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APPENDIX D-6

Providence #1 - Kentucky No. 9 Seam

	Page
IC-38 - Total Product: a-d, f-o	D- 97
IC-39 - 2" Rd. x 1/4" Rd.: a-k, n-o	D-104
IC-40 - 1/4" Rd. x 0: a-d, f-k, n-o	D-110

F-467

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COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434

PLEASE ADDRESS ALL CORRESPONDENCE TO
P.O. BOX 752, HENDERSON, KY 42420
OFFICE TEL. (502) 827-1187

TEXAS EASTERN SYNFUELS
Houston, TX 77001

August 17, 1981

Kind of sample reported to us	Coal	Sample identification by	CT&E Company
Sample taken at	Providence #1 Mine Providence, Kentucky		Tri-State Synfuels Project Island Creek Coal Company Providence No. 1 Mine Crushed Raw Coal - Total Product IC38
Sample taken by	CT&E		
Date sampled	June 23, 1981		
Date received	June 23, 1981	Analysis report no.	63-136454

PROXIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	7.14	XXXXX
Ash	19.19	20.67
Volatile	33.72	36.31
Fixed Carbon	39.95	43.02
	100.00	100.00
Btu/lb.	10739	11565
Sulfur	4.21	4.53
Alk. as Na_2O	0.53	0.57
SULFUR FORMS		
Pyritic Sulfur	2.69	2.90
Sulfate Sulfur	0.00	0.00
Organic Sulfur	1.52	1.63
	4.21	4.53
WATER SOLUBLE ALKALIES		
Na_2O	XXXX	XXXX
K_2O	XXXX	XXXX

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	7.14	XXXXX
Carbon	58.45	62.94
Hydrogen	4.40	4.74
Nitrogen	0.85	0.92
Chlorine	0.20	0.21
MAF 14578 Sulfur	4.21	4.53
Ash	19.19	20.67
Oxygen (diff)	5.56	5.99
	100.00	100.00

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	49.43
Alumina, Al_2O_3	17.65
Titania, TiO_2	0.84
Ferric oxide, Fe_2O_3	19.68
Lime, CaO	4.37
Magnesia, MgO	1.16
Potassium oxide, K_2O	2.79
Sodium oxide, Na_2O	0.92
Sulfur trioxide, SO_3	2.88
Phos. pentoxide, P_2O_5	0.14
Strontium Oxide, SrO	0.00
Barium Oxide, BaO	0.09
Manganese Oxide, Mn_3O_4	0.05
Undetermined	0.00
	100.00

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	1970 °F	2470 °F
Softening (H=W)	2050 °F	2510 °F
Softening (H=½W)	2090 °F	2560 °F
Fluid	2300 °F	2590 °F

H is Cone Height
W is Cone Width

% EQUILIBRIUM MOISTURE 4.97
HARDGROVE GRINDABILITY INDEX 57.7 at 3.80% Moisture
FREE SWELLING INDEX 6

Silica Value 66.22
Base: Acid Ratio 0.43
T_{250} Temperature 2380

Fouling Index 0.4
Slagging Index 1.9

.(IMATED VISCOSITY at critical viscosity temperature of 2290°F = 980 poises

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division

D-97. Charter Member

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F-454

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January 4, 1982

TEXAS EASTERN SYNFUELS, INC.
Houston, TX 77001

Sample identification by CT&E Company

Kind of sample reported to us: Coal

Sample taken at: Providence #1 Mine
Providence, Kentucky

Sample taken by: CT&E

Date sampled: June 23, 1981

Date received: June 23, 1981

Tri-State Synfuels Project
Island Creek Coal Company
Providence No. 1 Mine
Crushed Raw Coal - Total Product
IC38

Analysis report no. 63-136454

Caking Index (Damm's Method) = 15 - 16

	As Received	Dry Basis
Moisture, %	7.14	XXXX
Fluorine (F)[1], µg/g	90	97
Mercury (Hg)[2], µg/g	0.10	0.11

1. Preparation by oxygen bomb combustion; analysis by ion selective electrode. ASTM, Part 26, D3761-79

2. Preparation by oxygen train combustion; analysis by flameless cold vapor atomic absorption spectroscopy. ASTM, Part 26, D3684-78

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division

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D-98.

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TEXAS EASTERN SYNFUELS
Houston, TX 77001

August 17, 1981

Sample identification by CT&E Company

Kind of sample reported to us: Coal

Sample taken at: Providence #1 Mine, Providence, Kentucky

Sample taken by: CT&E

Date sampled: June 23, 1981

Date received: June 23, 1981

Tri-State Synfuels Project
Island Creek Coal Company
Providence No. 1 Mine
Crushed Raw Coal - Total Product
IC38

Analysis report no. 63-136454

Alkalies, dry coal basis

	Water Soluble	Non Water Soluble
Sodium oxide, Na_2O, ppm	678	988
Potassium oxide, K_2O, ppm	113	5035

% Ash in non water soluble coal = 19.00

% Ash in original sample = 20.67

Alkalies calculated to ignited basis from above:

	Ignited basis
% Sodium oxide, Na_2O	0.85
% Potassium oxide, K_2O	2.70

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

LT/kmc

L. W. TAYLOR III, Manager, Central Division D-99.

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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CENTRAL DIVISION MANAGER
L.W. TAYLOR III

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January 4, 1982

TEXAS EASTERN SYNFUELS, INC.
Houston, TX 77001

Lab No. 63-136454

Tri-State Synfuels Project
Island Creek Coal Company
Providence No. 1 Mine
Crushed Raw Coal - Total Product
IC38

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS

CONCENTRATION IN PPM WEIGHT

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium	8 (3.0)	Terbium	0.1	Ruthenium		Vanadium	68
Thorium	4	Gadolinium	0.3	Molybdenum	8	Titanium	MC
Bismuth		Europium	0.1	Niobium	2	Scandium	1
Lead	17	Samarium	2	Zirconium	26	Calcium	MC
Thallium		Neodymium	3	Yttrium	4	Potassium	MC
Mercury	NR	Praseodymium	1	Strontium	15	Chlorine	230
Gold		Cerium	12	Rubidium	31	Sulfur	MC
Platinum		Lanthanum	19	Bromine	8	Phosphorus	*390
Iridium		Barium	220	Selenium	3	Silicon	MC
Osmium		Cesium	1	Arsenic	4	Aluminum	MC
Rhenium		Iodine	2	Germanium	2	Magnesium	MC
Tungsten		Tellurium	0.3	Gallium	7	Sodium	MC
Tantalum		Antimony	2	Zinc	15	Fluorine	NR
Hafnium	0.5	Tin	0.8	Copper	8	Oxygen	NR
Lutetium	0.1	Indium	STD	Nickel	4	Nitrogen	NR
Ytterbium	0.5	Cadmium	0.3	Cobalt	2	Carbon	NR
Thulium		Silver		Iron	MC	Boron	21
Erbium	0.4	Palladium		Manganese	23	Beryllium	0.4
Holmium	0.5	Rhodium		Chromium	23	Lithium	3
Dysprosium	0.8	* Hegerogeneous		Neptunium	<0.1ppm	Hydrogen	NR

STD - Internal Standard
NR - Not Reported
All elements not detected <0.1ppm
MC - Major Component
INT - Interference
(- [illegible] (MPC)

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Lloyd W. Taylor, III
Manager, Central Division

D-100.

