATER LIFT PUMP
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TITLE
WASTEWATER TREATMENT
5530-401-Y-005
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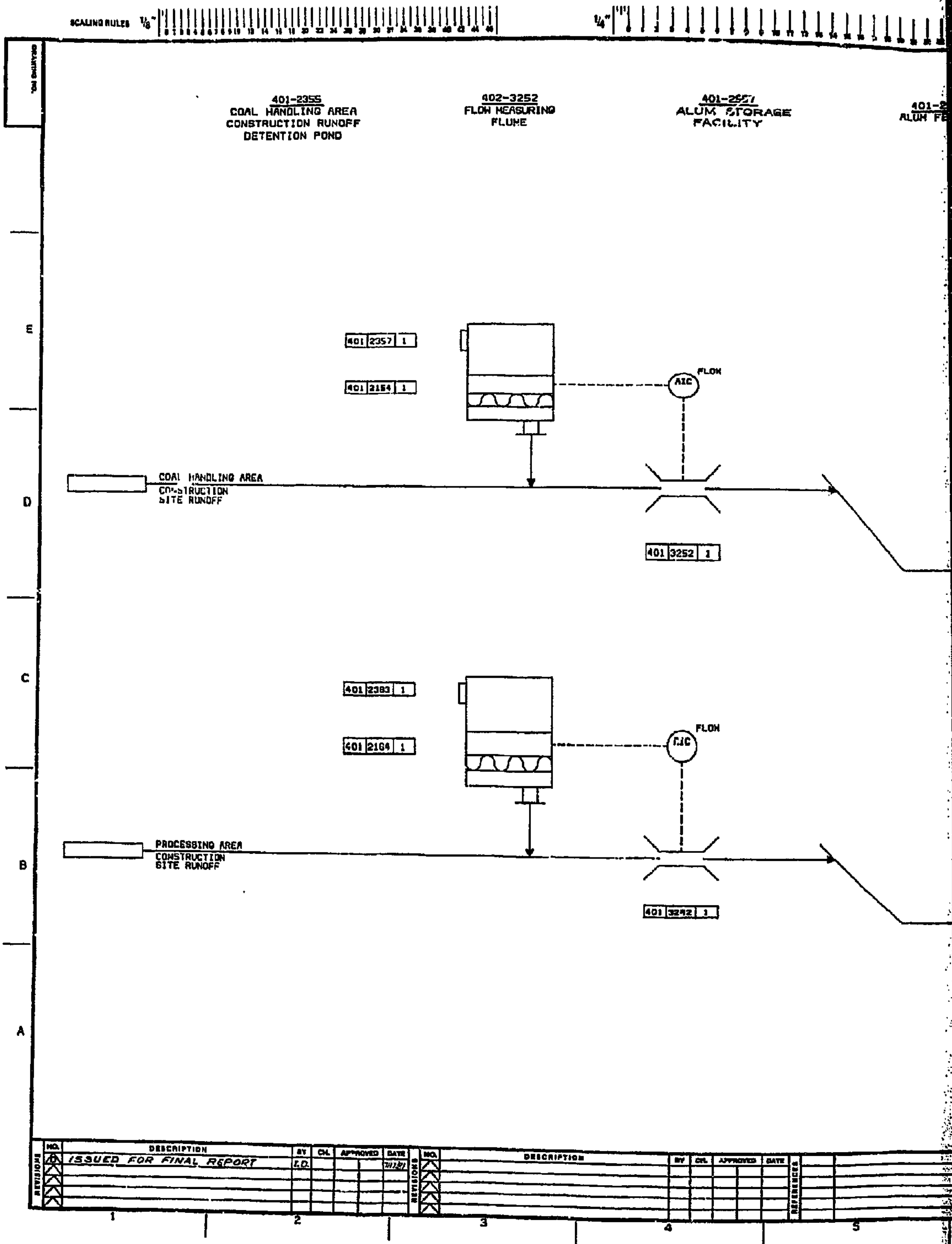
SCALING RULES
401-2355
COAL HANDLING AREA
CONSTRUCTION RUNOFF
DETENTION POND
402-3252
FLOW MEASURING
FLUME
ALUM STORAGE
FACILITY
E
D
C
B
A
401 2357 1
401 2164 1
FLOW
AIC
COAL HANDLING AREA
CONSTRUCTION
SITE RUNOFF
401 3252 1
401 2383 1
401 2164 1
FLOW
PROCESSING AREA
CONSTRUCTION
SITE RUNOFF
REVISIONS
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APPROVED
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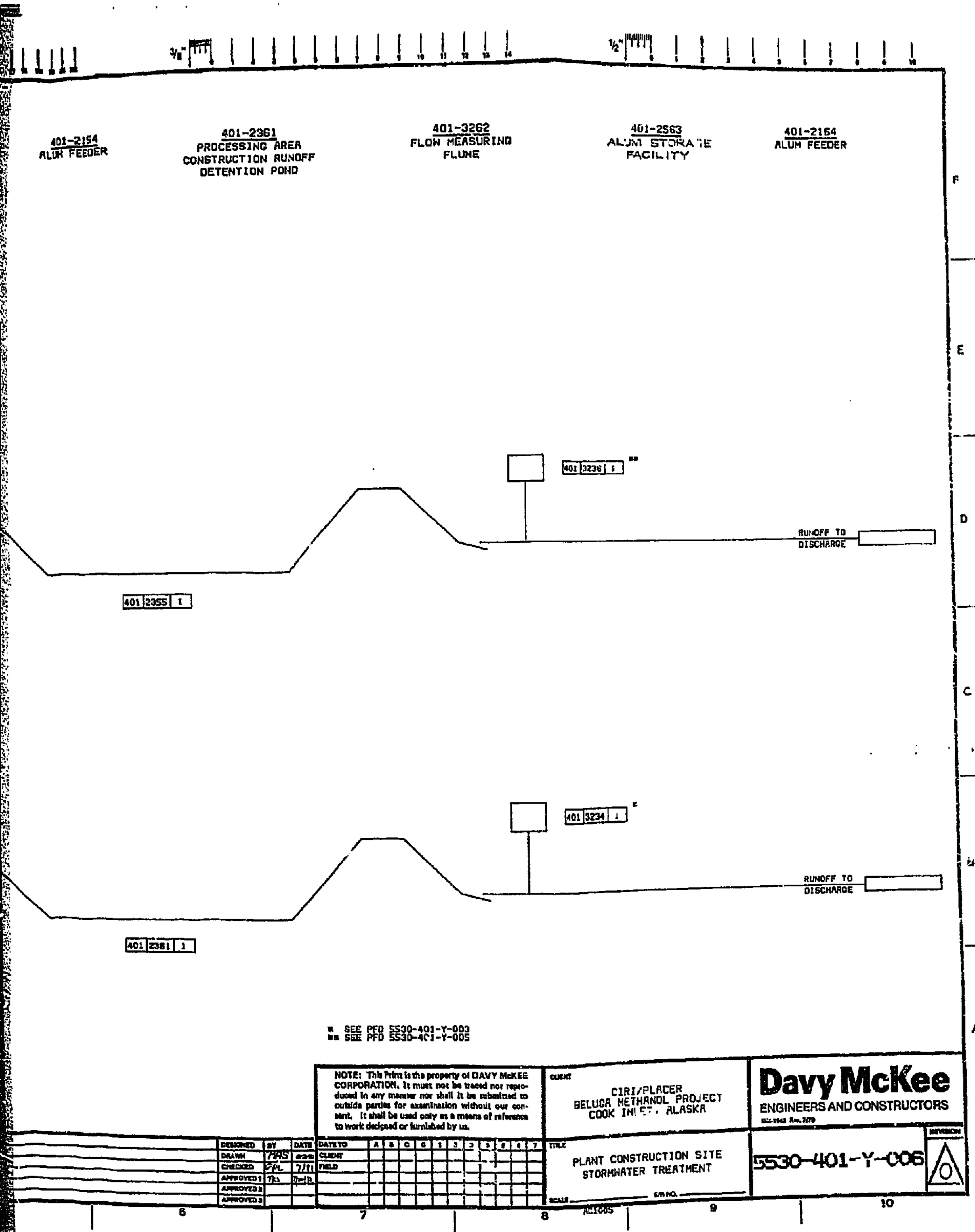
401-2154
ALUM FEEDER
401-2361
PROCESSING AREA
CONSTRUCTION RUNOFF
DETENTION POND
401-3262
FLOW MEASURING
FLUME
401-2S63
ALUM STORAGE
FACILITY
401-2164
ALUM FEEDER
401 3236 1 **
RUNOFF TO
DISCHARGE
401 2355 1
401 3234 1 *
RUNOFF TO
DISCHARGE
401 2381 1
* SEE PFD 5530-401-Y-003
** SEE PFD 5530-401-Y-005
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TITLE
PLANT CONSTRUCTION SITE
STORMWATER TREATMENT
5530-401-Y-006
REVISION
0
DESIGNED
DRAWN
CHECKED
APPROVED 1
APPROVED 2
APPROVED 3
BY
DATE
DATE TO
CLIENT
FIELD
SCALE
S/N NO.
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F
E
D
C
B
A

Coal Handling Area
Floor Wash Down Systems

Purpose

To keep concrete floors clean of coal dust deposited from surrounding atmosphere and from coal spillage. Steel floors (above grade) are considered to require dry clean-up (not described nor shown on this drawing).

System Description

Service Water Pumps

Pumps located in boiler house will furnish suitable water pressure through an underground supply header with branches to each building that requires washdown. The pumps should be sized for 180 GPM at 100 PSIG discharge pressure.

Hose Washdown Station

The stations will be located so that all areas of the floor can be washed down using one inch hose. The stations are shown on this drawing.

Floor Sumps

The sumps will be located on grade floor or in pits, to receive the washdown as shown on this drawing. The sump outlet will be fitted with a Nº 8 mesh screen to capture the coal chunks for re-use, and the fines will pass thru the screen with the water which will be piped to a gravity drain sewer header for disposal. Concrete floors above grade receiving washdown water will be piped to the sump. Drains, trenches, and sewers will be designed with sufficient carrying velocity to carry the coal fines with a minimum flow of water required.

Sewers

Individual drains from each sump will connect directly into the storm sewer. Coal fines will be carried in the storm sewer to a central settling basin where the fines and superfines can be removed as required. Daily floor washdown will keep wet any coal fines that may settle in the storm sewer between rains. Floor washdown will carry some of the fines to the central basin and surface drainage will carry the remainder periodically.

Sump Location	Nº of Hoses Reporting to Sump	GPM Draining from Sump	Normal Hose Flow	Hose Length	1 Ton Hoist
Coal Unloading Station	2@ 60 GPM	120	↑	100'	Where indicated
Junction Hse	1@ 60 GPM	60		25'	NO
Dryer Nº1	3@ 60 GPM	180		50&75'	NO
Dryer Nº2	3@ 60 GPM	180		50&75'	NO
~~Dryer Nº3~~	~~3@ 60 GPM~~	~~180~~	180 GPM	~~50&75'~~	~~NO~~
Surge Bin	1@ 60 GPM	60		20'	NO
Coal Bin	1@ 60 GPM	60		50'	NO
Coal Silo & Reclaim Hopper	2@ 60 GPM	120		25'&100'	YES
Secondary Crusher	1@ 60 GPM	60		75'	NO
Reclaim Hopper	1@ 60 GPM	60		25'	YES
Primary Crusher	1@ 60 GPM	60	↓	75'	NO

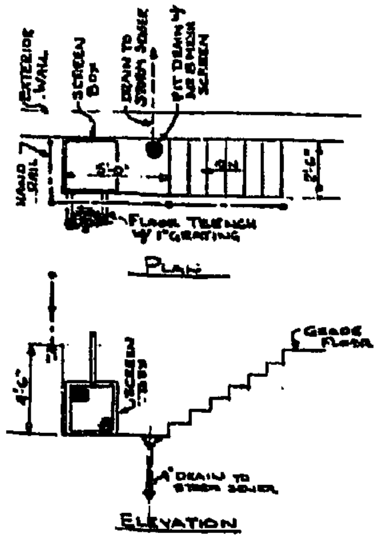
Normal operating - 180 GPM based on three hose station operating adjacently.
Maximum - 360 GPM based on 2 separate areas being washed down at any one time.

Comments

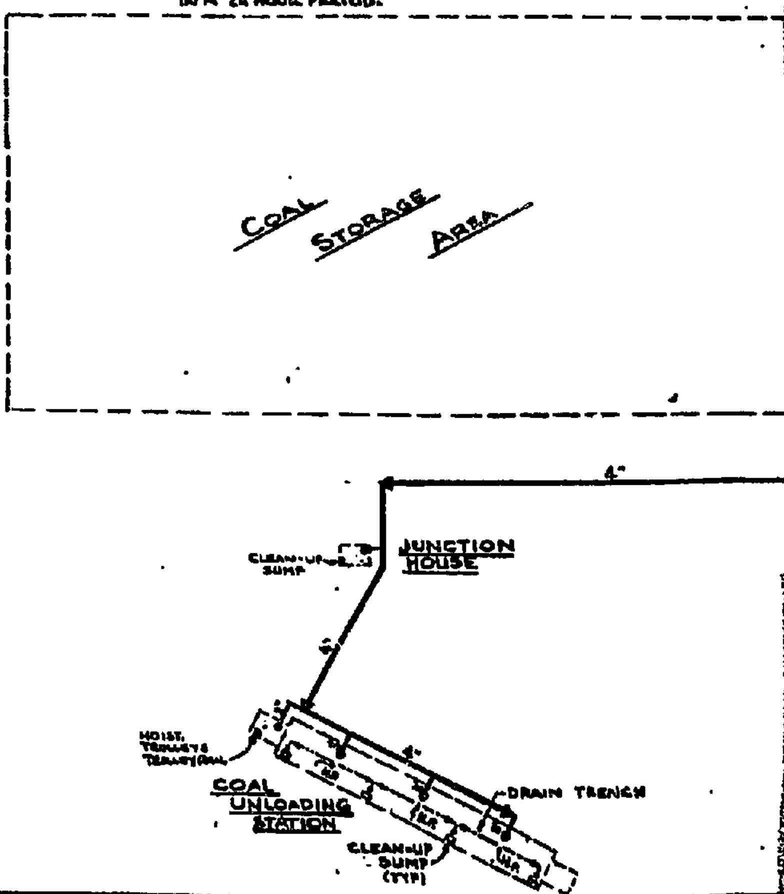
Local settling basin to collect coal fines before water enters the storm sewers is not practical because of the depth required for the sewers (18 ft). Also coal fines can be expected to enter the storm sewer mains from surface drainage. A separate floor washdown sewer is impractical for the same reason and would be an added expense.

Removable Screen Box

Each sump will be provided with a removable screen box. Above table shows sumps that require a 1 ton hoist, trolley, and short trolley rail. A fork lift will be use to lift removable screen box from sumps that are accessible.
Approx. total of 5 tons coal is expected to report to sumps in a 24 hour period.