TABLE NO. II
Trace Elements by Atomic Absorption
(concentration in ug/g)

Parameter	IC-38 As Rec'd	IC-38 Dry	IC-41 As Rec'd	IC-41 Dry	PB-25 As Rec'd	PB-25 Dry	AX-1 As Rec'd	AX-1 Dry	AX-4 As Rec'd	AX-4 Dry
Moisture (%)[1]	7.14	XXXX	7.82	XXXX	15.19	XXXX	11.61	XXXX	7.39	XXXX
Antimony	0.3	0.3	0.4	0.4	0.1	0.1	0.3	0.3	0.3	0.3
Arsenic	4.2	4.5	4.1	4.5	2.3	2.7	13.4	15.2	2.1	2.3
Beryllium	1	1	1	1	1	1	1	1	1	1
Boron[2]	100	110	110	120	220	260	130	150	80	90
Cadmium	0.8	0.9	1.6	1.7	0.4	0.5	0.2	0.2	0.4	0.4
Chromium	20	22	32	35	23	27	19	22	19	21
Copper	12	13	14	15	14	16	17	19	10	11
Fluorine[3]	90	97	140	155	250	300	120	140	95	105
Lead	7	7	14	15	4	5	16	18	8	9
Lithium	14	15	16	17	14	16	24	27	9	10
Manganese	73	79	91	99	88	104	63	71	63	68
Mercury	0.10	0.11	0.16	0.17	0.11	0.13	0.09	0.10	0.13	0.14
Nickel	13	14	17	18	20	24	21	24	12	13
Selenium	3.3	3.6	4.9	5.3	4.2	4.9	0.9	1	2.5	2.7
Uranium[4]	2.8	3.0	3.5	3.8	2.6	3.1	1.4	1.6	16.5	17.8
Vanadium	80	86	62	67	58	68	19	22	34	37
Zinc	113	122	153	166	98	116	50	57	95	103

1 Determination by ASTM Method D3173
2 Determination by curcumin colorimetric technique
3 Determination by ASTM Method D3761
4 Determination by delayed neutron activation

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DATE : 12/1/81

SAMPLE NUMBER RF3-0235
SAMPLE DESCRIPTION CT&E Lab No. 63-136454, IC38
TERMINAL TEMP 941 DEG. F
FISHER ASSAY NO. PR 2352

FISCHER ASSAY YIELDS	AS ANALYZED	NORMALIZED
OIL (LB/TON)	265.0	268.5
(GAL/TON)	30.2	30.6
API GRAVITY	3.2	3.2
GAS (LB/TON)	102.5	103.8
(SCF/TON)	1628.1	1649.5
WATER (LB/TON)	85.6	86.7
(GAL/TON)	10.3	10.4
SS (LB/TON)	1521.0	1541.0
TOTAL (LB/TON)	1974.0	2000.0
VARIANCE (PC)	-1.3	

GAS (NORMALIZED)	(LB/TON)	(LB/100 LB) (FA OIL)
H2	1.10	0.41
CO	4.39	1.64
CO2	11.79	4.39
H2S	23.62	8.80
C1	29.28	10.90
C2	12.39	4.62
C2-	2.20	0.82
C3	6.63	2.47
C3-	3.03	1.13
I-C4	0.76	0.28
N-C4	2.28	0.85
C4-	2.20	0.82
C5	1.86	0.69
C6	1.67	0.62
C7	0.65	0.24
C8	0.00	0.00
C9	0.00	0.00

ADJUSTED YIELDS (NORMALIZED)	LB/TON	SCF/TON	LB/100 LB F A OIL
C3 & LIGHTER	94.4	1595.1	35.6
SCRUBBED C3&LIGHTER (LESS CO2 & H2S)	59.0	1231.0	22.3
C4 & HEAVIER	277.9		104.9
TOTAL HYDROCARBONS INCL. H2 & CO, LB/TON	336.9		127.1
C4 & HEAVIER (GAL/TON)		32.5	
API GRAVITY		6.3	

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GAS ANALYSIS

SAMPLE NUMBER	RF3-0235
SAMPLE DESCRIPTION	CT&E Lab No. 65-136454, IC38
FISCHER ASSAY NO.	FR 2352

COMPONENT	MOLE PERCENT
H2	12.61
CO	3.60
CO2	6.16
H2S	15.92
C1	42.04
C2	9.46
C2-	1.80
C3	3.45
C3-	1.65
I-C4	0.30
N-C4	0.90
C4-	0.90
C5	0.60
C6	0.45
C7	0.15
C8	0.00
C9	0.00
SUM	100.00

AVERAGE MOLE WT	23.86
LBS C IN GAS/TON SHALE	54.74
WT. PERCENT TOTAL CARBON	52.72
WT. PERCENT SULFUR	21.41

BTU VALUE OF GAS (CALC.)		GROSS	NET
C3 & LIGHTER*	(BTU/SCF)	930.05	845.87
SCRUBBED C3 & LIGHTER	(BTU/SCF)	1068.89	970.37
WHOLE GAS*	(BTU/SCF)	1019.10	929.00
SCRUBBED WHOLE GAS	(BTU/SCF)	1177.28	1071.76

*[INCL. H2S & CO2]

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Identification:

Tri-State Synfuels Project
Island Creek Coal Company
Providence No. 1 Mine
Crushed Raw Coal - Total Product
IC38

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F-457

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TEXAS EASTERN SYNFUELS
Houston, TX 77001

August 17, 1981

Kind of sample reported to us: Coal

Sample taken at: Providence #1 Mine, Providence, Kentucky

Sample taken by: CT&E

Date sampled: June 23, 1981

Date received: June 23, 1981

Analysis report no. 63-136457

Sample identification by CT&E Company

Tri-State Synfuels Project
Island Creek Coal Company
Providence No. 1 Mine
Plus 1/4" Rd. Screen Fraction
IC39

PROXIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	5.06	XXXXX
Ash	20.66	21.76
Volatile	34.27	36.10
Fixed Carbon	40.01	42.14
	100.00	100.00
Btu/lb.	10847	11425
Sulfur	4.44	4.68
Alk. as Na_2O	0.56	0.59
SULFUR FORMS		
Pyritic Sulfur	2.83	2.98
Sulfate Sulfur	0.00	0.00
Organic Sulfur	1.61	1.70
	4.44	4.68
WATER SOLUBLE ALKALIES		
Na_2O	XXXX	XXXX
K_2O	XXXX	XXXX

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	5.06	XXXXX
Carbon	58.74	61.87
Hydrogen	4.06	4.28
Nitrogen	0.83	0.87
Chlorine	0.17	0.18
MAF 14603 Sulfur	4.44	4.68
Ash	20.66	21.76
Oxygen (diff)	6.04	6.36
	100.00	100.00

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	50.85
Alumina, Al_2O_3	17.89
Titania, TiO_2	0.88
Ferric oxide, Fe_2O_3	20.45
Lime, CaO	2.69
Magnesia, MgO	1.11
Potassium oxide, K_2O	2.88
Sodium oxide, Na_2O	0.83
Sulfur trioxide, SO_3	2.16
Phos. pentoxide, P_2O_5	0.14
Strontium Oxide, SrO	0.00
Barium Oxide, BaO	0.07
Manganese Oxide, Mn_3O_4	0.05
Undetermined	0.00
	100.00

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	2020 °F	2430 °F
H is Cone Height: Softening (H=W)	2100 °F	2490 °F
H is Cone Width: Softening (H=½W)	2160 °F	2520 °F
Fluid	2370 °F	2560 °F

% EQUILIBRIUM MOISTURE	4.22
HARDGROVE GRINDABILITY INDEX	57.3 at 3.89% Moisture
FREE SWELLING INDEX	5
Silica Value	67.71
Base: Acid Ratio	0.40
T_{250} Temperature	2408
Fouling Index	0.3
Slagging Index	1.9

E IATED VISCOSITY at critical viscosity temperature of 2360°F = 700 poises

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division

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D-104.