Typical Clean-out Sump



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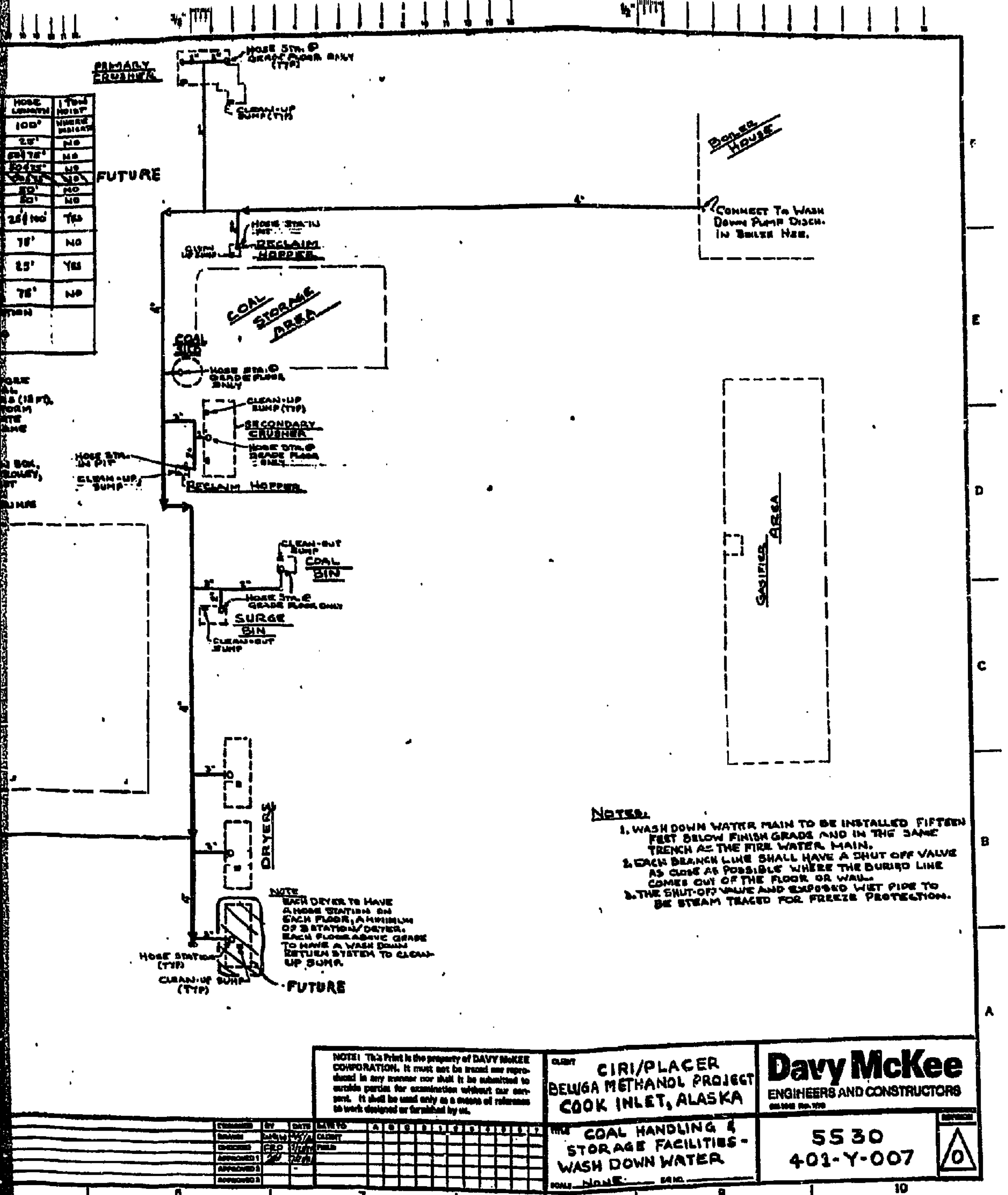
PRIMARY CRUSHER
HOSE STN. @ GRADE FLOOR ONLY (TYP)
CLEAN-UP SUMP (TYP)
HOSE LENGTH
1 TON HOIST
100'
WHERE HEIGHT
25'
NO
75'
NO
YES
80'
NO
50'
NO
25' & 100'
YES
75'
NO
25'
YES
75'
NO
FUTURE
BOILER HOUSE
4"
CONNECT TO WASH DOWN PUMP DISCH. IN BOILER HSE.
HOSE STATION PIT
RECLAIM HOPPER
COAL STORAGE AREA
COAL SILO
HOSE STN. @ GRADE FLOOR ONLY
CLEAN-UP SUMP (TYP)
SECONDARY CRUSHER
HOSE STN. @ GRADE FLOOR ONLY
HOSE STN. IN PIT
CLEAN-UP SUMP
RECLAIM HOPPER
CLEAN-OUT SUMP
COAL BIN
HOSE STN. @ GRADE FLOOR ONLY
SURGE BIN
CLEAN-OUT SUMP
GASIFIER AREA
DRYERS
NOTE
EACH DRYER TO HAVE A HOSE STATION ON EACH FLOOR, A MINIMUM OF 3 STATIONS/DRYER. EACH FLOOR ABOVE GRADE TO HAVE A WASH DOWN RETURN SYSTEM TO CLEAN-UP SUMP.
HOSE STATION (TYP)
CLEAN-UP SUMP (TYP)
FUTURE
NOTES:
1. WASH DOWN WATER MAIN TO BE INSTALLED FIFTEEN FEET BELOW FINISH GRADE AND IN THE SAME TRENCH AS THE FIRE WATER MAIN.
2. EACH BRANCH LINE SHALL HAVE A SHUT OFF VALVE AS CLOSE AS POSSIBLE WHERE THE BURIED LINE COMES OUT OF THE FLOOR OR WALL.
3. THE SHUT-OFF VALVE AND EXPOSED WET PIPE TO BE STEAM TRACED FOR FREEZE PROTECTION.
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CLIENT CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA
Davy McKee
ENGINEERS AND CONSTRUCTORS
TITLE COAL HANDLING & STORAGE FACILITIES - WASH DOWN WATER
SCALE NONE
5530
401-Y-007
0
A
B
C
D
E
F
6
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8
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10

NOMENCLATURE:
T - TYPE
C - CAPACITY
S - SIZE
P/T - OPERATING PRESSURE/ TEMPERATURE
M - MATERIAL
CS - CARBON STEEL
SS - STAINLESS STEEL
CI - CAST IRON
D - DRIVE
W - WEIGHT
ACC - ACCESSORIES

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-1101	3	Stormwater Lift Pump T - Horizontal, Self-Priming Centrifugal C - 170 GPM, 25' TDH M - Cast Iron D - 5 hp, Electric
401-1102	2	Wastewater Transfer Pump T - Horizontal, Centrifugal C - 1500 GPM M - Cast Iron D - 40 hp, Electric
401-1103	2	Stormwater Lift Pump T - Horizontal, Self-Priming, Centrifugal C - 30 GPM; 25' TDH M - Cast Iron D - 1/3 hp, Electric
401-1104	2	Wastewater Lift Pump T - Centrifugal, Self-Priming, Horizontal C - 25 GPM @ 20' TDH M - Fiberglass, Reinforced Plastic D - 1 hp, Electric
401-1106	2	Nutrient Solution Metering Pump T - Diaphragm Reciprocating C - 33 GPH M - 316 Stainless Steel D - 1/4 hp, Electric

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-1107	2	Wastewater Lift Pump T - Horizontal, Self-Priming, Centrifugal C - 50 GPM; 30' TDH M - Cast Iron D - 2 hp, Electric
401-1108	3	Clarifier Feed Pump T - Centrifugal, Self-Priming, Horizontal C - 180 GPM @ 70' TDH M - Cast Iron D - 7 1/2 hp, Electric
401-1109	2	Polymer Feed Pump T - Diaphragm, Reciprocating C - 66 GPH M - 316 Stainless Steel D - 1/3 hp, Electric
401-1113	2	Clarifier Effluent Transfer Pump T - Centrifugal, Self-Priming, Horizontal C - 385 GPM @ 90' TDH M - Cast Iron D - 15 hp, Electric
401-1114	3	Centrifuge Feed Pump T - Progressive Cavity C - 25 GPM @ 25' TDH M - Cast Iron, Buna N Stator, Tool Steel Rotor D - 3 hp, Electric

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-1115	1	Centrifuge Feed Pump T - Progressive Cavity C - 25 GPM; 25' TDH M - Cast Iron, Buna N Stator, Tool Steel Rotor D - 3 hp, Electric
401-1116	3	Filter Feed Pump T - Horizontal, Centrifugal C - 1510 GPM M - Cast Iron D - 60 hp, Electric
401-1117	2	Scum Transfer Pump T - Horizontal, Centrifugal C - 10 GPM M - Cast Iron D - 2 hp, Electric
401-1118	5	Sludge Recycle Pump T - Horizontal, Centrifugal C - 450 GPM M - Cast Iron D - 7 1/2 hp, Electric
401-1119	2	Lime Slurry Feed Pump T - Centrifugal, Horizontal C - 35 GPM @ 25' TDH D - 1 hp, Electric
401-1120	2	Lime Slurry Feed Pump T - Horizontal, Centrifugal C - 35 GPM; 25' TDH D - 1 hp, Electric

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-1121	2	Backwash Transfer Pump T - Horizontal, Centrifugal C - 35 GPM M - Cast Iron D - 1.5 hp, Electric
401-1122	2	Polymer Feed Pump T - Diaphragm, Reciprocating C - 22 GPH M - 316 Stainless Steel D - 1/4 hp, Electric
401-1123	2	Polymer Feed Pump T - Diaphragm Reciprocating C - 33 GPH M - 316 Stainless Steel D - 1/4 hp, Electric
401-1124	3	Waste Sludge Pump T - Horizontal, Centrifugal C - 25 GPM M - Cast Iron D - 5 hp, Electric
401-1125	2	Polymer Feed Pump T - Diaphragm Reciprocating C - 10 GPH M - 316 Stainless Steel D - 1/4 hp, Electric
401-1131	3	Dryer Quench Pump T - Horizontal, Centrifugal C - 2000 GPM, 120' TDH M - Cast Iron D - 125 hp, Electric

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-1132	2	Ash Conditioning Water Pump T - Horizontal, Centrifugal C - 300 GPM, 120' TDH M - Cast Iron D - 20 hp, Electric
401-1138	2	Centrifuge Feed Pump T - Progressive Cavity C - 15 GPM M - Steel with Buna-N Stator D - 1.5 hp, Electric
401-1139	2	Thickened Sludge Transfer Pump T - Progressive Cavity C - 15 GPM M - Steel with Buna-N Stator D - 1.5 hp, Electric
401-1141	2	Thickener Effluent Transfer Pump T - Horizontal, Centrifugal C - 35 GPM M - Cast Iron D - 1.5 hp, Electric
401-1144	2	Polymer Metering Pump T - Diaphragm Reciprocating C - 45 GPH M - Stainless Steel D - 1/2 hp, Electric
401-1207	1	Nutrient Solution Tank Mixer T - Propeller M - Stainless Steel D - 1/4 hp, Electric

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-1209	5	Aerators T - Turbine, Platform Mounted M - Steel D - 75 hp, Electric
401-1211	1	Flocculation Mixer T - Turbine M - Carbon Steel D - 5 hp, Electric
401-1212	1	Flocculation Mixer T - Turbine M - Carbon Steel D - 2 hp, Electric
401-1217	1	Lime Slurry Mixer T - Propeller M - Stainless Steel D - 1 hp, Electric
401-1218	1	Lime Slurry Mixer T - Propeller M - Stainless Steel D - 1 hp, Electric
401-1221	2	Polymer Solution Mixer T - Propeller M - Stainless Steel D - 2 hp, Electric
401-1222	2	Polymer Solution Mixer T - Propeller M - Stainless Steel D - 1 hp, Electric

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-1232	1	Mixer T - Propeller M - Cast Steel D - 5 hp, Electric
401-1236	2	Digester Aerators T - Turbine, Platform Mounted M - Steel D - 50 hp, Electric
401-1243	2	Polymer Tank Mixer T - Propeller M - Stainless Steel D - 0.5 hp, Electric
401-1247	1	Sludge Tank Mixer T - Propeller M - Steel D - 1/2 hp, Electric
401-1249	1	Effluent Diffuser T - Multiport 4" nozzle M - Cast Iron C - 135 GPM/Nozzle
401-1302	2	Air Blower T - Rotary Positive C - 270 CFM @ 5 psig M - Steel D - 10 hp, Electric
401-1404	1	Grit Removal Chamber T - Rectangular, Open C - To handle 50 GPM flow S - 3' wide, 15' long, 3' deep M - Reinforced Concrete

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-1406	1	Oil Separator
		T - Rectangular, Open C - To handle 50 GPM flow S - 3' wide, 20' long, 5' deep (1.5' FB) M - Reinforced Concrete
401-1407	1	Belt Oil Skimmer
		T - Endless belt on pulley M - Steel housing, PVC belt, 316 Stainless Steel doctor blade D - 1/2 hp, Electric
401-1409	1	Reactor-Clarifier Tank
		C - 40' Dia. x 12' SWD M - Steel Shell on Concrete Base Slab (Includes weirs, baffles, trough, etc.)
401-1410	1	Clarifier - Thickener Mechanism
		T - Rotary Plow M - Carbon Steel D - 1 1/2 hp, Electric (Includes reactor hood, bridge, drive, scraper, draft tube.)
401-1411	2	Clarifier Tank
		T - Circular, Open S - 75' dia x 12' deep M - Reinforced Concrete C - 837 GPM

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-1412	2	Clarifier Mechanism
		T - Tow-bro Type Mechanism M - Steel Acc - Skimmer, Weir
401-1413	1	Clarifier-Thickener Mechanism
		T - Rotary Plow M - Carbon Steel D - 1/2 hp, Electric Acc - Reactor hood, draft tube, skimmer
401-1414	2	Gravity Filter
		T - Rectangular Gravity Sand Filter C - 837 GPM M - Reinforced Concrete S - 12.5' wide, 40' long D - 7.5 hp, Electric Acc - Filter Media, Travelling Backwash Mechanism, Backwash Pump
401-1415	2	Centrifuge
		T - Imperforate Basket C - 25 GPM Average Feed Rate M - Stainless Steel D - 40 hp, Electric
401-1416	1	Reactor-Clarifier Tank
		T - Circular, Open C - To handle 80 GPM flow S - 20' dia. x 12' deep (2' FB) M - Steel Shell on concrete base slab Acc - Weir, baffles, trough

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-1417	1	Centrifuge T - Imperforate Basket C - 25 GPM M - Stainless Steel D - 40 hp, Electric
401-1437	1	Gravity Thickener Tank T - Circular, Open C - 52 GPM S - 32' dia x 12' (2' FB) M - Steel
401-1438	1	Gravity Thickener Mechanism T - Picket Type Mechanism M - Steel
401-1449	1	Centrifuge T - Solid Bowl Scroll C - 15 GPM M - Stainless Steel D - 25 hp, Electric
401-1452	1	Trash Rack T - Bar Screens S - 1" x 6" Bars 10' long at 4" centers M - Steel
401-1455	1	Trash Rack T - Bar Screen S - 1" x 6" bars 10' long at 4" centers M - Steel

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-2105	1	Grit Collector
		T - Chain and Bucket M - Carbon Steel
401-2120	1	Belt Conveyor
		T - Continuous Belt; w/cleats, Thumper and Dumpster Winch D - 2 hp, 3/4 hp, 3/4 hp, all Electric
401-2121	2	Polymer Dispersing Funnel
		T - Circular, Open S - 12" dia., 18" T/T M - Synthetic Molded Resin
401-2123	2	Polymer Dispersing Funnel
		M - Polyethylene
401-2145	2	Polymer Dispersing Funnel
		T - Circular, Open S - 12' dia x 18" T/T M - Synthetic Molded Resin
401-2154	1	Alum Feeder
		T - Screw Feeder C - Up to 8 cu ft/hour M - Stainless Steel Auger and Tube D - 1/4 hp, Electric
401-2164	1	Alum Feeder
		T - Screw Feeder C - Up to 8 cu ft/hour M - Stainless Steel Auger and Tube D - 1/4 hp, Electric

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-2301	1	Boiler Cleaning Wastes Storage Pond T - Earthen Basin, w/Liner C - 495,000 Gal. Active Volume
401-2302	1	Stormwater Sump T - Circular, Open C - 940 Gallon S - 4' dia. x 12' deep (2' FB) M - Reinforced Concrete
401-2303	1	Boiler Cleaning Wastes Lift Sump T - Circular, Open S - 4' Dia. x 14' Deep M - Concrete, w/Liner
401-2304	1	Stormwater Storage Pond T - Rectangular, Open C - 1,340,000 Gallon S - Top: 150' x 200' Bottom: 110' x 160' Depth: 10' (2' FB) M - Earthen, lined
401-2305	1	Coal Handling Area Stormwater Storage Pond T - Earthen Basin, w/Liner C - 800,000 CF Active Volume
401-2306	1	Wastewater Sump T - Square, Open C - 7000 Gallon M - Reinforced Concrete S - 10' x 10' x 10' (deep)

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-2307	1	Coal Runoff Lift Sump
		T - Circular, Open S - 6' Dia. x 14' Deep M - Concrete, w/Liner
401-2308	2	Aeration Basin
		T - Rectangular, Open C - 1,904,000 Gallon S - Bottoms = 100' x 200' Top = 148' x 248' Depth = 12' (2' free board) M - Earthen Lined
401-2310	1	Splitter Box
		T - Rectangular, Open C - 11,850 Gallon S - 12' x 22' x 6' deep M - Reinforced Concrete
401-2311	1	Splitter Box
		T - Rectangular, Open C - 11,850 Gallon S - 12' x 22' x 6' deep M - Reinforced Concrete
401-2312	1	Effluent Lift Sump
		T - Circular, Open S - 6' Dia. x 8' Deep M - Concrete
401-2313	1	Filter Feed Sump
		T - Square, Open C - 6000 Gallon S - 10' x 10' x 10' (2' free board) M - Reinforced Concrete

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-2314	1	Nutrient Solution Tank T - Circular, Open C - 100 Gallon S - 24" dia, 38" deep M - Stainless Steel
401-2316	1	Scum Sump T - Square, Open C - 600 Gallon S - 4' x 4' x 6' (1' Free Board) M - Reinforced Concrete
401-2317	1	Lime Slurry Tank (Included w/401-2516)
401-2318	1	Lime Slurry Tank T - Circular, Open C - 750 Gallons S - 5' dia. x 6' deep (1' FB) M - Steel
401-2319	2	Polymer Solution Tank T - Circular, Open C - 1200 Gallon S - 6' dia. x 8' deep (2' FB) M - Stainless Steel
401-2320	2	Polymer Solution Tank T - Circular, Open S - 2500 Gal Active Volume M - Stainless Steel

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-2321	1	Backwash Collection Sump
		T - Square, Open C - 5200 Gallon S - 11' x 11' x 8' (2' Free Board) M - Reinforced Concrete
401-2331	1	Effluent Mix Tank
		T - Square, Open C - 34,500 Gallon S - 22' x 22' x 12' (2' FB) M - Reinforced Concrete
401-2334	1	Effluent Storage Pond
		T - Rectangular, Open C - 18 Million Gallon S - Bottom: 190' x 920 Top: 250' x 980 Depth: 15' (3' FB) M - Earthen, Lined
401-2335	1	Aerabic Digestor Basin
		T - Rectangular, Open C - 1.12 Million Gallon S - Bottom: 75' x 150' Top: 123' x 198' Depth: 12' (2' FB) M - Earthen, Lined
401-2336	1	Sump
		T - Rectangular, Open C - 14,625 Gallon S - 7.5' x 20' x 15' (2' FB) M - Reinforced Concrete

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-2340	1	Thickener Effluent Sump
		T - Square, Open C - 600 Gallons S - 4' x 4' x 6' deep (1' FB) M - Reinforced Concrete
401-2342	2	Polymer Solution Tank
		T - Circular, Open C - 500 Gallons S - 48" dia x 70" deep M - Stainless Steel
401-2346	1	Sludge Tank
		T - Circular, Open C - 450 Gallon S - 4' dia x 6' deep (1' FB) M - Steel
401-2347	1	Storm Receiving Sump
		T - To house trash bar screen M - Reinforced concrete
401-2348	1	Primary Stormwater Basin
		T - Rectangular Open C - 294,000 Gallons S - Top: 70' x 120' Bottom: 20' x 70' Depth: 12.5' (2.5'FB) M - Earthen, lined
401-2349	1	Overflow Chamber
		T - To discharge overflow to stormwater pond, Rectangular open M - Reinforced concrete Acc - Weir plate

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-2350	1	Stormwater Storage Pond
		T - Rectangular Open C - 4,885,000 Gallons S - Top: 230' x 355' Bottom: 180' x 305' Depth: 12.5' (2.5' FB) M - Earthen, lined
401-2351	1	Storm water Lift Sump
		T - Square open C - 2,000 Gallons S - 5' x 5' x 12.5' (2.5' FB) M - Reinforced Concrete
401-2352	1	Clean Stormwater Receiving Sump
		T - To house trash screen M - Reinforced Concrete
401-2353	1	Primary Stormwater Basin
		T - Rectangular, Open C - 294,000 Gallons S - Top: 70' x 120' Bottom: 20' x 70' Depth: 12.5 (2.5' FB)
401-2354	1	Overflow Chamber
		T - Square, Open C - 2,000 Gallons S - 5' x 5' x 12.5' (2.5' FB) M - Reinforced Concrete
401-2355	1	Run-Off Detention Pond
		T - Rectangular, Open C - 4,500,000 Gallon S - Top: 250' x 535' Bottom: 222' x 507' Depth: 7' (2' FB) M - Earthen

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-2361	1	**Run-Off Detention Pond** T - Rectangular, Open C - 10,000,000 Gallon S - Top: 250' x 1160' Bottom: 222' x 1132' Depth: 7' (2' FB) M - Earthen
401-2504	1	**Nutrient Storage & Feed Facility** Package Consists of: . Storage Silo with Dust Collector . Volumetric Feeder **Storage Silo** T - Vertical, Cylindrical with Cone Bottom C - 520 cu ft S - 8' dia x 15' T-T M - Carbon Steel D - 4 hp, Electric Acc - Bin Vibrator, Dust Collector, Ladder **Volumetric Feeder** T - Screw Feeder C - Up To 2.4 cu ft/hour M - Stainless Steel Auger and Tube D - 1/2 hp, Electric

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-2515	1	Lime Storage & Feed System Package Consists of: . Storage Silo with dust collector . Volumetric Feeder . Lime Slaker Storage Silo T - Vertical, Cylindrical with Cone Bottom C - 370 cu ft S - 8' dia. x 12' S/S M - Carbon Steel D - 2 hp, Electric Acc - Bin Vibrator, Dust Collector, ladder Volumetric Feeder T - Screw Feeder C - Up to 250 lbs/hour M - Stainless Steel Auger and Tube D - 1/2 hp, Electric Lime Slaker C - Up to 250 lbs/hour M - Welded Steel D - 2.5 hp, Electric Acc - Breaker Bar, Stainless Steel wire-mesh screen, water jacket
401-2516	1	Lime Storage & Feed System Package consists of: Storage silo w/Dust Collector, Volumetric Feeder, Line Slaker.