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APPENDIX D-7

No. 9 - Kentucky No. 9 Seam

	Page
IC-41 - Total Product: a-d, f-o	D-116
IC-42 - 2" Rd. x 1/4" Rd.: a-k, n-o	D-123
IC-43 - 1/4" Rd. x 0: a-d, f-k, n-o	D-129

F-457

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TEXAS EASTERN SYNFUELS
Houston, TX 77001

August 17, 1981

Kind of sample reported to us: Coal

Sample taken at: Island Creek #9 Mine, Madisonville, Kentucky

Sample taken by: CT&E

Date sampled: June 23, 1981

Date received: June 23, 1981

Analysis report no. 63-136139

Sample identification by CT&E Company

Tri-State Synfuels Project
Island Creek Coal Company
No. 9 Mine
Crushed Raw Coal - Total Product
IC41

PROXIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	7.82	XXXXX
Ash	23.17	25.14
Volatile	31.49	34.16
Fixed Carbon	37.52	40.70
	100.00	100.00
Btu/lb.	9849	10685
Sulfur	4.34	4.71
Alk. as Na_2O	0.65	0.70
SULFUR FORMS		
Pyritic Sulfur	2.85	3.09
Sulfate Sulfur	0.00	0.00
Organic Sulfur	1.49	1.62
	4.34	4.71
WATER SOLUBLE ALKALIES		
Na_2O	XXXX	XXXX
K_2O	XXXX	XXXX

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	2090 °F	2590 °F
Softening (H=W)	2210 °F	2650 °F
Softening (H=½W)	2300 °F	2690 °F
Fluid	2420 °F	2730 °F

H is Cone Height
W is Cone Width

% EQUILIBRIUM MOISTURE	6.80
HARDGROVE GRINDABILITY INDEX	58.7 at 6.04% Moisture
FREE SWELLING INDEX	3
Silica Value	68.80
Base: Acid Ratio	0.38
T_{250} Temperature	2435

(IMATED VISCOSITY at critical viscosity temperature of 2500°F = 640 poises

MAF 14273

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	7.82	XXXXX
Carbon	53.94	58.52
Hydrogen	3.80	4.12
Nitrogen	1.14	1.24
Chlorine	0.07	0.08
Sulfur	4.34	4.71
Ash	23.17	25.14
Oxygen (diff)	5.72	6.19
	100.00	100.00

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	50.08
Alumina, Al_2O_3	18.82
Titania, TiO_2	0.84
Ferric oxide, Fe_2O_3	18.22
Lime, CaO	3.15
Magnesia, MgO	1.34
Potassium oxide, K_2O	3.00
Sodium oxide, Na_2O	0.82
Sulfur trioxide, SO_3	3.36
Phos. pentoxide, P_2O_5	0.26
Strontium Oxide, SrO	0.00
Barium Oxide, BaO	0.05
Manganese Oxide, Mn_3O_4	0.06
Undetermined	0.00
	100.00
Fouling Index	0.3
Slagging Index	1.8

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO

L. W. TAYLOR III, Manager, Central Division D-116.

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F-484

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SINCE 1909

January 2, 1982

TEXAS EASTERN SYNFUELS, INC.
Houston, TX 77001

Sample identification by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project
Sample taken at	Island Creek #9 Mine Madisonville, Kentucky	Island Creek Coal Company No. 9 Mine
Sample taken by	CT&E	Crushed Raw Coal - Total Product IC41
Date sampled	June 23, 1981	
Date received	June 23, 1981	

Analysis report no. 63-136139

Caking Index (Damm's Method) = 14 - 15

	As Received	Dry Basis
Moisture, %	7.82	XXXX
Fluorine, (F)[1], µg/g	145	155
Mercury, (Hg)[2], µg/g	0.16	0.17

1. Preparation by oxygen bomb combustion; analysis by ion selective electrode. ASTM, Part 26, D3761-79

2. Preparation by oxygen train combustion; analysis by flameless cold vapor atomic absorption spectroscopy. ASTM, Part 26, D3684-78

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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L.W. TAYLOR III, Manager, Central Division

D-117.

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TEXAS EASTERN SYNFUELS
Houston, TX 77001

August 17, 1981

Sample identification by CT&E Company

Kind of sample reported to us	Coal
Sample taken at	Island Creek #9 Mine Madisonville, Kentucky
Sample taken by	CT&E
Date sampled	June 23, 1981
Date received	June 23, 1981

Tri-State Synfuels Project
Island Creek Coal Company
No. 9 Mine
Crushed Raw Coal - Total Product
IC41

Analysis report no. 63-136139

Alkalies, dry coal basis

	Water Soluble	Non Water Soluble
Sodium oxide, Na_2O, ppm	737	950
Potassium oxide, K_2O, ppm	126	7125

% Ash in non water soluble coal = 22.62

% Ash in original sample = 25.14

Alkalies calculated to ignited basis from above:

	Ignited basis
% Sodium oxide, Na_2O	0.71
% Potassium oxide, K_2O	3.20

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division

D-118.

Charter Member

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COMMERCIAL TESTING & ENGINEERING CO.

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CENTRAL DIVISION MANAGER
L. W. TAYLOR III

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 752, HENDERSON, KY 42420
OFFICE TEL. (502) 827-1187

December 16, 1981

TEXAS EASTERN SYNFUELS, INC.
Houston, TX 77001

Lab No. 63-136139

Tri-State Synfuels Project
Island Creek Coal Company
No. 9 Mine
Crushed Raw Coal - Total Product
IC41

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS
CONCENTRATION IN PPM WEIGHT

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium	2 (35)	Terbium	0.1	Ruthenium		Vanadium	310
Thorium	3	Gadolinium	0.3	Molybdenum	7	Titanium	MC
Bismuth		Europium	0.2	Niobium	3	Scandium	2
Lead	11	Samarium	1	Zirconium	18	Calcium	MC
Thallium		Neodymium	2	Yttrium	3	Potassium	MC
Mercury	NR	Praseodymium	3	Strontium	22	Chlorine	35
Gold		Cerium	16	Rubidium	24	Sulfur	MC
atinum		Lanthanum	16	Bromine	5	Phosphorus	MC
Iridium		Barium	130	Selenium	3	Silicon	MC
Osmium		Cesium	0.9	Arsenic	5	Aluminum	MC
Rhenium		Iodine	0.3	Germanium	1	Magnesium	MC
Tungsten		Tellurium	0.1	Gallium	9	Sodium	MC
Tantalum		Antimony	1	Zinc	*41	Fluorine	NR
Hafnium		Tin	0.6	Copper	8	Oxygen	NR
Lutetium		Indium	STD	Nickel	11	Nitrogen	NR
Ytterbium		Cadmium	*0.9	Cobalt	1	Carbon	NR
Thulium		Silver		Iron	MC	Boron	15
Erbium	≤0.1	Palladium		Manganese	130	Beryllium	0.5
Holmium	≤0.2	Rhodium		Chromium	16	Lithium	9
Dysprosium	≤0.3	*Heterogeneous		Neptunium	<0.1ppm	Hydrogen	NR

STD - Internal Standard
NR - Not Reported
All elements not detected < 0.1ppm
MC - Major Component
INT - Interference

(MPC)

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Lloyd W. Taylor, III
Manager, Central Division

D-119. Charter Member

TABLE NO. II
Trace Elements by Atomic Absorption
(concentration in ug/g)

Parameter	IC-38 As Rec'd	IC-38 Dry	IC-41 As Rec'd	IC-41 Dry	PB-25 As Rec'd	PB-25 Dry	AX-1 As Rec'd	AX-1 Dry	AX-4 As Rec'd	AX-4 Dry
Moisture (%)[1]	7.14	XXXX	7.82	XXXX	15.19	XXXX	11.61	XXXX	7.39	XXXX
Antimony	0.3	0.3	0.4	0.4	0.1	0.1	0.3	0.3	0.3	0.3
Arsenic	4.2	4.5	4.1	4.5	2.3	2.7	13.4	15.2	2.1	2.3
Beryllium	1	1	1	1	1	1	1	1	1	1
Boron[2]	100	110	110	120	220	260	130	150	80	90
Cadmium	0.8	0.9	1.6	1.7	0.4	0.5	0.2	0.2	0.4	0.4
Chromium	20	22	32	35	23	27	19	22	19	21
Copper	12	13	14	15	14	16	17	19	10	11
Fluorine[3]	90	97	140	155	250	300	120	140	95	105
Lead	7	7	14	15	4	5	16	18	8	9
Lithium	14	15	16	17	14	16	24	27	9	10
Manganese	73	79	91	99	88	104	63	71	63	68
Mercury	0.10	0.11	0.16	0.17	0.11	0.13	0.09	0.10	0.13	0.14
Nickel	13	14	17	18	20	24	21	24	12	13
Selenium	3.3	3.6	4.9	5.3	4.2	4.9	0.9	1	2.5	2.7
Uranium[4]	2.8	3.0	3.5	3.8	2.6	3.1	1.4	1.6	16.5	17.8
Vanadium	80	86	62	67	58	68	19	22	34	37
Zinc	113	122	153	166	98	116	50	57	95	103