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
		Storage Silo
		T - Vertical, Cylindrical, w/Cone Bottom
		C - 20 Tons of Pebble Lime
		M - Carbon Steel
		Acc - Bin Vibrator, Dust Collector, Ladder
		D - 2, 1/6 hp Electric
		Volumetric Feeder
		T - Screw Feeder
		C - Up to 500 lb/hr
		M - Stainless Steel Auger and Tube
		D - 1/2 hp, Electric
		Line Slaker
		C - Up to 500 lb/hr
		M - Welded Steel
		D - 1 1/2, 1, 1/3, 1/8, hp, Electric
		Acc - Breaker Bar, Stainless Steel wire mesh screen, water jacket, grit removal screw, level indicator, compressor
401-2557	1	Alum Storage Facility
		Package Consist of:
		. Bucket Elevator with Dust Collector, Storage Hopper
		Bucket Elevator
		T - Closed Bucket Elevator
		C - Up to 200 cu ft/hour
		S - Casing: 9" x 24" Bucket: 6" x 4" x 4-1/2"
		M - Mild Steel casing, Malleable Iron Bucket

WASTEWATER TREATMENT - AREA 401

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
		D - 1-1/2 hp - Bucket Elevator 1 hp - Dust Collector Acc - Dust Collector
		Storage Hopper
		T - Vertical, Cylindrical with Cone Bottom C - 162.5 cu ft S - 4' dia. x 14' S/S M - Rolled Steel
401-2563	1	Alum Storage Facility
		Package Consist of:
		. Bucket Elevator with Dust Collector, Storage Hopper
		Bucket Elevator
		T - Closed Bucket Elevator C - Up to 200 cu ft/hour S - Casing: 9" x 24" Bucket: 6" x 4" x 4-1/2" M - Mild Steel casing, Malleable Iron Bucket D - 1-1/2 hp - Bucket Elevator 1 hp - Dust Collector Acc - Dust Collector
		Storage Hopper
		T - Vertical, Cylindrical with Cone Bottom C - 162.5 cu ft S - 4' dia. x 14' S/S M - Rolled Steel

WASTEWATER TREATMENT - AREA 401

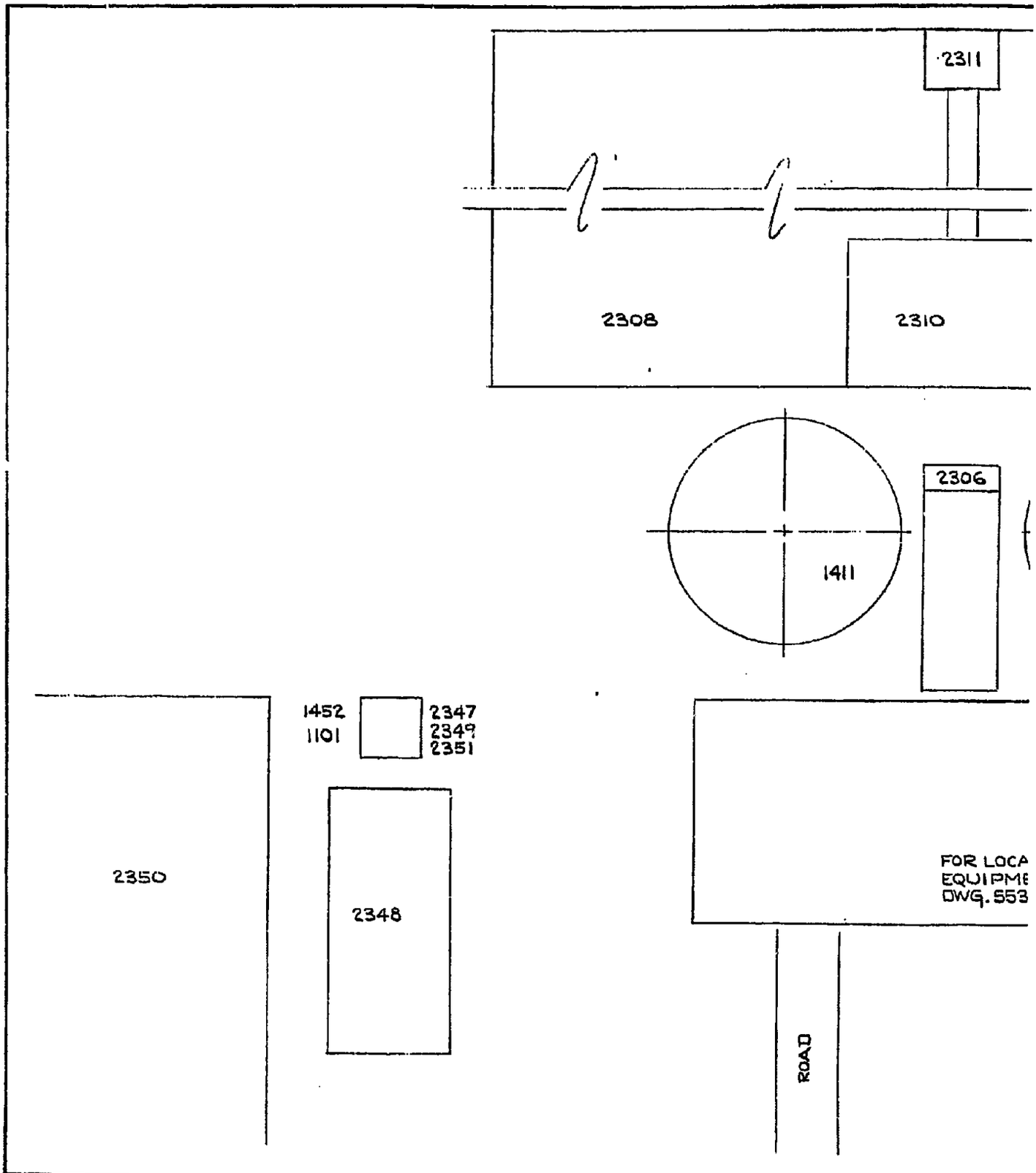
EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-3233	1	Effluent Sampler T - Flow Proportioned, Composite Sampler M - Steel D - Fract hp, Electric Acc - Refrigerated Compartment
401-3234	1	Automatic Sampler T - Flow-proportional, composite sampler M - Plastic Case, Silicon Rubber Perastaltic Tubing D - Fractional hp Acc - Refrigerated Housing
401-3235	1	Effluent Sampler T - Flow Proportioned, Composite Sampler M - Steel D - Fract hp, Electric Acc - Refrigerated Compartment
401-3236	1	Automatic Sampler T - Flow-proportional, composite sampler M - Plastic Case, Silicone Rubber Perastaltic Tubine D - Fract hp, Electric Acc - Refrigerated, Housing
401-3252	1	Flow Measuring Flume T - Palmer Bowlins Flume S - 36" Flume M - Fiberglass, Reinforced Plastic Flume set in concrete

WASTEWATER TREATMENT - AREA 401

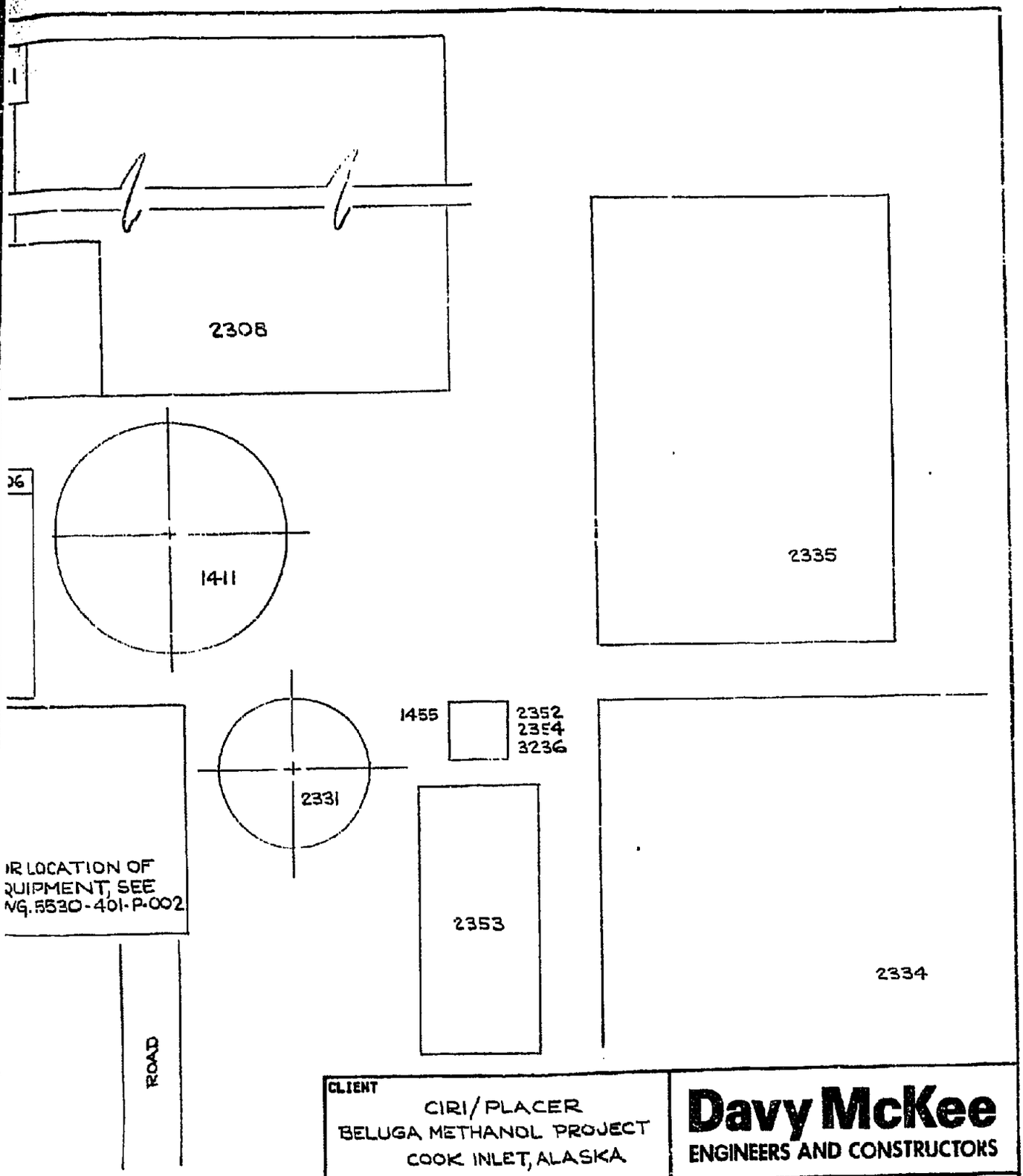
EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
401-3262	1	Flow Measuring Flume T - Palmer Bowlins Flume S - 72" Flume M - Fiberglass, Reinforced Plastic Flume set in concrete



REVISIONS					REVISIONS					REFERENCES	
NO.	DESCRIPTION	BY	CHK.	DATE	NO.	DESCRIPTION	BY	CHK.	DATE	DWG. NO.	TITLE
A	PREL. REVIEW	GW		6-24-81	0	ISSUED FOR FINAL REPORT	GW		7/20/81	401-P-002	PLAN @ GRADE

DM-132-1 REV. 4/80



CLIENT

CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

	BY	DATE
DES		
DRWN		
CK'D		
APP	[illegible]	7/20/81
APP		

TITLE

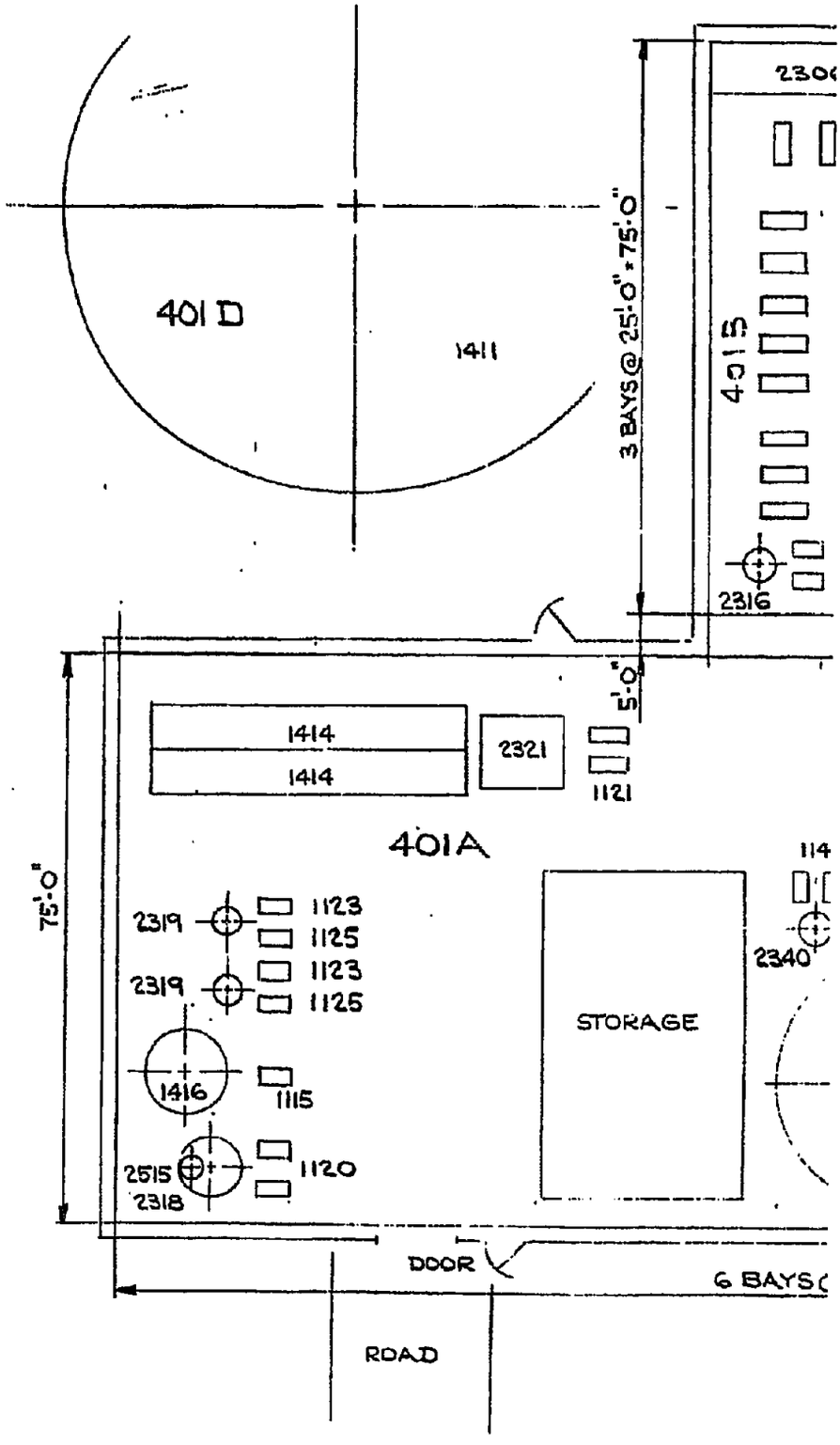
WASTE WATER
TREATMENT
GENERAL ARRANGEMENT

SCALE 1"=40'

DRAWING NO.

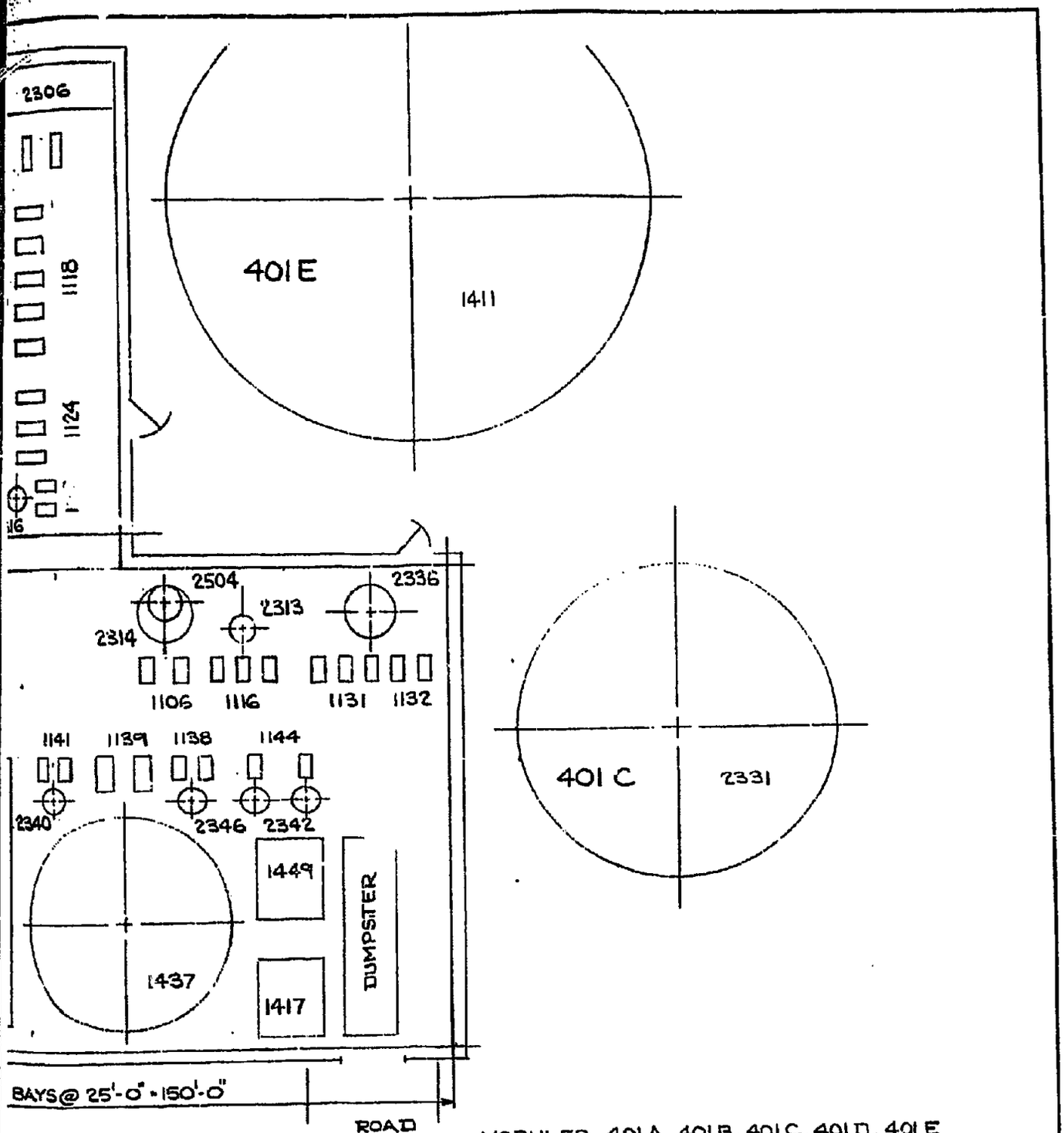
5530-401-P-001

REV. 0



REVISIONS					REVISIONS					REFERENCES	
NO.	DESCRIPTION	BY	CHK.	DATE	NO.	DESCRIPTION	BY	CHK.	DATE	DWG. NO.	TITLE
A	PREL. REVIEW	GW		6-24-81	0	ISSUED FOR FINAL REPORT	GW		7/20/81	401-P-001	GENERAL ARRANGEMENT

DM-1320-1 REV. 4/80



MODULES 401 A, 401 B, 401 C, 401 D, 401 E

CLIENT
CIRI / PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

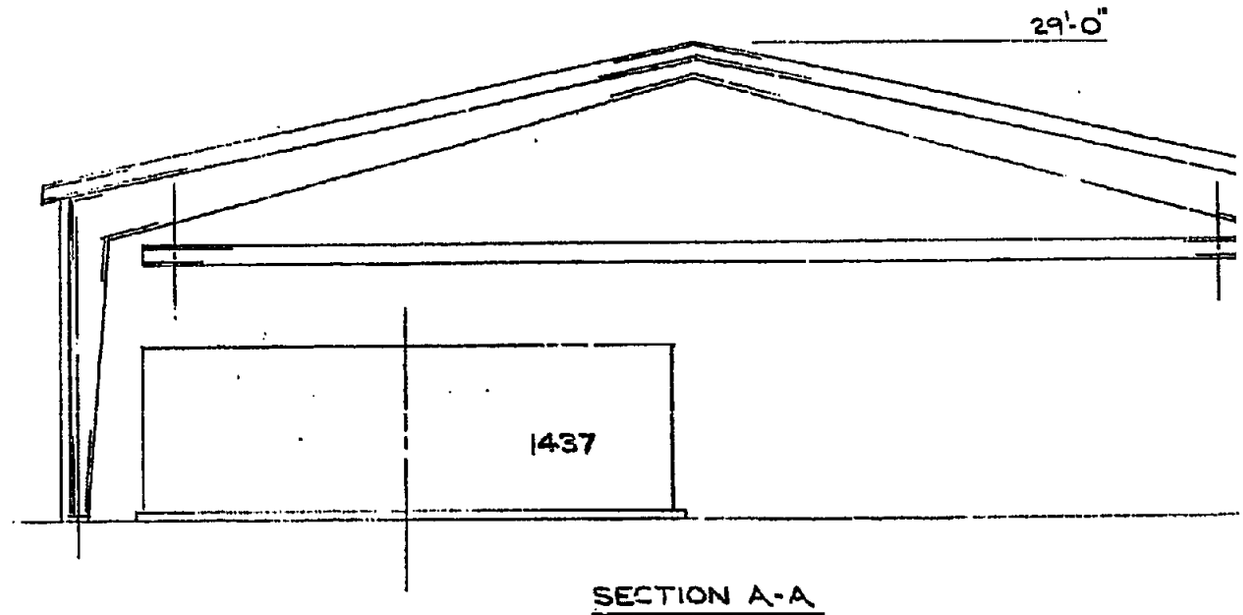
	BY	DATE
DES		
DRWN		
CK'D		
APP	DJS.	7/20/81
APP		

TITLE
WASTE WATER
TREATMENT
PLAN @ GRADE

SCALE 1" = 20'

REV. A

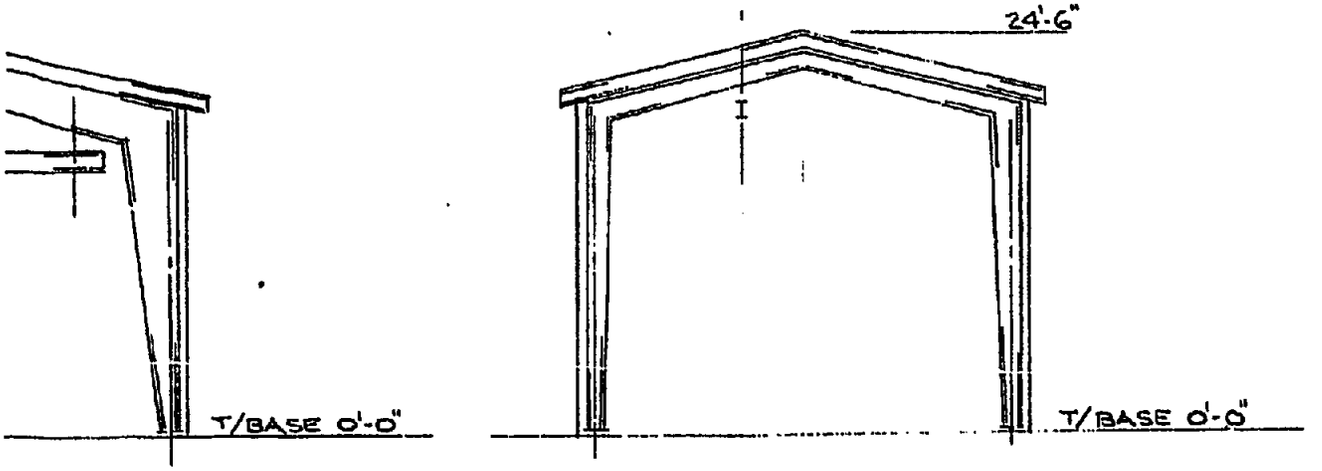
DRAWING NO.
5530-401-P-002



SECTION A-A

REVISIONS					REVISIONS					REFERENCES	
NO.	DESCRIPTION	BY	CHK.	DATE	NO.	DESCRIPTION	BY	CHK.	DATE	DWG. NO.	TITLE
A	PREL. REVIEW	GW		6-24-81	0	ISSUED FOR FINAL REPORT	GW		7/20/81		

DM-1328-1 REV. 4/80



SECTION B-B

CLIENT
CIRI / PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

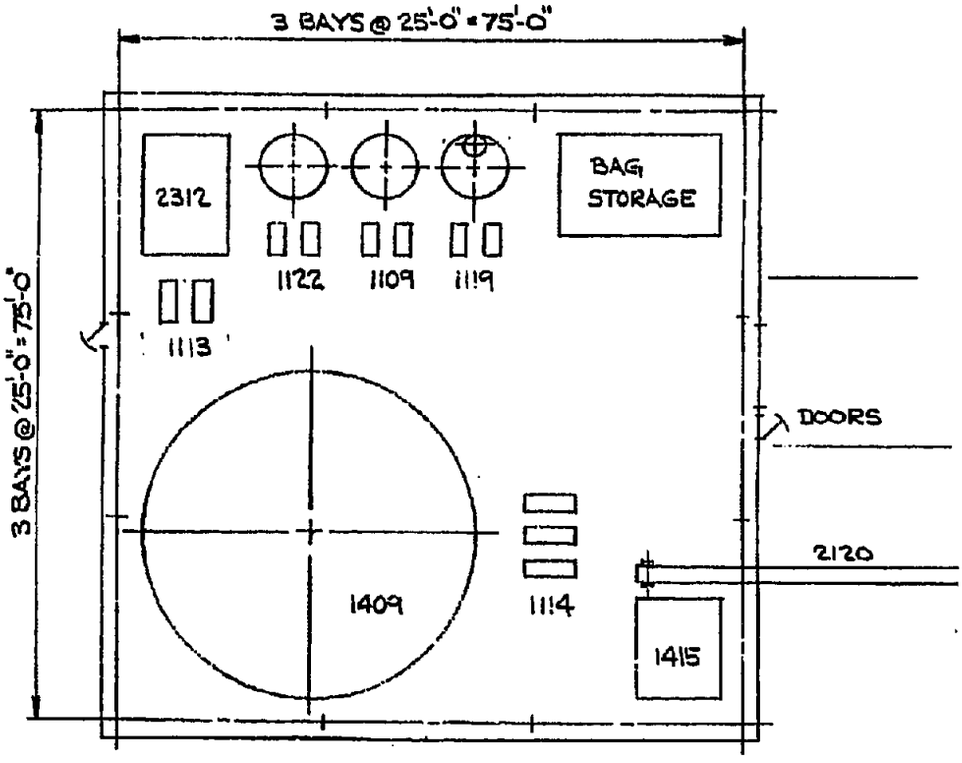
	BY	DATE
DES		
DRWN		
CK'D		
APP	YB.	7/20/81
APP		

TITLE
WASTE WATER
TREATMENT
SECTIONS A-A, B-B

SCALE 1"=

REV. 0

DRAWING NO.
5530-401-P-003



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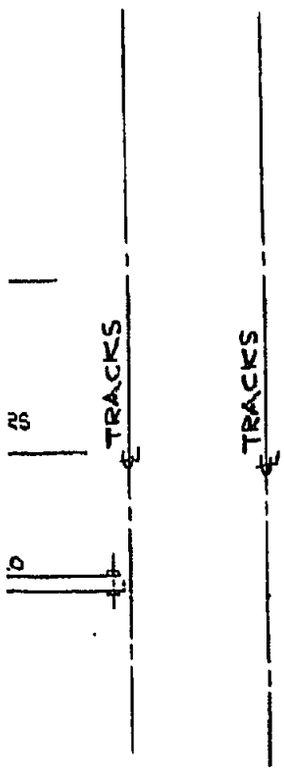
A	PREL. REVIEW	GW		6-24-81	0	ISSUED FOR FINAL REPORT	GW		7/10/81		

DM-1328-1 REV. 4/80



MODULE 401 F

CLIENT
CIRI / PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

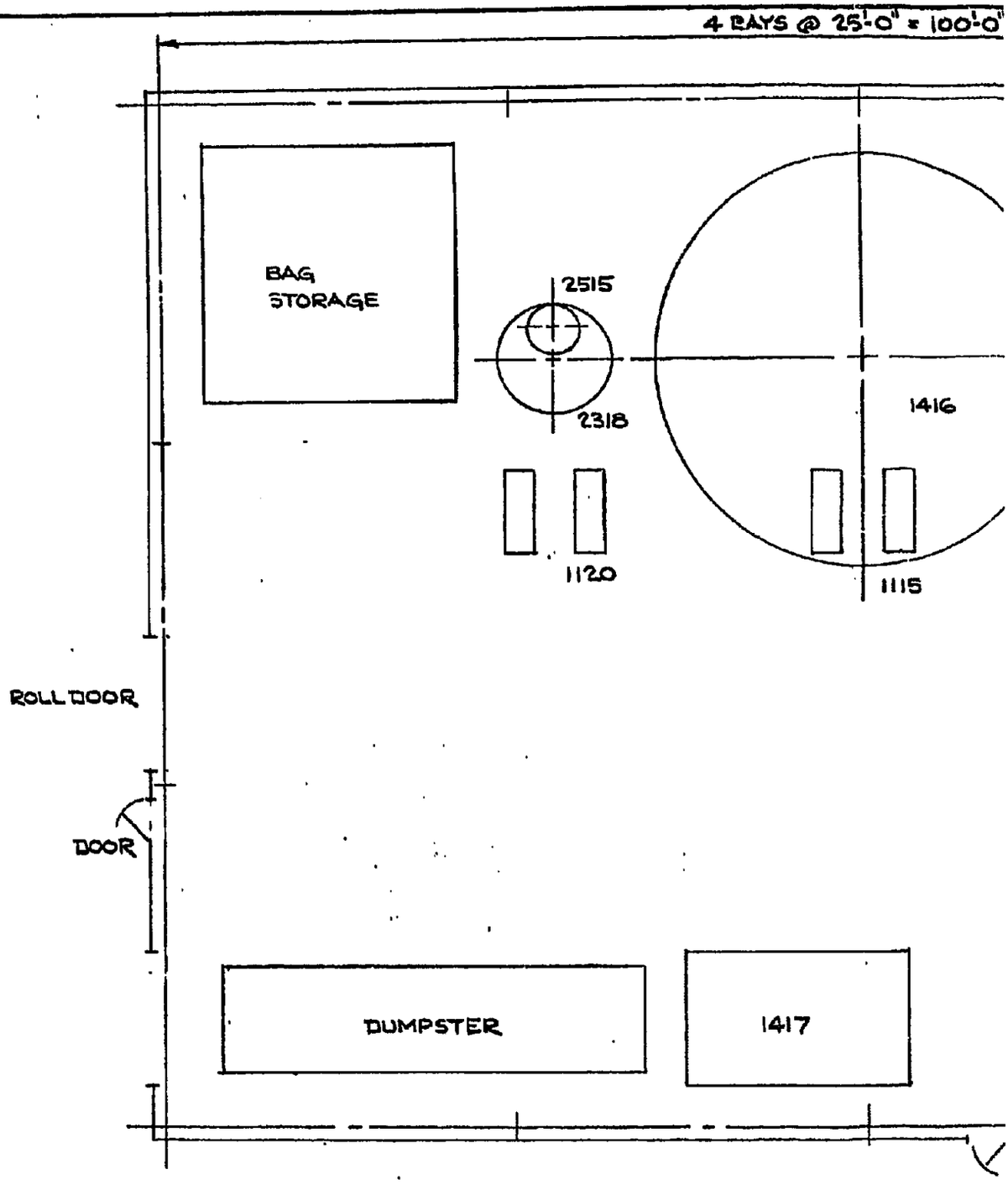
	BY	DATE
DES		
DRWN	GW	
CK'D		
APP	[illegible]	7/20/81
APP		

TITLE
BOILER CLEANING AND
COAL STORAGE AREA
WASTE WATER TREATMENT
PLAN @ GRADE

SCALE 1"=20"