1 Determination by ASTM Method D3173
2 Determination by curcumin colorimetric technique
3 Determination by ASTM Method D3761
4 Determination by delayed neutron activation

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DATE : 11/19/81

SAMPLE NUMBER RF3-0006
SAMPLE DESCRIPTION CT&E Lab No. 63-136139, IC41
TERMINAL TEMP 932 DEG. F
FISHER ASSAY NO. FB2332

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FISCHER ASSAY YIELDS	AS ANALYZED	NORMALIZED
OIL (LB/TON)	258.0	257.8
(GAL/TON)	29.5	29.5
API GRAVITY	3.6	3.6
GAS (LB/TON)	106.5	106.4
(SCF/TON)	1717.6	1716.1
WATER (LB/TON)	81.2	81.1
(GAL/TON)	9.7	9.7
SS (LB/TON)	1556.1	1554.7
TOTAL (LB/TON)	2001.8	2000.0
VARIANCE (PC)	0.1	

GAS (NORMALIZED)	(LB/TON)	(LB/100 LB) (FA OIL)
H2	1.21	0.47
CO	5.71	2.21
CO2	15.27	5.92
H2S	28.31	10.98
C1	29.22	11.33
C2	10.90	4.23
C2-	2.32	0.90
C3	4.99	1.94
C3-	2.86	1.11
I-C4	0.44	0.17
N-C4	1.32	0.51
C4-	2.12	0.82
C5	1.07	0.42
C6	0.64	0.25
C7	0.00	0.00
C8	0.00	0.00
C9	0.00	0.00

ADJUSTED YIELDS (NORMALIZED)	LB/TON	SCF/TON	LB/100 LB F A OIL
C3 & LIGHTER	100.8	1681.7	39.1
SCRUBBED C3&LIGHTER [LESS CO2 & H2S]	57.2	1235.6	22.2
C4 & HEAVIER	263.4		102.1
TOTAL HYDROCARBONS INCL. H2 & CO, LB/TON	320.6		124.2
C4 & HEAVIER (GAL/TON)		30.6	
API GRAVITY		5.6	

COMMERCIAL TESTING & ENGINEERING CO.

D-121.

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GAS ANALYSIS

SAMPLE NUMBER	RF3-0006
SAMPLE DESCRIPTION	CT&E Lab No. 63-136139, IC41
FISCHER ASSAY NO.	PB2332

COMPONENT	MOLE PERCENT
H2	13.33
CO	4.50
CO2	7.67
H2S	18.33
C1	40.33
C2	8.00
C2-	1.83
C3	2.50
C3-	1.50
I-C4	0.17
N-C4	0.50
C4-	0.83
C5	0.33
C6	0.17
C7	0.00
C8	0.00
C9	0.00
SUM	100.00

AVERAGE MOLE WT	23.49
LBS C IN GAS/TON SHALE	50.44
WT. PERCENT TOTAL CARBON	47.42
WT. PERCENT SULFUR	25.04

BTU VALUE OF GAS (CALC.)		GROSS	NET
C3 & LIGHTER*	(BTU/SCF)	867.20	788.66
SCRUBBED C3 & LIGHTER	(BTU/SCF)	1017.69	923.39
WHOLE GAS*	(BTU/SCF)	918.18	836.33
SCRUBBED WHOLE GAS	(BTU/SCF)	1082.52	984.18

*[INCL. H2S & CO2]

Identification:

Tri-State Synfuels Project
Island Creek Coal Company
No. 9 Mine
Crushed Raw Coal - Total Product

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F-467

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OFFICE TEL. (502) 827-1187

TEXAS EASTERN SYNFUELS
Houston, TX 77001

August 18, 1981

Kind of sample reported to us: Coal

Sample taken at: Island Creek #9 Mine, Madisonville, Kentucky

Sample taken by: CT&E

Date sampled: June 23, 1981

Date received: June 23, 1981

Analysis report no. 63-136140

Sample identification by CT&E Company

Tri-State Synfuels Project
Island Creek Coal Company
No. 9 Mine
Plus 1/4" Rd. Screen Fraction
IC42

PROXIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	7.08	XXXXX
Ash	25.73	27.69
Volatile	31.36	33.75
Fixed Carbon	35.83	38.56
	100.00	100.00
Btu/lb.	9582	10312
Sulfur	4.45	4.79
Alk. as Na_2O	0.74	0.80
SULFUR FORMS		
Pyritic Sulfur	2.99	3.22
Sulfate Sulfur	0.00	0.00
Organic Sulfur	1.46	1.57
	4.45	4.79
WATER SOLUBLE ALKALIES		
Na_2O	XXXX	XXXX
K_2O	XXXX	XXXX

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	2040 °F	2580 °F
Softening (H=W)	2150 °F	2640 °F
Softening (H=½W)	2230 °F	2660 °F
Fluid	2400 °F	2700 °F

H is Cone Height
W is Cone Width

% EQUILIBRIUM MOISTURE 7.39
HARDGROVE GRINDABILITY INDEX 56.2 at 6.02% Moisture
FREE SWELLING INDEX 3 1/2

Silica Value 70.23
Base: Acid Ratio 0.36
T_{250} Temperature 2463

ESTIMATED VISCOSITY at critical viscosity temperature of 2430°F = 610 poises

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	7.08	XXXXX
Carbon	51.80	55.75
Hydrogen	3.99	4.29
Nitrogen	0.96	1.03
Chlorine	0.07	0.08
MAF 14261 Sulfur	4.45	4.79
Ash	25.73	27.69
Oxygen (diff)	5.92	6.37
	100.00	100.00

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	51.56
Alumina, Al_2O_3	19.27
Titania, TiO_2	0.87
Ferric oxide, Fe_2O_3	18.46
Lime, CaO	2.06
Magnesia, MgO	1.34
Potassium oxide, K_2O	3.14
Sodium oxide, Na_2O	0.81
Sulfur trioxide, SO_3	2.12
Phos. pentoxide, P_2O_5	0.29
Strontium Oxide, SrO	0.00
Barium Oxide, BaO	0.04
Manganese Oxide, Mn_3O_4	0.04
Undetermined	0.00
	100.00

Fouling Index 0.3
Slagging Index 1.7

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division D-123.

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P.O. BOX 752, HENDERSON, KY 42420
OFFICE TEL. (502) 827-1187

September 18, 1981

TEXAS EASTERN SYNFUELS
Houston, TX 77001

Sample identification by CT&E Company

Kind of sample reported to us: Coal

Sample taken at: Providence #1 Mine, Providence, Kentucky

Sample taken by: CT&E

Date sampled: June 23, 1981

Date received: June 23, 1981

Tri-State Synfuels Project
Island Creek Coal Company
Providence No. 1 Mine
Plus 1/4" Rd. Screen Fraction
IC39

Analysis report no. 63-136457

TUMBLER TEST FOR COAL - ASTM D 441-45 (1975)

Retained on	Passing	Weight Percent (1)	Average of Sieve Openings Inches (2)	Factor (3)	Product of (1) x (3)
1.06 in.	1.50 in.	100.0	1.280	1	100.00 = S
1.06 in.	1.50 in.	57.2	1.280	1	57.2
0.750 in.	1.06 in.	18.4	0.905	0.7	12.88
0.530 in.	0.750 in.	7.7	0.640	0.5	3.85
0.375 in.	0.530 in.	1.4	0.452	0.35	.49
0.0469 in.	0.375 in.	2.6	0.211	0.16	.416
0.0117 in.	0.0469 in.	1.8	0.029	0.023	.0414
	0.0117 in.	10.9	0.006	0.005	.0545
Total (Sum of Products (1) x (3)					74.93 = s

Friability, 25.0 percent: with dust index of 11

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division D-105.