REV. 0

DRAWING NO.
5530-401-P-004



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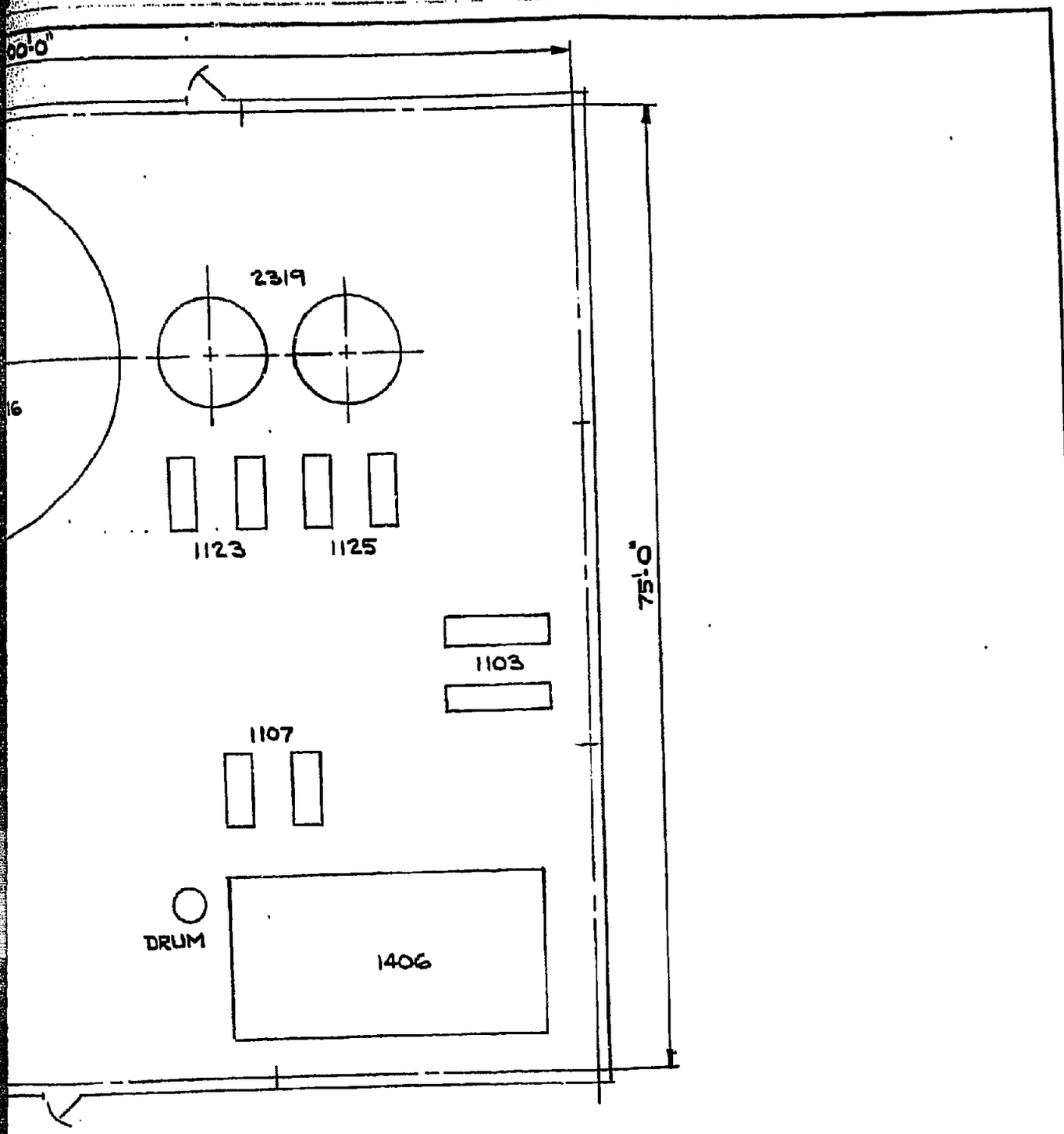


CLIENT
CIRI / PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

	BY	DATE
DES		
DRWN		
CK'D		
APP	gjs.	7/20/81
APP		

TITLE
RAILROAD MAINTENANCE
AND SHOP AREAS WASTE
WATER TREATMENT
PLAN @ GRADE

SCALE 1" = 10'

REV. 0

DRAWING NO.
5530-401-P-005

SECTION 10.0
EMERGENCY AND SAFETY SYSTEMS

10.1 RELIEF AND FLARE SYSTEMS (Dwg 5530-404-Y-001)

10.1.1 Design Basis

These systems are designed on the assumption that no more than the equivalent of one single 2500-ton-per-day train would be in emergency shutdown at any one time. This would equate to the following conditions:

System Shutdown		Maximum Number of Units Shut Down at One Time
Low Pressure Start-up and Emergency:		
Particulate Removal	(Area 207)	3 of 8 Gasifiers
Reforming	(Area 219)	
High Pressure Emergency:		
Raw Gas Compression	(Area 209)	1 of 3 Trains
Shift and Hydrolysis	(Area 210)	1 of 3 Trains
Acid Gas Removal Unit	(Area 211)	1 of 3 Trains
Makeup Gas Compression	(Area 212)	1 of 3 Trains
Methanol Synthesis	(Area 213)	1 of 3 Trains

10.2 General

Most of the gases generated in the methanol plant processes have specific gravities which are lighter than air. In most cases these gases could be vented to the atmosphere during upset conditions but, to minimize pollution under all conditions including emergencies, three separate flare systems will be provided, namely:

- o Low Pressure Continuous Flare System
- o Low Pressure Start-up and Emergency Flare System
- o High Pressure Emergency Flare System

These three systems are shown in drawing No. 5530-404-Y-001 and are described separately under the immediately following headings.

10.2.1 Low Pressure Continuous Flare System

This system will handle the gases from the Particulate Removal unit depressured scrubber water and the "compressor seal loss" gases from the Raw Gas Compression unit. All of these gases are collected in a single header which is piped to the continuous flare system.

10.2.2 Low Pressure Start-up and Emergency Flare System

Design of this system recognizes and provides for the following conditions:

- o Raw Winkler gas from the Particulate Removal unit (Area 207) will be continuously flared until the design composition is achieved (start-up condition).
- o Particulate free gas will be flared during any emergency condition in the Raw Gas Compression unit (Area 209).
- o Methanol unit purge and vent gases, normally sent to the reforming unit, will be flared during emergency shutdown of the reformer.

Flare headers from these various units will be connected to a single flare header piped to the low pressure emergency flare.

10.2.3 High Pressure Emergency Flare System

This system will handle compressed gases in situations where downstream equipment is down, and during emergencies. For example, flare operation may be required when any of the following units are down:

- o Shift/COS Hydrolysis
- o Acid Gas Removal
- o Makeup Gas Compression
- o Methanol Synthesis

Flare headers from these various units are piped to the high pressure emergency flare.

10.2.4 Pressure Relief Valves

In addition to the above provisions for shutdown situations, pressure relief valves are provided on each major vessel to relieve gases to flares in case of upset conditions during operation.

10.3 FIRE WATER SYSTEM (Area 308, Dwgs. 5530-308-Y-001, 002)

Fire water will be supplied from the effluent pond in the wastewater treatment area. This will be done by means of an electrically-driven 5000 gpm pump which will maintain water pressure in distribution mains throughout the plant. An emergency diesel-driven pump will also be provided to cut in automatically in the event of a power failure or loss of pressure.

The pressure in the fire water system will be maintained continuously. The distribution mains will be located 15 feet below grade to prevent freezing, and fire hydrants will be located at appropriate intervals in all areas where protection is necessary. Branches will be piped from the mains to buildings and equipment where required, and exposed wet piping will be electrically traced to prevent freezing.

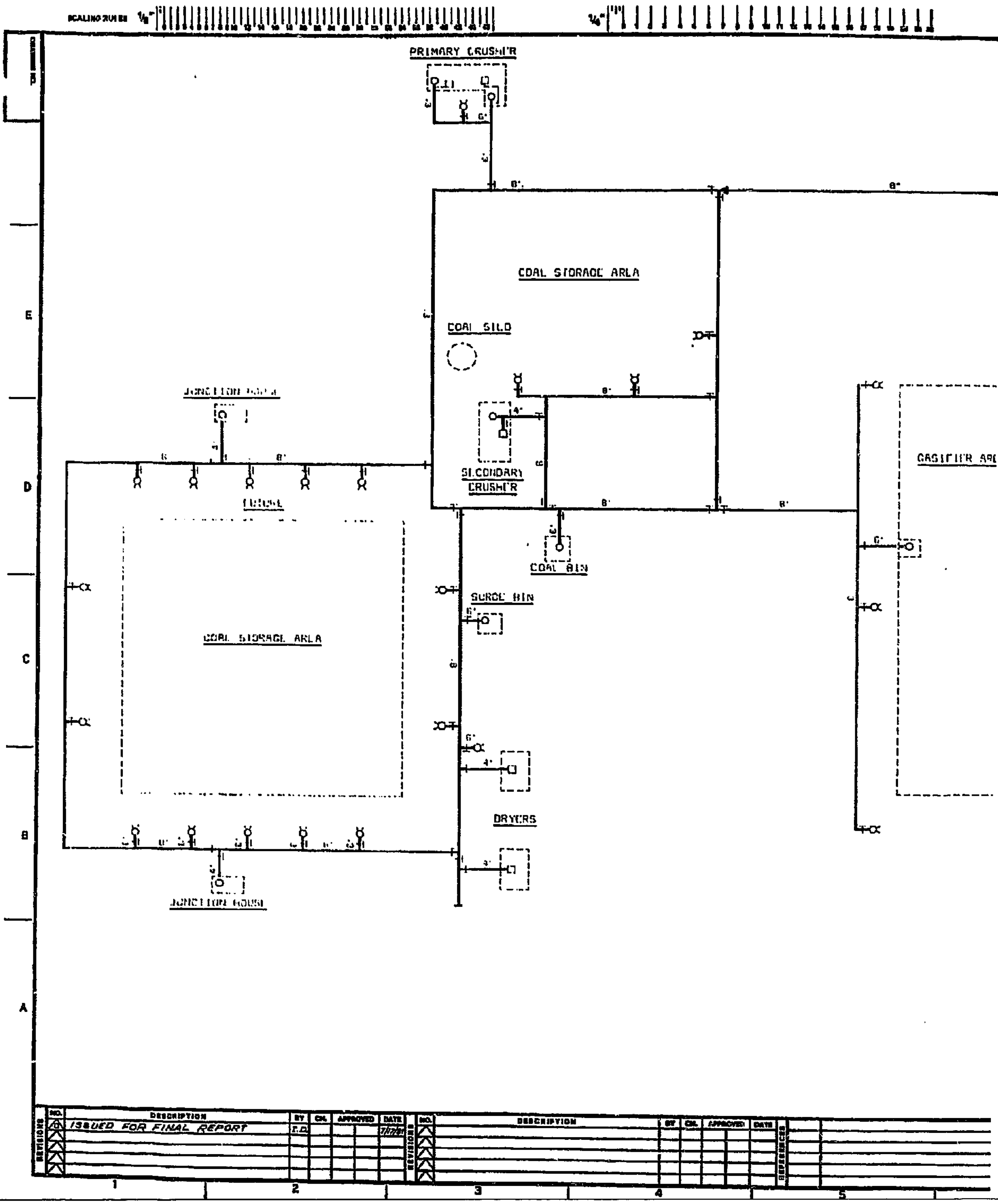
10.4 ENGINEERING DESIGN DATA

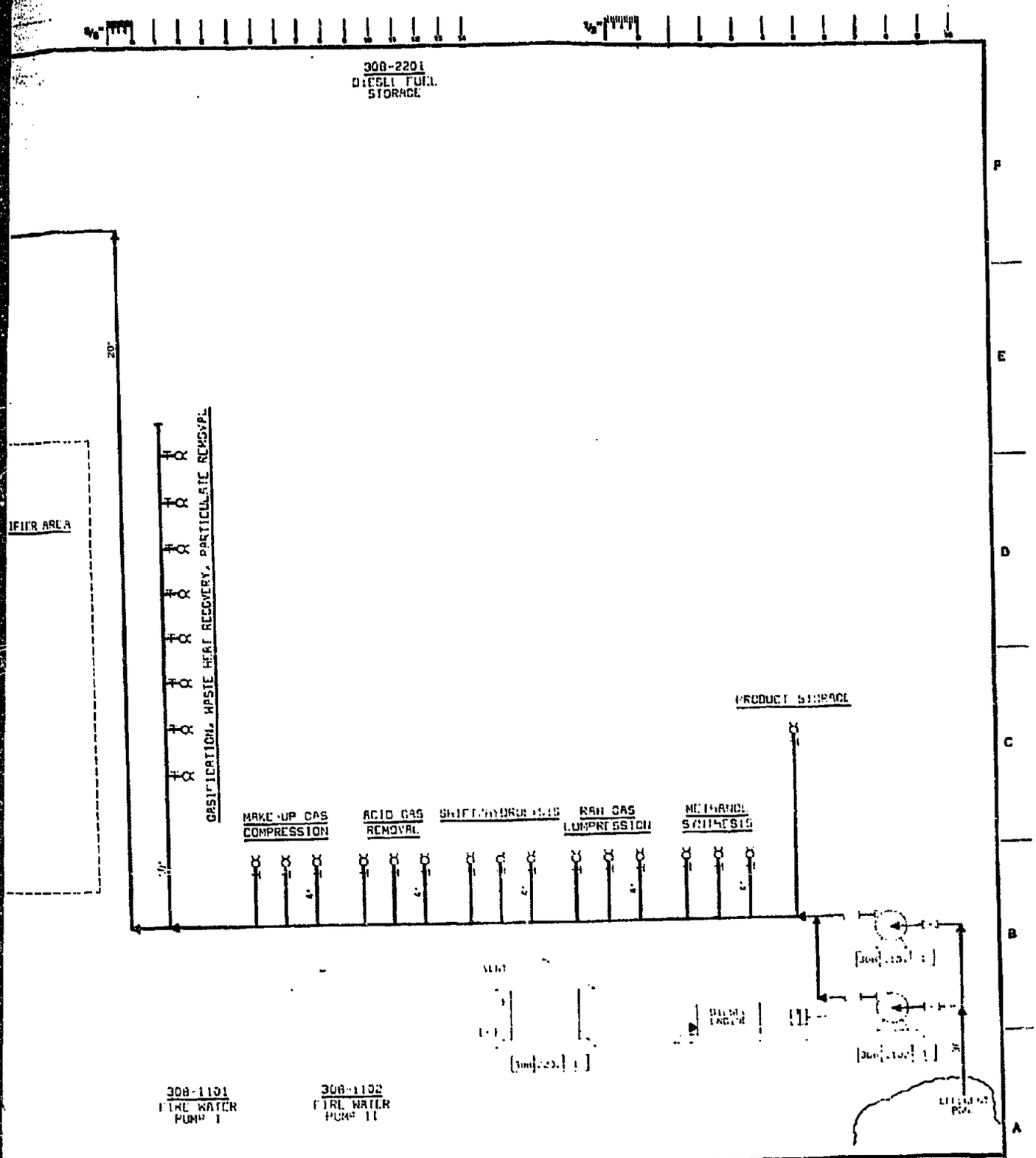
Design data pertinent to Emergency and Safety Systems are detailed in the drawings listed below and in the Equipment List beginning on Page 10/5.

DRAWING NO.	TITLE
5530-308-Y-001	Fire Water System
5530-308-Y-002	Coal Handling & Storage Facilities - Fire Protection
5530-404-Y-001	Relief and Flare System

EQUIPMENT LIST

5530-308-P-001	Fire Water Pumps - Plan & Section


SCALING RULES
PRIMARY CRUSHER
COAL STORAGE AREA
COAL SILO
JUNCTION HOUSE
SECONDARY CRUSHER
COAL BIN
SURGE BIN
COAL STORAGE AREA
DRYERS
JUNCTION HOUSE
GASIFIER ARE
REVISIONS
NO.
DESCRIPTION
BY
CK.
APPROVED
DATE
ISSUED FOR FINAL REPORT
REFERENCES



CLIENT

Davy McKee
ENGINEERS AND CONSTRUCTORS

	BY	DATE
DESIGNED		
DRAWN		
CHECKED		
APPROVED 1		
APPROVED 2		
APPROVED 3		

DATE TO: CLIENT / FIELD

TITLE: FIRE WATER SYSTEM

SCALE: DWG NO.: 3530-308-Y-001

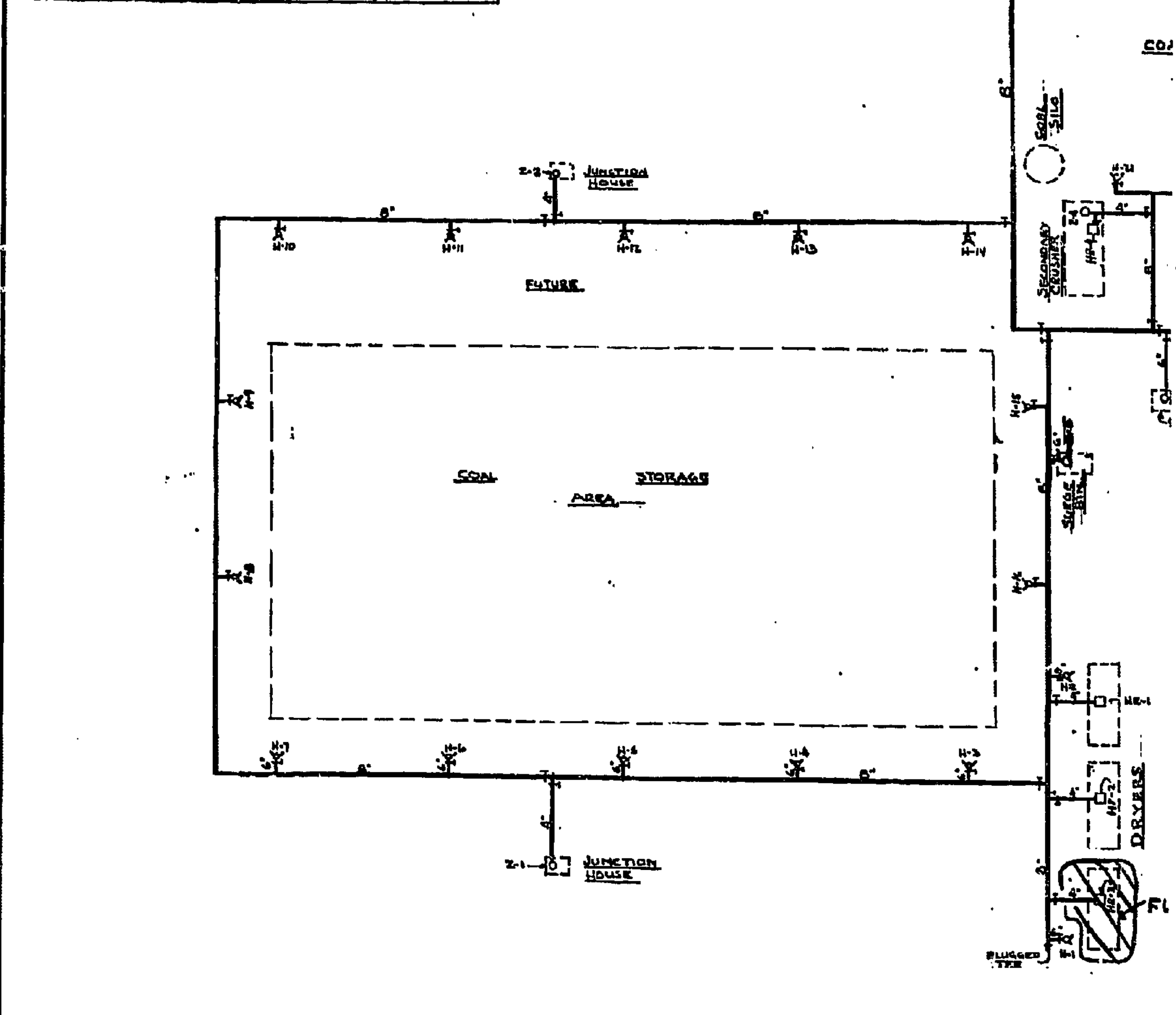
REVISION: 0

6 7 8 9 10

SCALING RULES 1/8" 1/4"

SPRINKLER SYSTEMS					
ZONE NO.	TOTAL HEADS	TEMP. SENSOR	CONTROL "VA"	MIN. HEAD	SERVICE
Z-1	89	29	4"	37 PSI	CONV. Nº 201-2101, 2102 & TAIL PULLEY OF 201-2160
Z-2	60	20	4"	84 PSI	CONV. Nº 201-2103 & HEAD (. PULLEY OF 201-2160
Z-3	[illegible]	[illegible]	[illegible]	[illegible] PSI	CONV. Nº 201-2104, 2106; 202-2101, 2106, 2107, 2110 & 2160
Z-4	94	36	6"	41 PSI	CONV. Nº 202-2103, 2104 & 2111
Z-5	124	44	6"	69 PSI	CONV. Nº 203-2101, 2102 & 2160
Z-6	322	128	6"	116 PSI	CONV. Nº 203-2103; 204-2101, 2102, & 2160
Z-7	169	66	6"	119 PSI	CONV. Nº 204-2103, 2104, 2105, 2106, 2107, 2108, & 2161
Z-8	185	75	6"	87 PSI	CONV Nº 201-2105; 202-2102, 2105, 2108, & 2109

HOSE REEL CABINETS			
CAB. Nº	Nº REEL	BLDG	LOCATION
HR-1	5	DRYER #1	2-GRADE FL. (ONE ON EACH SIDE OF BURNER, ONE AT CONTROL ROOM, AND ONE EACH SIDE OF DRYER
HR-2	5	DRYER #2	SAME AS HR-1
~~HR-3~~	~~5~~	~~DRYER #3~~	~~SAME AS HR-1~~ FUTURE
HR-4	2	SECOND. CRUSHER	FROM Z-4, ONE ON CRUSHER FL., & ONE ON SCREENING FL.
HR-5	3	PRIMARY CRUSHER	FROM Z-3, (WEST SIDE) ONE ON CONVEYOR FL., ONE ON CRUSHER FL., & ONE ON SCREENING FL.
HR-6	3	PRIMARY CRUSHER	FROM Z-8, (EAST SIDE) ONE ON CONVEYOR FL., ONE ON CRUSHER FL., & ONE ON SCREENING FL.



REVISIONS NO.	DESCRIPTION	BY	CH.	APPROVED	DATE
1	PRELIMINARY - FOR INFORMATION				[illegible]
2	ADD HOSE CAB. @ HYDRANTS				[illegible]
3	ISSUED FOR REPORT	GHH	RPP	[illegible]	7-21-[illegible]

NO.	DESCRIPTION	BY	CH.	APPROVED	DATE

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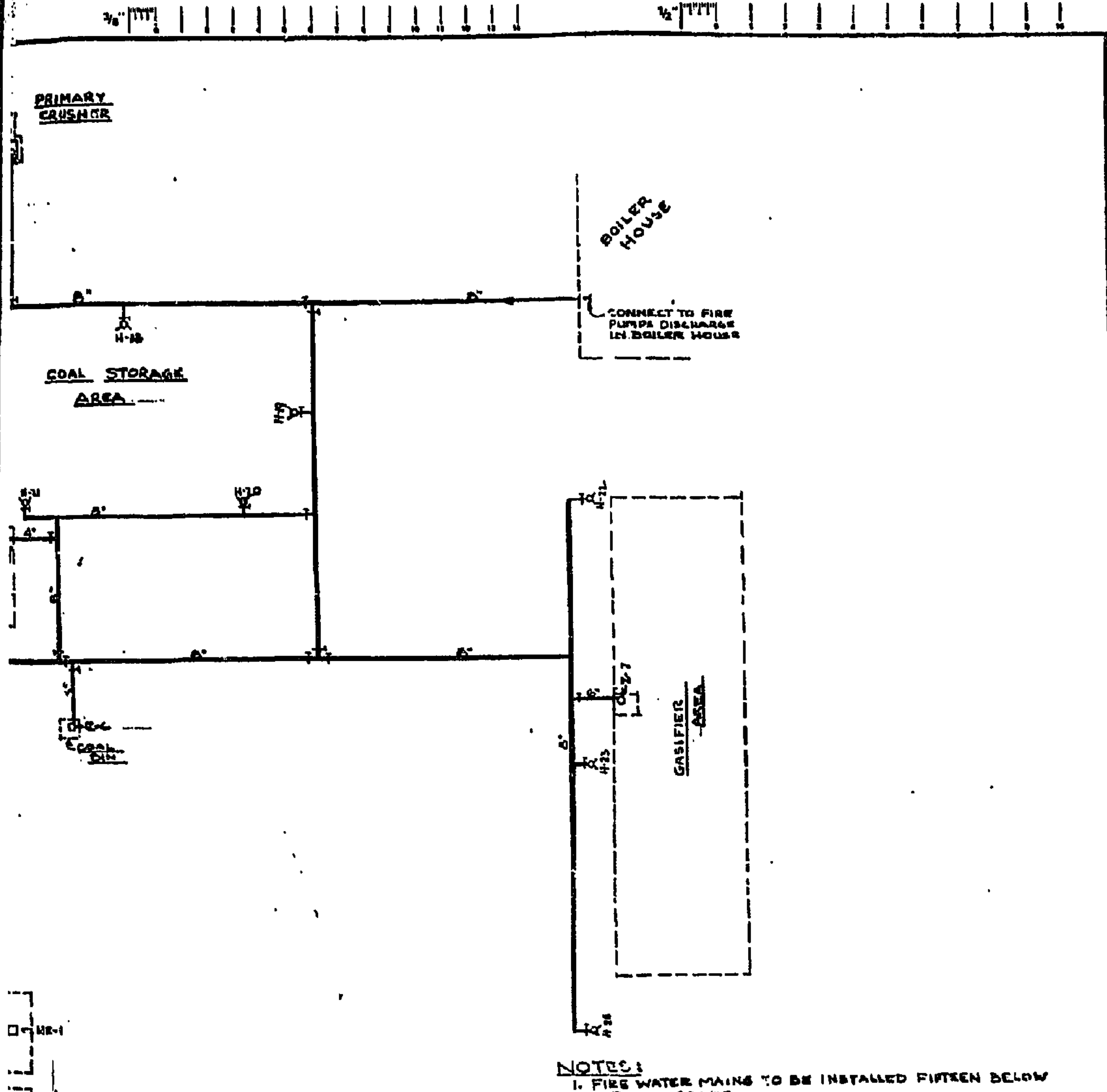


LEGEND
- —⊣(H- INDICATES FIRE HYDRANT & CABINET WITH SHUT-OFF VALVE
- ---DZ- INDICATES SPRINKLER SYSTEM ZONE Nº
- —□HR- INDICATES HOSE REEL WITH CABINET Nº
- INDICATES ISOLATION OR SHUT-OFF VALVES WITH ROAD WAY BOX OR POST INDICATOR (BURIED VA)

NOTES:
1. FIRE WATER MAINS TO BE INSTALLED FIFTEEN BELOW FINISH GRADE
2. ALL WET PIPES ABOVE GRADE TO BE ELECTRIC TRACED
3. ALL HOSE REEL CABINETS TO HAVE 75 FEET OF 1½" FIRE HOSE. CONNECTION TO BE FROM THE SPRINKLER ZONES AND SHALL BE DOWN STREAM OF THE SPRINKLER MONITOR SHUT-OFF VALVE.
4. ALL HYDRANTS (H-1 THRU H-26) TO HAVE HOSE CABINETS CONTAINING THE FOLLOWING: (1) 2" DIA RUBBER LINED COTTON HOSE, (1) NOZZLE WITH 1⅛" DIA. SMOOTH BORE TIP, (2) PLAY PIPE HOLDER, (4) TABOR SPANNER, (1) FIRE AXE, (1) CROW BAR, (2) HOSE STRAPS, (1) HYDRANT WRENCH, (1) LANTERN, AND (4) EXTRA WASHERS FOR HOSE COUPLINGS.

CLIENT: CIRI/PLACER BELUGA METHANOL PROJECT COOK INLET, ALASKA

Davy McKee ENGINEERS AND CONSTRUCTORS

	BY	DATE
DESIGNED		
DRAWN		
CHECKED	F.E.P	
APPROVED 1		
APPROVED 1		
APPROVED 2		

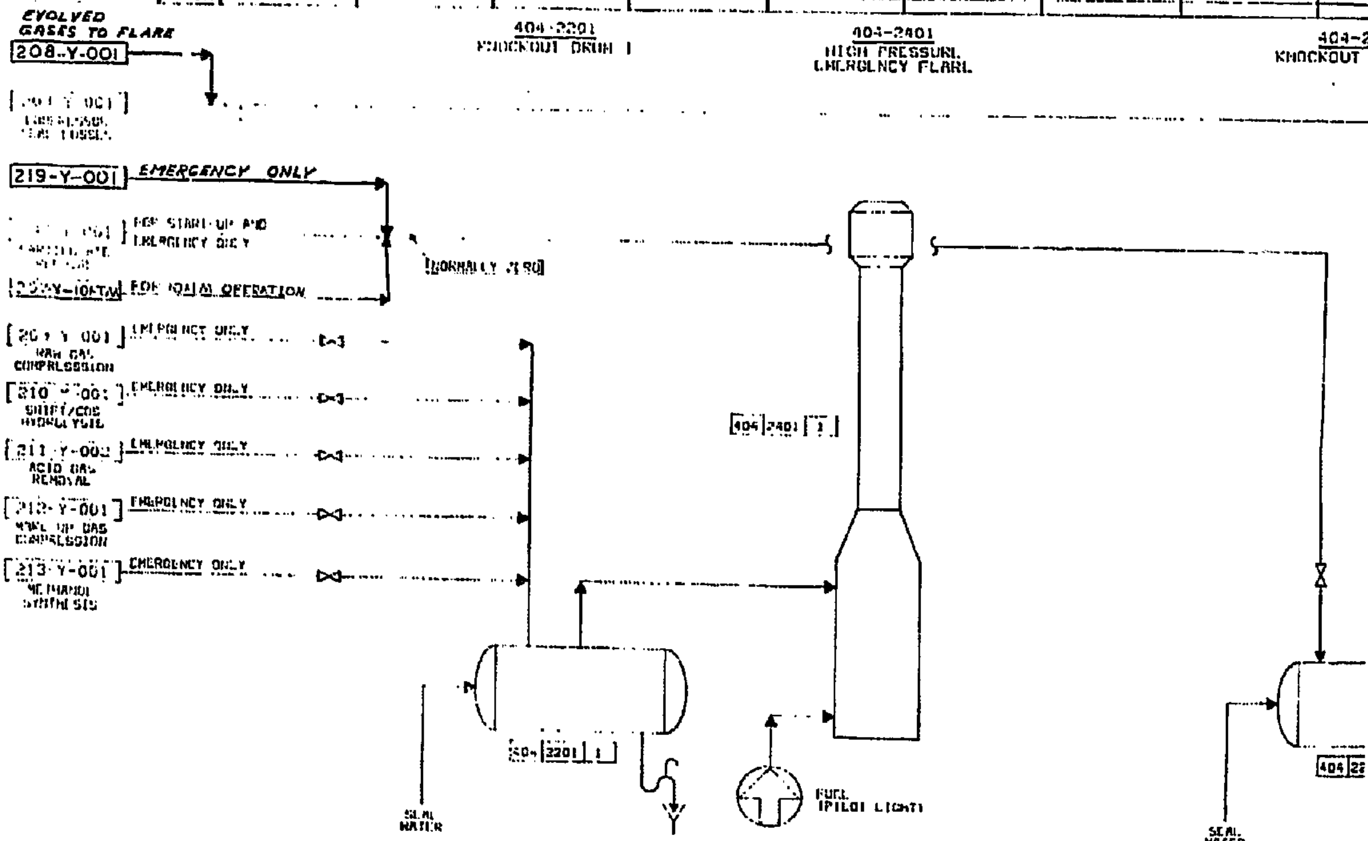
TITLE: COAL HANDLING & STORAGE FACILITIES.- FIRE PROTECTION.

SCALE: NONE

5530
308-Y-002

REVISION: 0

STREAM NO.		6		2	3	4	5	6	7	8
STREAM DESCRIPTION		CONTINUOUS FLARE GASES								
PHASE										
COMPONENT	MOL. WT.	WT. %	LB. MOL/HR							
CARBON	12.011									
HYDROGEN	2.016	82.47	240.21							
NITROGEN	28.014	1.18	8.76							
SULFUR	32.060									
OXYGEN	32.000									
CHLORINE	35.453									
NOX										
WATER	18.016	7.69	58.39							
CARBON MONOXIDE	28.011	87.98	276.42							
CARBON DIOXIDE	44.011	18.83	134.86							
METHANE	16.043	2.79	20.62							
HYDROGEN SULFIDE	34.076	0.06	0.46							
CARBONYL SULFIDE	60.071	81 PPM	0.06							
SULFUR DIOXIDE	64.066									
METHANOL	32.042									
DIMETHYL ETHER	46.068									
HIGHER ALCOHOL	74.120									
TOTAL (WET)		100.00	739.78							
FLOW (DRY)	SCFH	258,580								
TOTAL FLOW	LB/HR	15,810								
PRESSURE	PSIG	20								
TEMPERATURE	°F	100								
HHV	BTU/LB									
HHV (DRY)	BTU/SCF									



NO.	DESCRIPTION	BY	CH.	APPROVED	DATE
0	ISSUED FOR FINAL REPORT	F.D.			7/81

NO.	DESCRIPTION	BY	CH.	APPROVED	DATE

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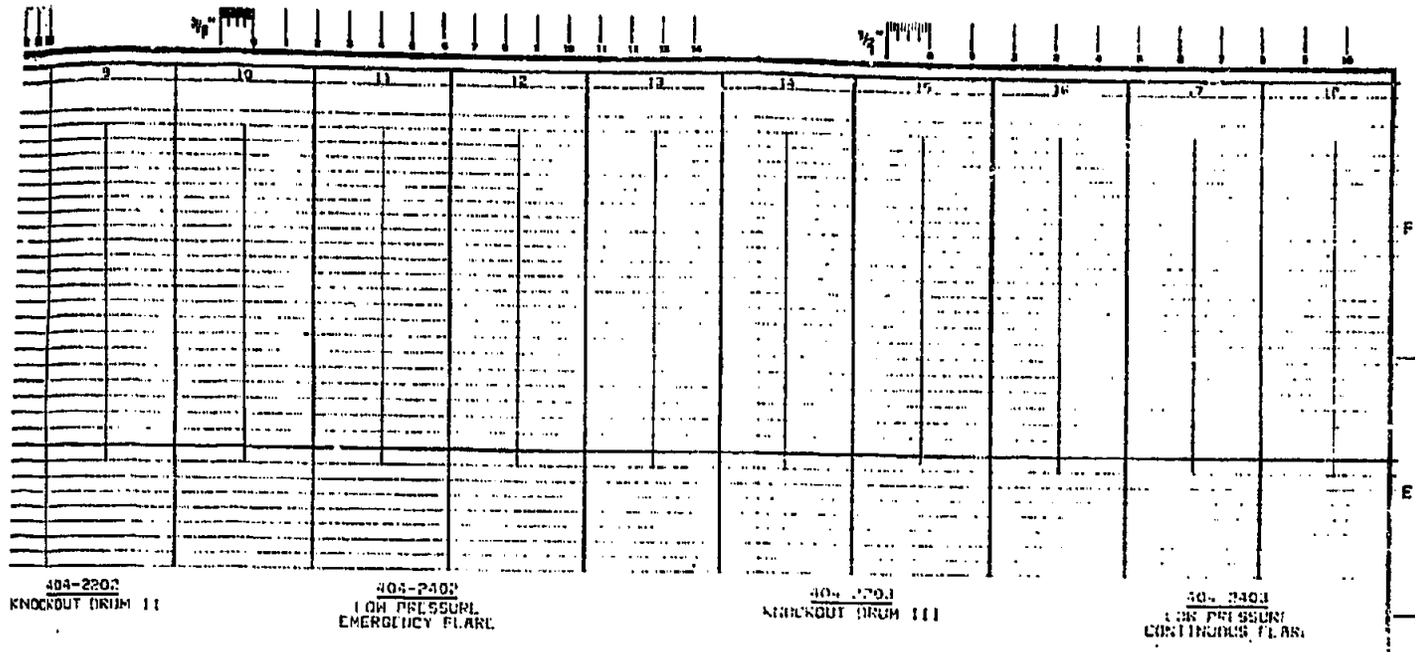
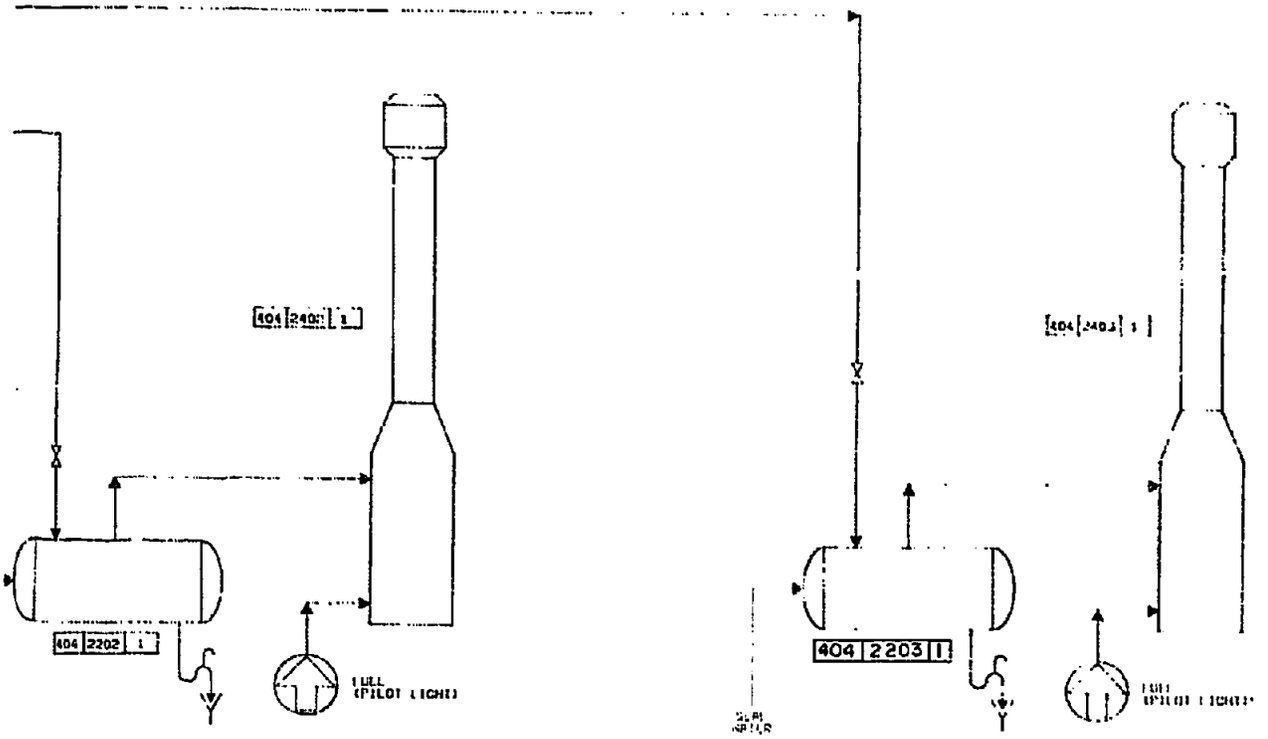