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OFFICE TEL. (502) 827-1187

January 4, 1982

TEXAS EASTERN SYNFUELS, INC.
Houston, TX 77001

Sample identification by CT&E Company

Kind of sample reported to us: Coal

Sample taken at: Providence #1 Mine
Providence, Kentucky

Sample taken by: CT&E

Date sampled: June 23, 1981

Date received: June 23, 1981

Tri-State Synfuels Project
Island Creek Coal Company
Providence #1 Mine
Plus 1/4" Rd. Screen Fraction
IC39

Analysis report no. 63-136457

Caking Index (Damm's Method) = 17 - 18

	As Received	Dry Basis
Moisture, %	5.06	XXXX
Fluorine (F)[1], µg/g	100	105
Mercury (Hg)[2], µg/g	0.03	0.03

1. Preparation by oxygen bomb combustion; analysis by ion selective electrode. ASTM, Part 26, D3761-79

2. Preparation by oxygen train combustion; analysis by flameless cold vapor atomic absorption spectroscopy. ASTM, Part 26, D3684-78

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L.W. TAYLOR III, Manager, Central Division

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D-106.

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TEXAS EASTERN SYNFUELS
Houston, TX 77001

August 17, 1981

Sample identification by CT&E Company

Kind of sample reported to us Coal

Sample taken at Providence #1 Mine
Providence, Kentucky

Sample taken by CT&E

Date sampled June 23, 1981

Date received June 23, 1981

Tri-State Synfuels Project
Island Creek Coal Company
Providence No. 1 Mine
Plus 1/4" Rd. Screen Fraction
IC39

Analysis report no. 63-136457

Akkalies, dry coal basis

	Water Soluble	Non Water Soluble
Sodium oxide, Na_2O, ppm	640	978
Potassium oxide, K_2O, ppm	124	5616

% Ash in non water soluble coal = 20.80

% Ash in original sample = 21.76

Alkalies calculated to ignited basis from above:

	Ignited basis
% Sodium oxide, Na_2O	0.76
% Potassium oxide, K_2O	2.76

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division

D-107.

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2

DATE : 12/02/81

SAMPLE NUMBER RF3-0234
SAMPLE DESCRIPTION CT&E Lab No. 63-136457, IC39
TERMINAL TEMP 936 DEG. F
FISHER ASSAY NO. FB 2355

FISCHER ASSAY YIELDS	AS ANALYZED	NORMALIZED
OIL (LB/TON)	295.0	299.6
(GAL/TON)	33.4	34.0
API GRAVITY	2.3	2.3
GAS (LB/TON)	80.3	81.6
(SCF/TON)	1172.8	1191.2
WATER (LB/TON)	64.4	65.4
(GAL/TON)	7.7	7.8
SS (LB/TON)	1529.5	1553.4
TOTAL (LB/TON)	1969.2	2000.0
VARIANCE (PC)	-1.5	

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GAS (NORMALIZED)	(LB/TON)	(LB/100 LB) (FA OIL)
H2	0.51	0.17
CO	3.56	1.19
CO2	7.75	2.59
H2S	19.11	6.38
C1	20.25	6.76
C2	10.46	3.49
C2-	1.85	0.62
C3	6.15	2.05
C3-	2.89	0.96
I-C4	0.85	0.28
N-C4	2.13	0.71
C4-	1.92	0.64
C5	1.74	0.58
C6	1.67	0.56
C7	0.73	0.24
C8	0.00	0.00
C9	0.00	0.00

ADJUSTED YIELDS (NORMALIZED)	LB/TON	SCF/TON	LB/100 LB F A OIL
C3 & LIGHTER	72.5	1139.3	24.6
SCRUBBED C3&LIGHTER [LESS CO2 & H2S]	45.7	860.1	15.5
C4 & HEAVIER	308.6		104.6
TOTAL HYDROCARBONS INCL. H2 & CO, LB/TON	354.3		120.1
C4 & HEAVIER (GAL/TON)		35.7	
API GRAVITY		5.1	

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3

GAS ANALYSIS

SAMPLE NUMBER	RF3-0234
SAMPLE DESCRIPTION	CT&E Lab No. 63-136457, IC39
FISCHER ASSAY NO.	PB 2355

COMPONENT	MOLE PERCENT
H2	8.10
CO	4.05
CO2	5.61
H2S	17.83
C1	40.27
C2	11.06
C2-	2.10
C3	4.44
C3-	2.18
I-C4	0.47
N-C4	1.17
C4-	1.09
C5	0.78
C6	0.62
C7	0.23
C8	0.00
C9	0.00
SUM	100.00

AVERAGE MOLE WT	25.96
LBS C IN GAS/TON SHALE	43.86
WT. PERCENT TOTAL CARBON	53.76
WT. PERCENT SULFUR	22.04

BTU VALUE OF GAS (CALC.)		GROSS	NET
C3 & LIGHTER*	(BTU/SCF)	994.29	906.70
SCRUBBED C3 & LIGHTER	(BTU/SCF)	1159.25	1055.45
WHOLE GAS*	(BTU/SCF)	1110.28	1014.89
SCRUBBED WHOLE GAS	(BTU/SCF)	1301.35	1188.29

*[INCL. H2S & CO2]

Identification:

Tri-State Synfuels Project
Island Creek Coal Company
Providence #1 Mine
Plus 1/4" Rd. Screen Fraction
IC39

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OFFICE TEL. (502) 827-1187

TEXAS EASTERN SYNFUELS
Houston, TX 77001

August 18, 1981

Kind of sample reported to us: Coal

Sample taken at: Providence #1 Mine, Providence, Kentucky

Sample taken by: CT&E

Date sampled: June 23, 1981

Date received: June 23, 1981

Sample identification by CT&E Company

Tri-State Synfuels Project
Island Creek Coal Company
Providence No. 1 Mine
Minus 1/4" Rd. Screen Fraction
IC40

Analysis report no. 63-136455

PROXIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	6.97	XXXXX
Ash	18.55	19.94
Volatile	33.88	36.42
Fixed Carbon	40.60	43.64
	100.00	100.00
Btu/lb.	10858	11671
Sulfur	4.22	4.54
A.k. as Na_2O	0.34	0.37

SULFUR FORMS		
Pyritic Sulfur	2.66	2.86
Sulfate Sulfur	0.06	0.06
Organic Sulfur	1.50	1.62
	4.22	4.54

WATER SOLUBLE ALKALIES		
Na_2O	XXXX	XXXX
K_2O	XXXX	XXXX

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	6.97	XXXXX
Carbon	59.06	63.48
Hydrogen	4.46	4.79
Nitrogen	0.84	0.90
Chlorine	0.20	0.21
MAF 14578 Sulfur	4.22	4.54
Ash	18.55	19.94
Oxygen (diff)	5.70	6.14
	100.00	100.00

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	46.26
Alumina, Al_2O_3	16.90
Titania, TiO_2	0.78
Ferric oxide, Fe_2O_3	20.67
Lime, CaO	6.53
Magnesia, MgO	1.07
Potassium oxide, K_2O	2.62
Sodium oxide, Na_2O	0.93
Sulfur trioxide, SO_3	3.61
Phos. pentoxide, P_2O_5	0.15
Strontium Oxide, SrO	0.00
Barium Oxide, BaO	0.13
Manganese Oxide, Mn_3O_4	0.06
Undetermined	0.29
	100.00

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	2050 °F	2350 °F
H is Cone Height — Softening (H=W)	2150 °F	2400 °F
W is Cone Width — Softening (H=½W)	2180 °F	2460 °F
Fluid	2300 °F	2500 °F