CLIENT: CIRI/PLATCUS
BELUGA RIVER GAS PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

	BY	DATE
DESIGNED	[illegible]	
DRAWN	[illegible]	7/27
CHECKED	[illegible]	7/27
APPROVED 1	TAL	7/27
APPROVED 2		
APPROVED 3		

DATE TO: CLIENT, FIELD

TITLE: RELIEF AND FLARE SYSTEM

SCALE: _____ DWG NO.: 5530-404-Y-001

REVISION: 0

8 AC0397

NOMENCLATURE:
T - TYPE
C - CAPACITY
S - SIZE
P/T - OPERATING PRESSURE/TEMPERATURE
M - MATERIAL
CS - CARBON STEEL
SS - STAINLESS STEEL
CI - CAST IRON
D - DRIVE
W - WEIGHT
ACC - ACCESSORIES

FIRE WATER SYSTEM - AREA 308

EQUIPMENT LIST

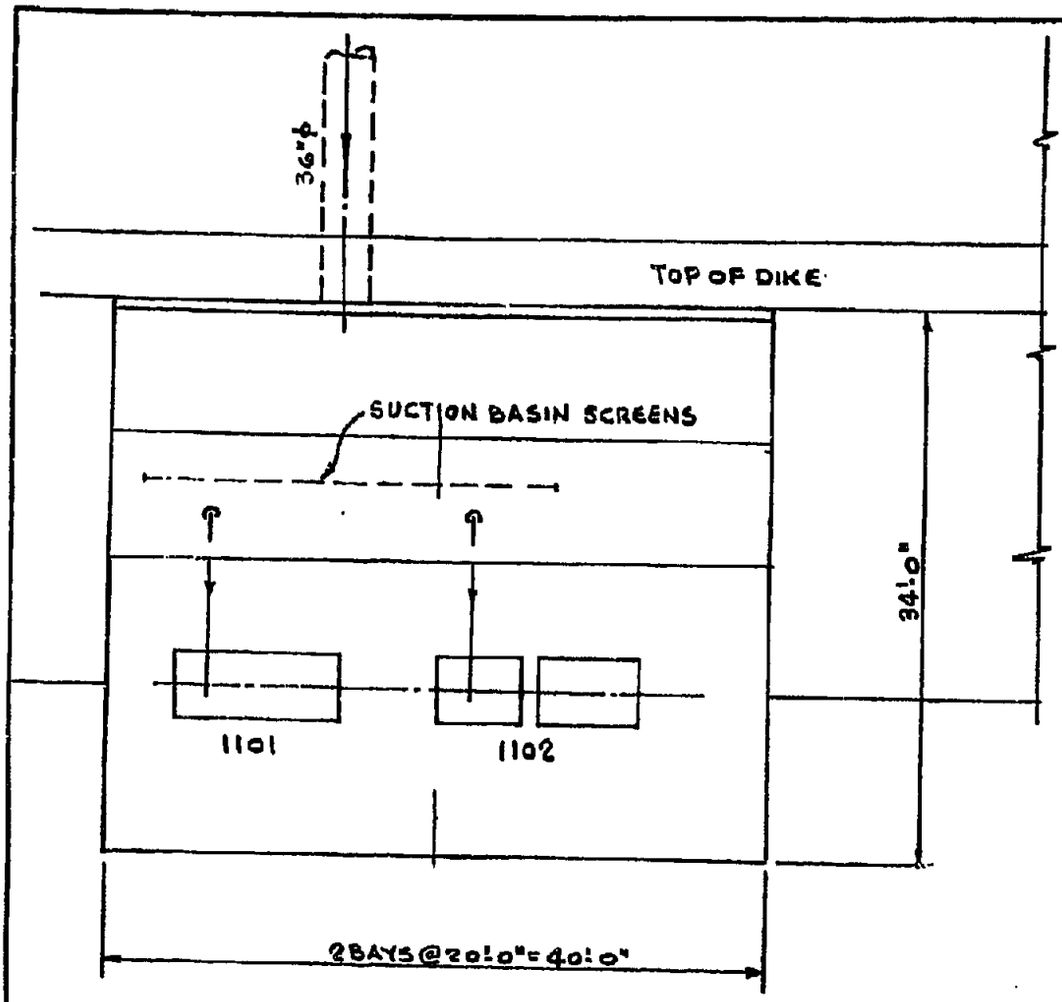
ITEM	NO. REQUIRED	DESCRIPTION
308-1101	1	**Fire Water Pump I**
		T - Centrifugal
		C - 5,500 GPM @ 1 psig, 60°F; ΔP = 135 psig
		M - Carbon Steel
		D - 550 hp, Electric
308-1102	1	**Fire Water Pump II**
		T - Centrifugal
		C - 5,500 GPM @ 1 psig, 60°F; ΔP = 135 psig
		M - Carbon Steel
		D - 550 hp, Diesel
308-2201	1	**Diesel Fuel Storage**
		T - Vertical, Cylindrical
		C - 1,000 gal
		M - Carbon Steel
		P/T - Atm/Amb

NOMENCLATURE:
T - TYPE
C - CAPACITY
S - SIZE
P/T - OPERATING PRESSURE/ TEMPERATURE
M - MATERIAL
CS - CARBON STEEL
SS - STAINLESS STEEL
CI - CAST IRON
D - DRIVE
W - WEIGHT
ACC - ACCESSORIES

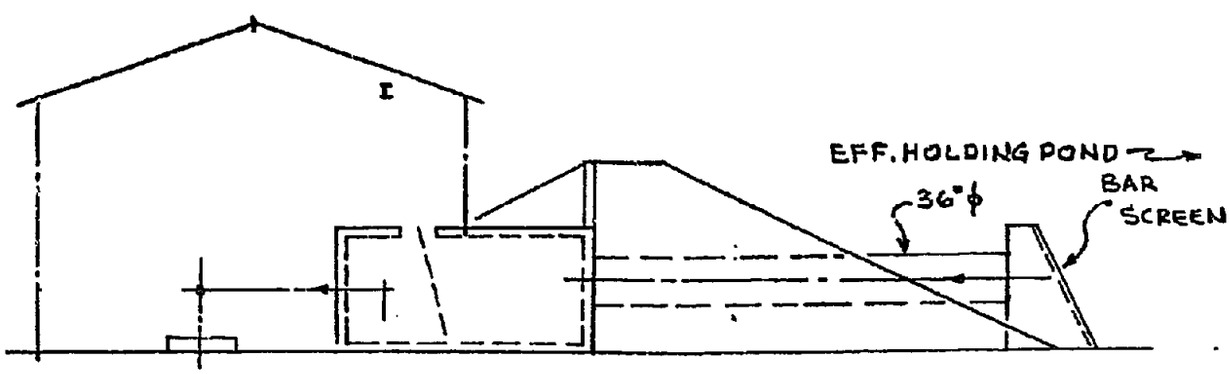
RELIEF AND FLARE SYSTEM - AREA 404

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
404-2501	1	Relief and Flare System Package This area is to handle discarded gas from the process. The package unit is to include the following items:
404-2201	1	Knockout Drum I
404-2202	1	Knockout Drum II
404-2203	1	Knockout Drum III
404-2401	1	H.P. Emergency Flare - Max. Rate - 152,664 SCFM
404-2402	1	L.P. Emergency Flare - Max. Rate - 152,664 SCFM
404-2403	1	L.P. Continuous Flare - Max. Rate - 3,751 SCFM



REVISIONS					REVISIONS					REFERENCES	
NO.	DESCRIPTION	BY	CHK.	DATE	NO.	DESCRIPTION	BY	CHK.	DATE	DWG. NO.	TITLE
A	FOR REVIEW	WJS		7/2/91	0	ISSUED FOR FINAL REPORT	GW		7/10/91		



CLIENT

CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

	BY	DATE
DES		
DRWN		
CK'D		
APP	[illegible]	7/20/81
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TITLE

FIRE WATER PUMPS
PLAN & SECTION

SCALE 1"=10'

REV. 0

DRAWING NO.

5530-308-P-001

SECTION 11.0
STORAGE FACILITIES FOR METHANOL PRODUCT, FUELS, CHEMICALS

11.1 METHANOL STORAGE AND PUMPING (Area 215, Dwg 5530-215-Y-001)

Storage capacity is provided for 786,000 barrels of methanol product, which is equivalent to 15 days' production.

The storage facilities consist of three 210 ft diameter, 262,000 barrel carbon steel tanks, located in an area diked to contain any spills or leaks that may occur.

Each tank is provided with a vapor recovery system which uses refrigeration to condense methanol vent vapors and return the liquid to the tank. This system includes a vapor scrubbing packed tower, refrigeration unit, chiller, liquid methanol receiver and a recirculation pump.

Two 3500 gpm transfer pumps are provided at each tank, one operating and one spare. Piping is manifolded so that any or all pumps can be utilized at one time to empty a tank and thus reduce pumping time.

11.2 FUEL STORAGE (Area 106, Dwg 5530-105/106-Y-001)

Three carbon steel storage tanks are provided; one each for diesel fuel, No. 2 fuel oil and gasoline. All are located within diked wall areas remote from processing operations.

- The diesel fuel tank is 30 ft ID by 24 ft high and has a capacity of 95,400 gallons, equivalent to a 15-day supply. Internal heating coils are provided to warm the contents in cold weather. Two 100 gpm centrifugal pumps are provided, one operating and one spare.

- The No. 2 fuel oil tank is 25 ft ID by 24 ft high, and has a capacity of 70,800 gallons - a 15-day supply. This tank is also equipped with internal heating coils, and two 100 gpm centrifugal pumps - one operating and one spare.

- The gasoline storage tank is 20 ID by 18 ft high with capacity for 30,000 gallons - a 30-day supply. This tank is equipped with a floating roof for vapor containment. Two 25 gpm centrifugal pumps are provided - one operating and one spare.

11.3 CHEMICAL STORAGE (Area 105, Dwg 5530-105/106-Y-001)

This area contains a lime storage silo, a caustic tank and two sulfuric acid tanks. The lime and caustic are required for wastewater treatment. The sulfuric acid is used in the raw water treatment area and also at the cooling towers.

- Lime is stored in a concrete silo capable of holding a 15-day supply at normal plant usage. Lime is delivered to the area in bulk carriers and is transferred to storage pneumatically. A baghouse is provided on top of the silo to remove entrained solids from the vent gas.

- Caustic - One 15,000 gallon carbon steel tank is provided to store a 15-day supply of 50% caustic solution. Internal heating coils are provided to maintain the temperature of the contents between 60° and 100°F. Two 5 gpm centrifugal pumps are provided, one operating and one spare.

- Sulfuric Acid - Two 32,000 gallon carbon steel tanks are provided for storage of a 15-day supply of 66° Baume

sulfur acid. Internal heating coils are included to prevent freezing in winter. One 100 gpm centrifugal pump will serve both tanks. Two pumps are provided, one operating and one spare.

11.4 ENGINEERING DESIGN DATA

Design data pertinent to storage facilities is detailed in the drawings listed below and in the Equipment Lists beginning on Page 11/4.

DRAWING NO.	TITLE
5530-105/106-Y-001	Chemicals/Fuel Storage
5530-215-Y-001	Product Storage & Pumping

NOMENCLATURE:
T - TYPE
C - CAPACITY
S - SIZE
P/T - OPERATING PRESSURE/TEMPERATURE
M - MATERIAL
CS - CARBON STEEL
SS - STAINLESS STEEL
CI - CAST IRON
D - DRIVE
W - WEIGHT
ACC - ACCESSORIES

CHEMICAL STORAGE - AREA 105

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
105-1101	2 + 2	Sulfuric Acid Pump
		T - Centrifugal C - 100 GPM ΔP = 5 psig M - Carbon Steel D - 2 hp, Electric
105-1102	1 + 1	Caustic Pump
		T - Centrifugal C - 25 GPM ΔP = 5 psig M - Carbon Steel D - 1 hp, Electric
105-1701	1	Dry Lime Bag House
		T - Bag, Pulse Air 4.5: 1 Air/Cloth C - 1,500 ACFM S - 330 Sq. Ft. M - Carbon Steel D - 20 hp
105-2201	2	Sulfuric Acid Tank
		T - Vertical, Cylindrical S - 25' ID x 25' T-T M - Carbon Steel Des P/T - Atm/Amb ACC - Internal Heating Coil
105-2202	1	Caustic Tank
		T - Vertical, Cylindrical S - 15' ID x 18' T - T M - Carbon Steel Des P/T - Atm/Amb ACC - Internal Heating Coil

CHEMICAL STORAGE - AREA 105

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
105-2203	1	Lime Storage T - Vertical Concrete Silo S - 10' ID x 21' Straight Side with cone bottom M - Concrete P/T - Atm/Amb

NOMENCLATURE:
T - TYPE
C - CAPACITY
S - SIZE
P/T - OPERATING PRESSURE/TEMPERATURE
M - MATERIAL
CS - CARBON STEEL
SS - STAINLESS STEEL
CI - CAST IRON
D - DRIVE
W - WEIGHT
ACC - ACCESSORIES

FUEL STORAGE - AREA 106

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
106-1101	1 + 1	Gasoline Pump T - For Gasoline Service C - 25 GPM ΔP = 5 psig M - Carbon Steel D - 1 hp, Electric
106-1102	1 + 1	Diesel Fuel Pump T - Centrifugal C - 100 GPM ΔP = 10 psig M - Carbon Steel D - 2 hp, Electric
106-1103	1 + 1	No. 2 Fuel Oil Pump T - Centrifugal C - 100 GPM ΔP = 10 psig M - Carbon Steel D - 2 hp, Electric
106-2201	1	Gasoline Storage Tank T - Vertical, Cylindrical with Floating Roof S - 20' ID x 18' T-T M - Carbon Steel Des P/T - Atm/Amb
106-2202	1	Diesel Fuel Storage Tank T - Vertical, Cylindrical S - 30' ID x 24' T - T M - Carbon Steel Des P/T - Atm/Amb ACC - Internal Heating Coil

FUEL STORAGE - AREA 106

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
106-2203	1	No. 2 Fuel Oil Tank

T - Vertical, Cylindrical
S - 25' ID x 24' T-T
M - Carbon Steel
Des P/T - Atm/Amb
ACC - Internal Heating Coil

T - TYPE
C - CAPACITY
S - SIZE
P/T - OPERATING PRESSURE/ TEMPERATURE
M - MATERIAL
CS - CARBON STEEL
SS - STAINLESS STEEL
CI - CAST IRON
D - DRIVE
W - WEIGHT
ACC - ACCESSORIES

PRODUCT STORAGE AND PUMPING-AREA 21-

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
215-1101	3 + 3	Product Methanol Pump T - Horizontal, Centrifugal C - 3500 GPM, ΔP=870 psi M - Carbon Steel D - 2090 hp
215-1102	6 + 3	Product Methanol Re-Run Pump T - Centrifugal, Horizontal C - 1215 GPM @ 20 psi ΔP M - Casing-Carbon Steel - Impellor-Cast Iron D - 30 hp, Electric
215-1103	1 + 1	Crude Methanol Pump T - Centrifugal, Horizontal C - 740 GPM @ 90 psi ΔP M - Casing-Stainless Steel - Impellor-Stainless Steel D - 75 hp, Electric
215-2201	3	Product Methanol Storage Tank T - Vertical, Cylindrical C - 11,000,000 gal S - 210' ID x 48' T-T M - Carbon Steel P - ATM
215-2202	6	Product Methanol Re-Run Tank T - API Cone Roof S - 45' ID x 40' High M - Carbon Steel P - ATM
215-2203	1	Crude Methanol Storage Tank T - API Cone Roof S - 78' ID x 48' High M - Carbon Steel P - ATM