% EQUILIBRIUM MOISTURE 5.38

HARDGROVE GRINDABILITY INDEX 60.7 at 3.25% Moisture

FREE SWELLING INDEX 6

Silica Value 62.07

Base: Acid Ratio 0.50

T_{250} Temperature 2312

Fouling Index 0.5

Slagging Index 2.3

ESTIMATED VISCOSITY at critical viscosity temperature of 2380°F = 180 poises

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L.W. TAYLOR III, Manager, Central Division

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

F-464

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GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 752, HENDERSON, KY 42420
OFFICE TEL. (502) 827-1187

January 4, 1982

TEXAS EASTERN SYNFUELS, INC.
Houston, TX 77001

Sample identification by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project
Sample taken at	Providence #1 Mine Providence, Kentucky	Island Creek Coal Company Providence #1 Mine
Sample taken by	CT&E	Minus 1/4" Rd. Screen Fraction IC40
Date sampled	June 23, 1981	
Date received	June 23, 1981	

Analysis report no. 63-136455

Caking Index (Damm's Method)= 16 - 17

	As Received	Dry Basis
Moisture, %	6.97	XXXX
Fluorine (F)[1], µg/g	49	53
Mercury (Hg)[2], µg/g	0.02	0.02

1. Preparation by oxygen bomb combustion; analysis by ion selective electrode. ASTM, Part 26, D3761-79

2. Preparation by oxygen train combustion; analysis by flameless cold vapor atomic absorption spectroscopy. ASTM, Part 26, D3684-78

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO

L. W. TAYLOR III, Manager, Central Division

D-111.

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LT/mc

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OFFICE TEL. (502) 827-1187

TEXAS EASTERN SYNFUELS
Houston, TX 77001

August 18, 1981

Sample identification by . CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Island Creek Coal Company Providence No. 1 Mine Minus 1/4" Rd. Screen Fraction IC40
Sample taken at	Providence #1 Mine Providence, Kentucky	
Sample taken by	CT&E	
Date sampled	June 23, 1981	
Date received	June 23, 1981	

Analysis report no. 63-136455

Alkalies, dry coal basis

	Water Soluble	Non Water Soluble
Sodium oxide, Na_2O, ppm	683	858
Potassium oxide, K_2O, ppm	117	4928

% Ash in non water soluble coal = 18.25

% Ash in original sample = 19.94

Alkalies calculated to ignited basis from above:

	Ignited basis
% Sodium oxide, Na_2O	0.81
% Potassium oxide, K_2O	2.76

LT/kmc

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L.W. TAYLOR III, Manager, Central Division

D-112.

Charter Member

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DATE : 12/02/81

SAMPLE NUMBER RF3-0236
SAMPLE DESCRIPTION CT&E Lab No. 63-136455, IC40
TERMINAL TEMP 946 DEG. F
FISHER ASSAY NO. PB 2354

FISCHER ASSAY YIELDS	AS ANALYZED	NORMALIZED
OIL (LB/TON)	302.4	306.7
(GAL/TON)	34.4	34.9
API GRAVITY	3.0	3.0
GAS (LB/TON)	101.8	103.2
(SCF/TON)	1661.1	1684.8
WATER (LB/TON)	62.3	63.2
(GAL/TON)	7.5	7.6
SS (LB/TON)	1505.3	1526.9
TOTAL (LB/TON)	1971.8	2000.0
VARIANCE (PC)	-1.4	

GAS (NORMALIZED)	(LB/TON)	(LB/100 LB) (FA OIL)
H2	1.05	0.34
CO	4.83	1.57
CO2	10.33	3.37
H2S	21.41	6.98
C1	32.72	10.67
C2	12.26	4.00
C2-	2.06	0.67
C3	6.33	2.06
C3-	2.94	0.96
I-C4	0.86	0.28
N-C4	2.14	0.70
C4-	2.88	0.94
C5	1.84	0.60
C6	1.57	0.51
C7	0.00	0.00
C8	0.00	0.00
C9	0.00	0.00

ADJUSTED YIELDS (NORMALIZED)	LB/TON	SCF/TON	LB/100 LB F A OIL
C3 & LIGHTER	93.9	1629.0	31.1
SCRUBBED C3&LIGHTER [LESS CO2 & H2S]	62.2	1302.1	20.6
C4 & HEAVIER	316.0		104.5
TOTAL HYDROCARBONS INCL. H2 & CO, LB/TON	378.2		125.1
C4 & HEAVIER (GAL/TON)		36.8	
API GRAVITY		5.8	

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GAS ANALYSIS

SAMPLE NUMBER	RF3-0236
SAMPLE DESCRIPTION	CT&E Lab No. 63-136455, IC40
FISCHER ASSAY NO.	FR 2354

COMPONENT	MOLE PERCENT
H2	11.79
CO	3.88
CO2	5.28
H2S	14.12
C1	46.00
C2	9.16
C2-	1.65
C3	3.23
C3-	1.57
I-C4	0.33
N-C4	0.83
C4-	1.16
C5	0.58
C6	0.42
C7	0.00
C8	0.00
C9	0.00
SUM	100.00

AVERAGE MOLE WT	23.22
LBS C IN GAS/TON SHALE	56.48
WT. PERCENT TOTAL CARBON	54.72
WT. PERCENT SULFUR	19.52

RTU VALUE OF GAS (CALC.)		GROSS	NET
C3 & LIGHTER*	(BTU/SCF)	942.03	856.31
SCRUBBED C3 & LIGHTER	(BTU/SCF)	1061.79	963.59
WHOLE GAS*	(BTU/SCF)	1026.60	935.37
SCRUBBED WHOLE GAS	(BTU/SCF)	1161.80	1057.28

*[INCL. H2S & CO2]

Identification:

Tri-State Synfuels Project
Island Creek Coal Company
Providence #1 Mine
Minus 1/4" Rd. Screen Fraction
IC40

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OFFICE TEL. (502) 827-1187

September 18, 1981

TEXAS EASTERN SYNFUELS
Houston, TX 77001

Sample identification by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project
Sample taken at	Island Creek #9 Mine Madisonville, Kentucky	Island Creek Coal Company No. 9 Mine
Sample taken by	CT&E	Plus 1/4" Rd. Screen Fraction
Date sampled	June 23, 1981	IC42
Date received	June 23, 1981	

Analysis report no. 63-136140

TUMBLER TEST FOR COAL - ASTM D 441-45 (1975)

Retained on	Passing	Weight Percent (1)	Average of Sieve Openings Inches (2)	Factor (3)	Product of (1) x (3)
1.06 in.	1.50 in.	100.0	1.280	1	100.0 = S
1.06 in.	1.50 in.	53.9	1.280	1	53.9
0.750 in.	1.06 in.	23.9	0.905	0.7	16.73
0.530 in.	0.750 in.	5.1	0.640	0.5	2.54
0.375 in.	0.530 in.	1.7	0.452	0.35	.611
0.0469 in.	0.375 in.	2.6	0.211	0.16	.420
0.0117 in.	0.0469 in.	2.1	0.029	0.023	.0485
	0.0117 in.	10.7	0.006	0.005	.0533
Total (Sum of products (1) x (3)					74.30 = s

Friability, 25.5 percent: with dust index of 11

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division D-124.

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LT/mc

Charter Member

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OFFICE TEL. (502) 827-1187

January 2, 1982

TEXAS EASTERN SYNFUELS, INC.
Houston, TX 77001

Sample identification by CT&E Company

Kind of sample reported to us: Coal

Sample taken at: Island Creek #9 Mine, Madisonville, Kentucky

Sample taken by: CT&E

Date sampled: June 23, 1981

Date received: June 23, 1981

Tri-State Synfuels Project
Island Creek Coal Company
No. 9 Mine
Plus 1/4" Rd. Screen Fraction
IC42

Analysis report no. 63-136140

Caking Index (Damm's Method) = 13 - 14

	As Received	Dry Basis
Moisture, %	7.08	XXXX
Fluorine, (F)[1], ug/g	150	160
Mercury, (Hg)[2], ug/g	0.10	0.11

1. Preparation by oxygen bomb combustion; analysis by ion selective electrode. ASTM, Part 26, D3761-79

2. Preparation by oxygen train combustion; analysis by flameless cold vapor atomic absorption spectroscopy. ASTM, Part 26, D3684-78

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division

D-125.

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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TEXAS EASTERN SYNFUELS
Houston, TX 77001

August 18, 1981

Sample identification by CT&E Company

Kind of sample reported to us: Coal

Sample taken at: Island Creek #9 Mine, Madisonville, Kentucky

Sample taken by: CT&E

Date sampled: June 23, 1981

Date received: June 23, 1981

Tri-State Synfuels Project
Island Creek Coal Company
No. 9 Mine
Plus 1/4" Rd. Screen Fraction
IC42

Analysis report no. 63-136140

Alkalies, dry coal basis

	Water Soluble	Non Water Soluble
Sodium oxide, Na_2O, ppm	757	1107
Potassium oxide, K_2O, ppm	137	8048

% Ash in non water soluble coal = 25.15

% Ash in original sample = 27.69

Alkalies calculated to ignited basis from above:

	Ignited basis
% Sodium oxide, Na_2O	0.71
% Potassium oxide, K_2O	3.25

LT/kmc

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS.
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

DATE : 11/17/81

SAMPLE NUMBER RF3-0007
SAMPLE DESCRIPTION CT&E Lab No. 63-136140, IC42
TERMINAL TEMP 941 DEG. F
FISHER ASSAY NO. PB 2333

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FISCHER ASSAY YIELDS	AS ANALYZED	NORMALIZED
OIL (LB/TON)	230.2	231.7
(GAL/TON)	26.2	26.3
API GRAVITY	2.7	2.7
GAS (LB/TON)	99.1	99.7
(SCF/TON)	1534.4	1544.3
WATER (LB/TON)	80.6	81.1
(GAL/TON)	9.7	9.7
SS (LB/TON)	1577.4	1587.5
TOTAL (LB/TON)	1987.3	2000.0
VARIANCE (PC)	-0.6	

GAS (NORMALIZED)	(LB/TON)	(LB/100 LB) (FA OIL)
H2	0.85	0.37
CO	5.06	2.18
CO2	14.21	6.13
H2S	26.42	11.40
C1	27.07	11.68
C2	9.91	4.28
C2-	2.17	0.94
C3	4.84	2.09
C3-	2.72	1.17
I-C4	0.38	0.16
N-C4	1.13	0.49
C4-	1.81	0.78
C5	1.38	0.59
C6	1.10	0.47
C7	0.64	0.28
C8	0.00	0.00
C9	0.00	0.00

ADJUSTED YIELDS (NORMALIZED)	LB/TON	SCF/TON	LB/100 LB F A OIL
C3 & LIGHTER	93.3	1507.6	40.5
SCRUBBED C3&LIGHTER [LESS CO2 & H2S]	52.6	1091.5	22.9
C4 & HEAVIER	238.2		103.4
TOTAL HYDROCARBONS INCL. H2 & CO, LB/TON	290.8		126.3
C4 & HEAVIER (GAL/TON)		27.6	
API GRAVITY		5.2	

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CT&E Lab No.: 63-136140
3 IC-42

GAS ANALYSIS

USE OR DISCLOSURE OF REPORT DATA IS SUBJECT TO THE RESTRICTION ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT

SAMPLE NUMBER RF3-0007
SAMPLE DESCRIPTION CT&E Lab No. 63-136140, IC42
FISCHER ASSAY NO. FR 2333

COMPONENT	MOLE PERCENT
H2	10.46
CO	4.44
CO2	7.92
H2S	19.02
C1	41.52
C2	8.08
C2-	1.90
C3	2.69
C3-	1.58
I-C4	0.16
N-C4	0.48
C4-	0.79
C5	0.48
C6	0.32
C7	0.16
C8	0.00
C9	0.00
SUM	100.00

AVERAGE MOLE WT 24.46

LBS C IN GAS/TON SHALE 47.81

WT. PERCENT TOTAL CARBON 47.97
WT. PERCENT SULFUR 24.94

BTU VALUE OF GAS (CALC.)		GROSS	NET
C3 & LIGHTER*	(BTU/SCF)	887.24	807.59
SCRUBBED C3 & LIGHTER	(BTU/SCF)	1053.55	956.85
WHOLE GAS*	(BTU/SCF)	953.35	869.32
SCRUBBED WHOLE GAS	(BTU/SCF)	1138.63	1036.48

*[INCL. H2S & CO2]

Identification:

Tri-State Synfuels Project
Island Creek Coal Company
No. 9 Mine
Plus 1/4" Rd. Screen Fraction
IC42

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OFFICE TEL. (502) 827-1187

TEXAS EASTERN SYNFUELS
Houston, TX 77001

August 17, 1981

Kind of sample reported to us	Coal	Sample identification by	CT&E Company
Sample taken at	Island Creek #9 Mine Madisonville, Kentucky		Tri-State Synfuels Project Island Creek Coal Company No. 9 Mine Minus 1/4" Rd. Screen Fraction IC43
Sample taken by	CT&E		
Date sampled	June 23, 1981		
Date received	June 23, 1981	Analysis report no.	63-136141

PROXIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	9.54	XXXXX
Ash	20.75	22.94
Volatile	31.24	34.53
Fixed Carbon	38.47	42.53
	100.00	100.00
Btu/lb.	9957	11007 MAF 14284
Sulfur	3.67	4.06
Alk. as Na_2O	0.57	0.63
SULFUR FORMS		
Pyritic Sulfur	2.25	2.49
Sulfate Sulfur	0.01	0.01
Organic Sulfur	1.41	1.56
	3.67	4.06
WATER SOLUBLE ALKALIES		
Na_2O	XXXX	XXXX
K_2O	XXXX	XXXX

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	9.54	XXXXX
Carbon	55.27	61.10
Hydrogen	3.83	4.23
Nitrogen	0.97	1.07
Chlorine	0.08	0.09
Sulfur	3.67	4.06
Ash	20.75	22.94
Oxygen (diff)	5.89	6.51
	100.00	100.00

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	48.69
Alumina, Al_2O_3	18.48
Titania, TiO_2	0.81
Ferric oxide, Fe_2O_3	17.44
Lime, CaO	5.20
Magnesia, MgO	1.29
Potassium oxide, K_2O	2.87
Sodium oxide, Na_2O	0.87
Sulfur trioxide, SO_3	4.03
Phos. pentoxide, P_2O_5	0.22
Strontium Oxide, SrO	0.00
Barium Oxide, BaO	0.05
Manganese Oxide, Mn_3O_4	0.05
Undetermined	0.00
	100.00

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	2120 °F	2550 °F
H is Cone Height; Softening (H=W)	2200 °F	2600 °F
W is Cone Width; Softening (H=½W)	2250 °F	2620 °F
Fluid	2350 °F	2680 °F

% EQUILIBRIUM MOISTURE 7.20
HARDGROVE GRINDABILITY INDEX 62.8 at 4.40% Moisture
FREE SWELLING INDEX 3

Silica Value 67.04
Base: Acid Ratio 0.41
T_{250} Temperature 2402

Fouling Index 0.4
Slagging Index 1.7

IMATED VISCOSITY at critical viscosity temperature of 2450°F = 290 poises

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L.W. TAYLOR III, Manager, Central Division D-129.