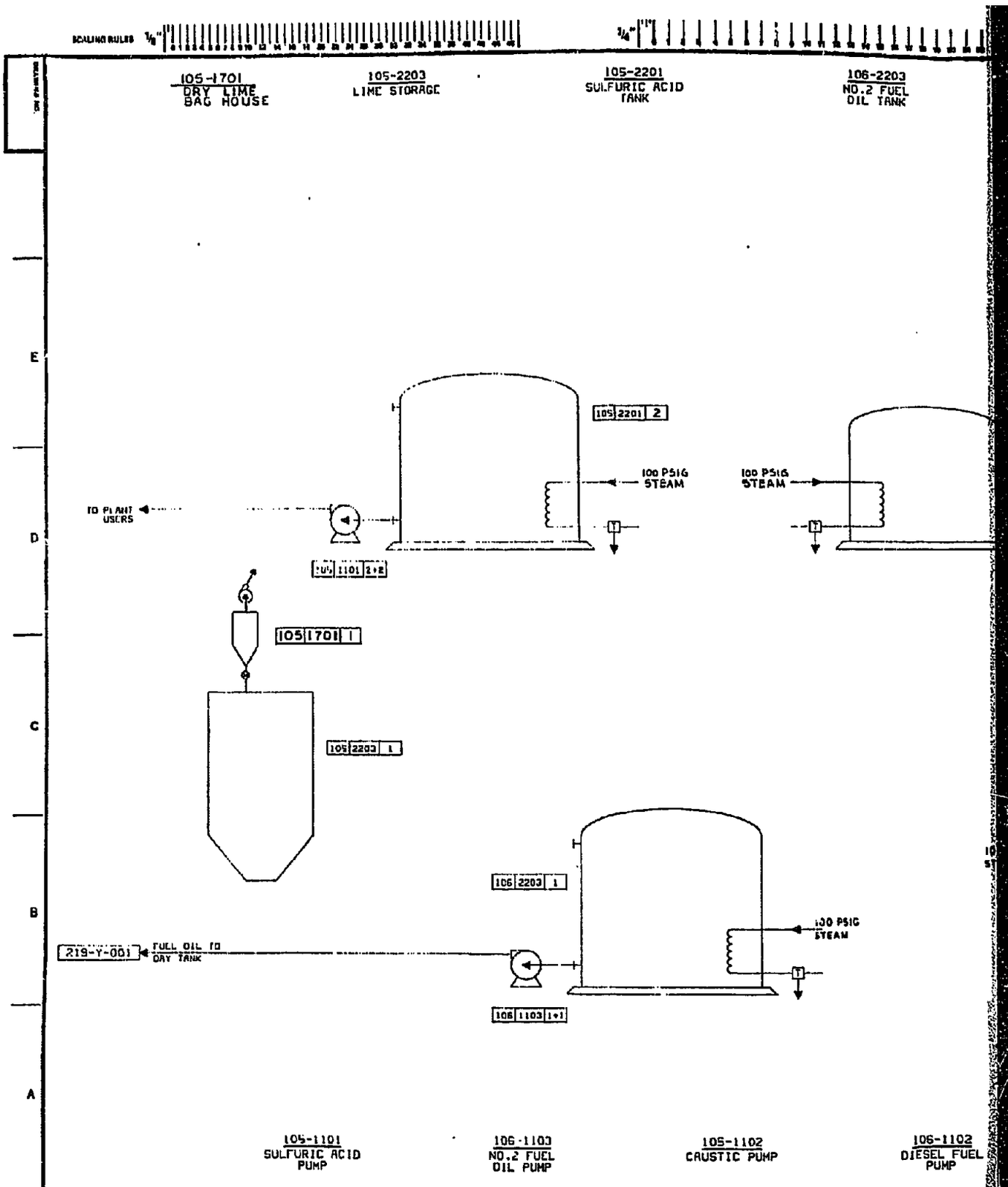
PRODUCT STORAGE AND PUMPING-AREA 215

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
215-2501	3	Vapor Recovery System

This package is to include the following items:

- Vapor Scrubbing Packed Tower
- Refrigeration System
- Chiller
- Liquid Methanol Receiver
- Circulation Pump


SCALING RULES 1/8" 1/4"
105-1701
DRY LIME
BAG HOUSE
105-2203
LIME STORAGE
105-2201
SULFURIC ACID
TANK
106-2203
NO.2 FUEL
OIL TANK
105 2201 2
100 PSIG
STEAM
100 PSIG
STEAM
TO PLANT
USERS
105 1101 1+2
105 1701 1
105 2203 1
106 2203 1
100 PSIG
STEAM
219-Y-001
FUEL OIL TO
DAY TANK
106 1103 1+1
105-1101
SULFURIC ACID
PUMP
106-1103
NO.2 FUEL
OIL PUMP
105-1102
CAUSTIC PUMP
106-1102
DIESEL FUEL
PUMP
REVISIONS
NO.
DESCRIPTION
BY
CHK.
APPROVED
DATE
ISSUED FOR FINAL REPORT
F.D.
7/7/81
REFERENCES
1
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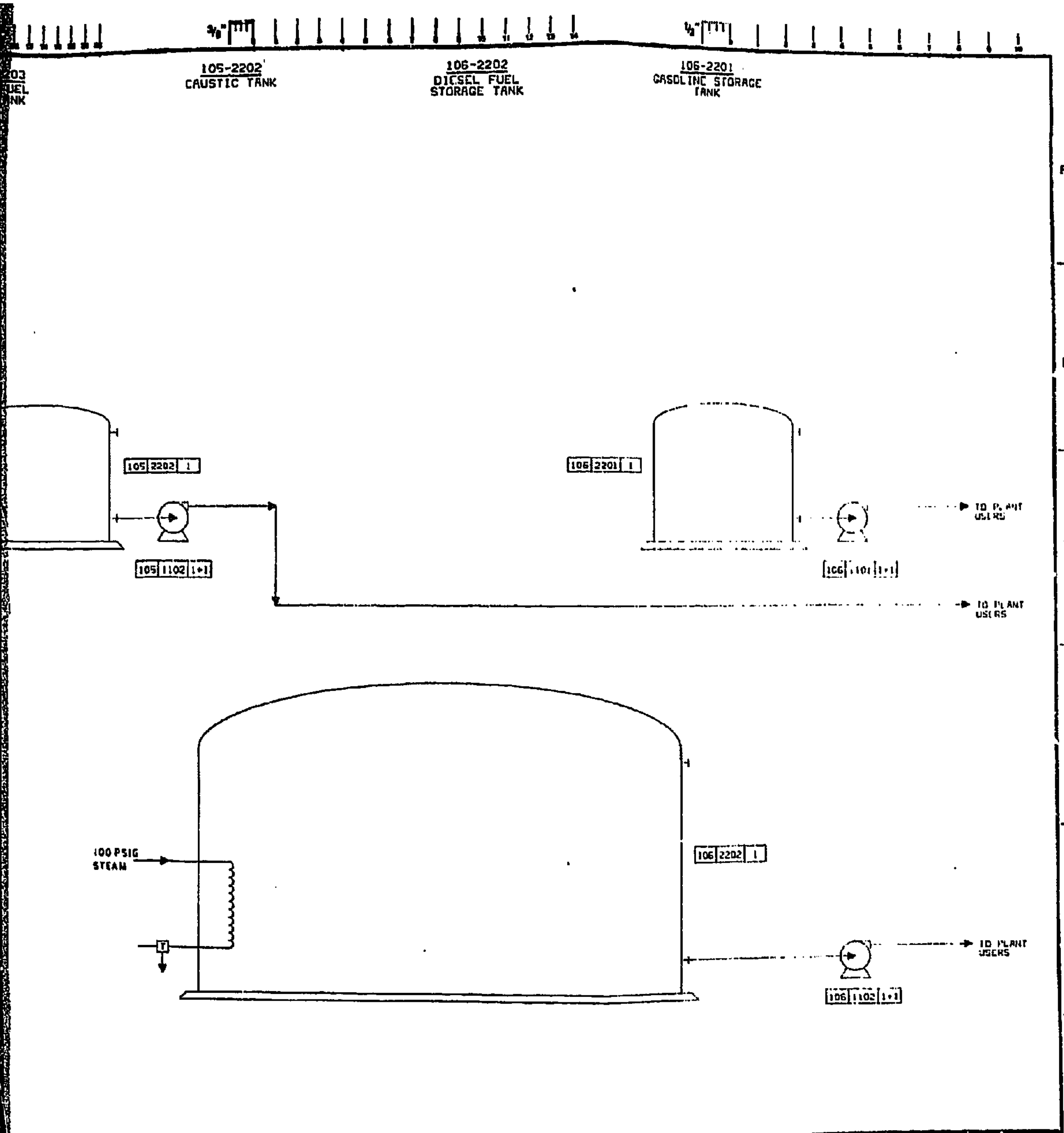

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CLIENT: CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

TITLE: CHEMICAL/FUEL STORAGE

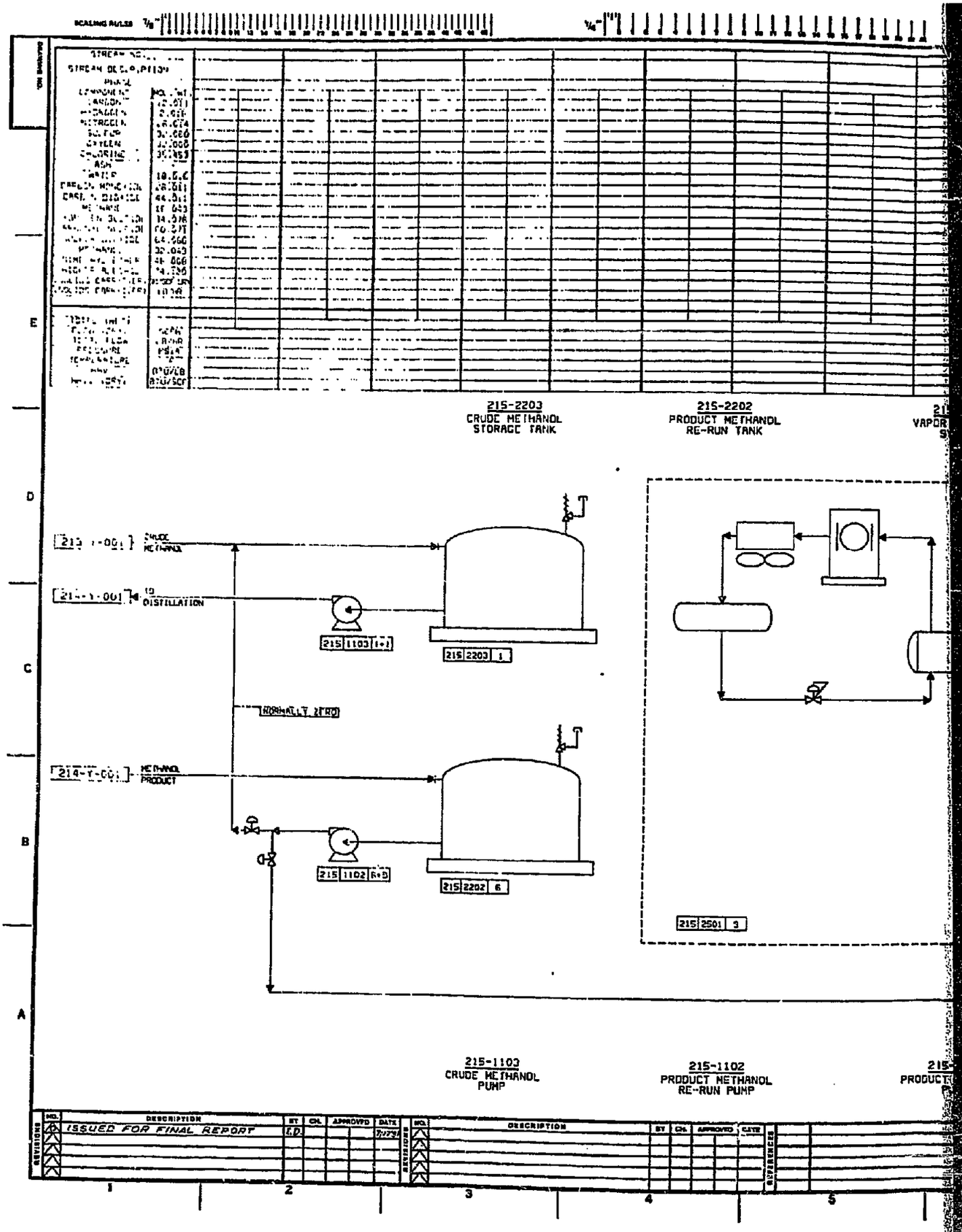
5530-105/106-Y-001

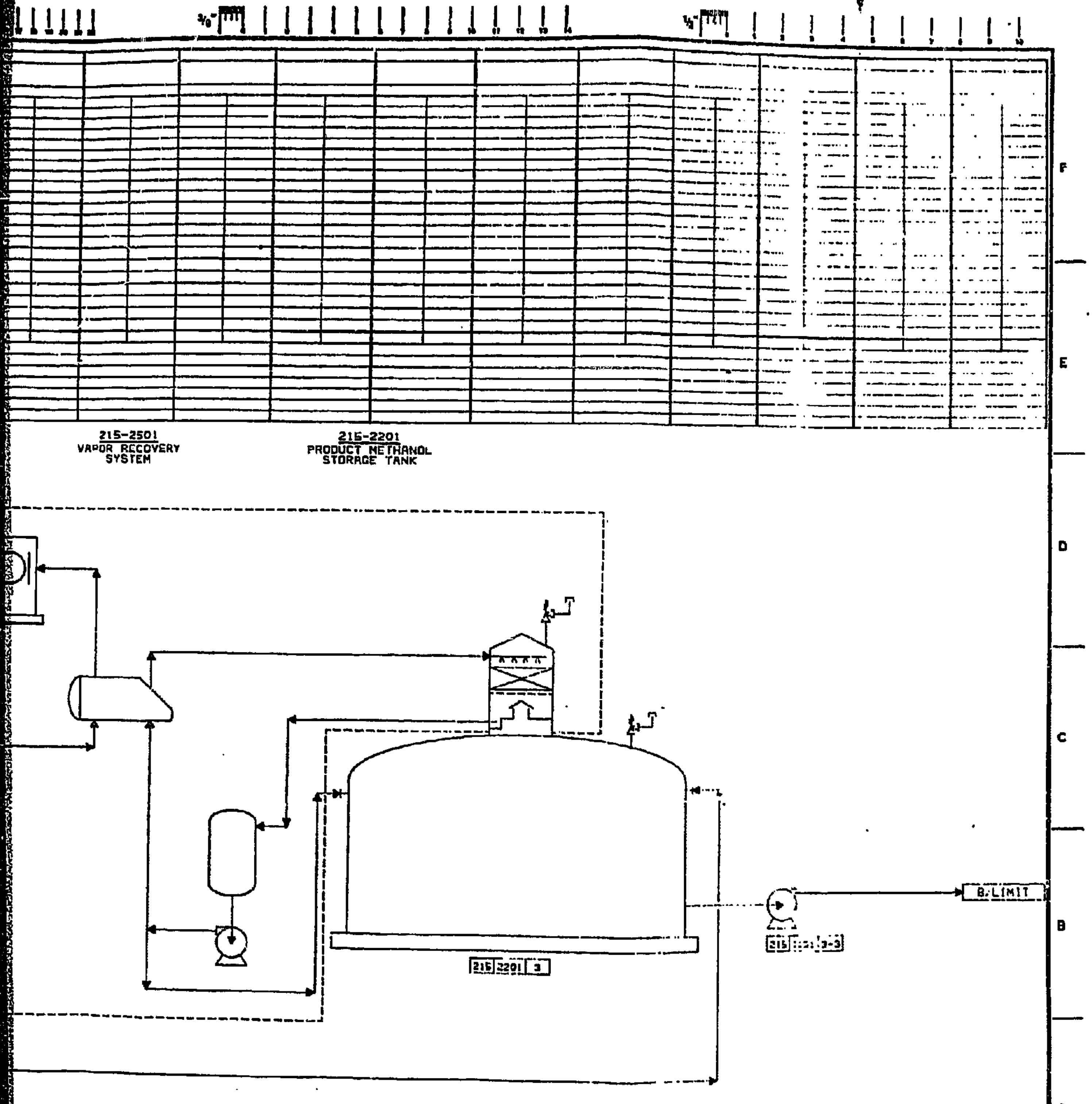
REVISION: 0

	BY	DATE
DESIGNED		
DRAWN	MHS	
CHECKED	GPL	
APPROVED 1		
APPROVED 2		
APPROVED 3		

SCALE
ER NO.
AC1443

6 7 8 9 10


215-2203
CRUDE METHANOL
STORAGE TANK
215-2202
PRODUCT METHANOL
RE-RUN TANK
215-1103
CRUDE METHANOL
PUMP
215-1102
PRODUCT METHANOL
RE-RUN PUMP
NORMALLY ZERO
215 1103 1+1
215 2203 1
215 1102 1+1
215 2202 6
215 2501 3
ISSUED FOR FINAL REPORT



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CLIENT: CIRI/PLACER, BELUGA METHANOL PROJECT, COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

TITLE: PRODUCT STORAGE AND PUMPING

5530-215-Y-001

REVISION: 0

DESIGNED	BY	DATE
DRAWN		
CHECKED		
APPROVED 1	TKS	
APPROVED 2		
APPROVED 3		

DATE TO: CLIENT, R.F.D.

SCALE ______ B/M NO. ______

AC142F