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Charter Member

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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OFFICE TEL. (502) 827-1187

January 2, 1982

TEXAS EASTERN SYNFUELS, INC.
Houston, TX 77001

Sample identification
by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project
Sample taken at	Island Creek #9 Mine Madisonville, Kentucky	Island Creek Coal Company No. 9 Mine
Sample taken by	CT&E	Minus 1/4" Rd. Screen Fraction
Date sampled	June 23, 1981	IC43
Date received	June 23, 1981	

Analysis report no. 63-136141

Caking Index (Damm's Method) = 13 - 14

	As Received	Dry Basis
Moisture, %	9.54	XXXX
Fluorine (F)[1], ug/g	140	150
Mercury (Hg)[2], ug/g	0.08	0.09

1. Preparation by oxygen bomb combustion; analysis by ion selective electrode. ASTM, Part 26, D3761-79

2. Preparation by oxygen train combustion; analysis by flameless cold vapor atomic absorption spectroscopy. ASTM, Part 26, D3684-78

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division

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OFFICE TEL. (502) 827-1187

TEXAS EASTERN SYNFUELS
Houston, TX 77001

August 17, 1981

Sample identification by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Island Creek Coal Company No. 9 Mine Minus 1/4" Rd. Screen Fraction IC43
Sample taken at	Island Creek #9 Mine Madisonville, Kentucky	
Sample taken by	CT&E	
Date sampled	June 23, 1981	
Date received	June 23, 1981	

Analysis report no. 63-136141

Alkalies, dry coal basis

	Water Soluble	Non Water Soluble
Sodium oxide, Na_2O, ppm	719	872
Potassium oxide, K_2O, ppm	137	6121

% Ash on non water soluble coal = 20.75

% Ash in original sample = 22.94

Alkalies calculated to ignited basis from above:

	Ignited basis
% Sodium oxide, Na_2O	0.73
% Potassium oxide, K_2O	3.01

LT/kmc

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division D-131.

Charter Member

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DATE : 11/18/81

SAMPLE NUMBER RF 3-0009
SAMPLE DESCRIPTION CT&E Lab No. 63-136141, IC43
TERMINAL TEMP 932 DEG. F
FISHER ASSAY NO. PB 2335

FISCHER ASSAY YIELDS	AS ANALYZED	NORMALIZED
OIL (LB/TON)	247.4	249.2
(GAL/TON)	28.0	28.2
API GRAVITY	2.3	2.3
GAS (LB/TON)	97.2	97.9
(SCF/TON)	1581.1	1592.7
WATER (LB/TON)	77.6	78.2
(GAL/TON)	9.3	9.4
SS (LB/TON)	1563.3	1574.7
TOTAL (LB/TON)	1985.4	2000.0
VARIANCE (PC)	-0.7	

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GAS (NORMALIZED)	(LB/TON)	(LB/100 LB) (FA OIL)
H2	1.07	0.43
CO	5.72	2.29
CO2	13.32	5.34
H2S	20.88	8.38
C1	28.72	11.53
C2	11.65	4.68
C2-	2.37	0.95
C3	5.28	2.12
C3-	2.96	1.19
I-C4	0.41	0.16
N-C4	1.23	0.49
C4-	1.97	0.79
C5	1.00	0.40
C6	0.60	0.24
C7	0.70	0.28
C8	0.00	0.00
C9	0.00	0.00

ADJUSTED YIELDS (NORMALIZED)	LB/TON	SCF/TON	LB/100 LB F A OIL
C3 & LIGHTER	92.0	1558.0	37.2
SCRUBBED C3&LIGHTER [LESS CO2 & H2S]	57.8	1211.2	23.4
C4 & HEAVIER	255.1		103.1
TOTAL HYDROCARBONS INCL. H2 & CO, LB/TON	312.9		126.5
C4 & HEAVIER (GAL/TON)		29.4	
API GRAVITY		4.5	

COMMERCIAL TESTING & ENGINEERING CO.

D-132.

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GAS ANALYSIS

SAMPLE NUMBER	RF 3-0009
SAMPLE DESCRIPTION	CT&E Lab No. 63-136141, IC43
FISCHER ASSAY NO.	FR 2335

COMPONENT	MOLE PERCENT
H2	12.73
CO	4.86
CO2	7.20
H2S	14.57
C1	42.71
C2	9.21
C2-	2.01
C3	2.85
C3-	1.68
I-C4	0.17
N-C4	0.50
C4-	0.84
C5	0.34
C6	0.17
C7	0.17
C8	0.00
C9	0.00
SUM	100.00

AVERAGE MOLE WT 23.29

LBS C IN GAS/TON SHALE 50.77

WT. PERCENT TOTAL CARBON 51.87
WT. PERCENT SULFUR 20.08

BTU VALUE OF GAS (CALC.)		GROSS	NET
C3 & LIGHTER*	(BTU/SCF)	905.89	823.98
SCRUBBED C3 & LIGHTER	(BTU/SCF)	1042.87	946.99
WHOLE GAS*	(BTU/SCF)	963.90	878.21
SCRUBBED WHOLE GAS	(BTU/SCF)	1113.21	1012.89

*[INCL. H2S & CO2]

Identification:

Tri-State Synfuels Project
Island Creek Coal Company
No. 9 Mine
Minus 1/4" Rd. Screen Fraction
IC43

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APPENDIX D-8

Marissa Mine - Illinois No. 6 Seam

	Page
PB-25 - Total Product: a-o	D-135
PB-26 - 2" Rd. x 1/4" Rd.: a-d, f-k, n-o	D-143
PB-27 - 1/4" Rd. x 0: a-d, f-k, n-o	D-148

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COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-5434

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16130 VAN DRUNEN RD., P.O. BOX 127
SOUTH HOLLAND, IL 60473
OFFICE TEL. (312) 264-1173

TEXAS EASTERN SYNFUELS
HOUSTON, TX 77001

February 5, 1982

Kind of sample reported to us: Coal

Sample identification by C. T. & E. CO.

Sample taken at: Marissa Mine, Randolph County, Illinois

Sample taken by: CT&E

Tri-State Synfuels Project
Peabody Coal Company
Marissa Mine
Crushed Raw Coal. Total Product.
PB-25

Date sampled: June 23, 1981

Date received: June 23, 1981 Analysis report no. 71-74298

PROXIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	15.19	XXXXX
Ash	27.57	32.51
Volatile	27.53	32.46
Fixed Carbon	29.71	35.03
	100.00	100.00
Btu/lb.	7957	9382
Sulfur	3.07	3.62
Alk. as Na_2O	0.83	0.98

MAF 13901

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	15.19	XXXXX
Carbon	44.76	52.78
Hydrogen	3.12	3.68
Nitrogen	0.64	0.76
Chlorine	0.14	0.16
Sulfur	3.07	3.62
Ash	27.57	32.51
Oxygen (diff)	5.51	6.49
	100.00	100.00

SULFUR FORMS		
Pyritic Sulfur	1.86	2.19
Sulfate Sulfur	0.02	0.03
Organic Sulfur	1.19	1.40

WATER SOLUBLE ALKALIES		
Na_2O	XXXX	XXXX
K_2O	XXXX	XXXX

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	2110 °F	2170 °F
Softening (H=W)	2330 °F	2420 °F
Softening (H=½W)	2370 °F	2480 °F
Fluid	2580 °F	2630 °F

H is Cone Height
W is Cone Width

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	54.68
Alumina, Al_2O_3	18.21
Titania, TiO_2	0.80
Ferric oxide, Fe_2O_3	9.97
Lime, CaO	4.80
Magnesia, MgO	1.48
Potassium oxide, K_2O	2.33
Sodium oxide, Na_2O	1.49
Sulfur trioxide, SO_3	4.55
Phos. pentoxide, P_2O_5	0.19
Strontium Oxide, SrO	0.00
Barium Oxide, BaO	0.10
Manganese Oxide, Mn_3O_4	0.06
Undetermined	1.34
	100.00
Fouling Index	0.40
Slagging Index	0.98

% EQUILIBRIUM MOISTURE	10.89
HARDGROVE GRINDABILITY INDEX	76 @5.30% moisture
FREE SWELLING INDEX	1-1/2
Silica Value	77.09
Base: Acid Ratio	0.27
T_{250} Temperature	2600

ESTIMATED VISCOSITY at critical viscosity temperature of 2590°F = 540 poises

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

D-135.

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OFFICE TEL. (312) 264-1173

TEXAS EASTERN Synfuels, Inc.
Houston, TX 77001

February 5, 1982

Sample identification by CT&E COMPANY

Kind of sample reported to us	Coal	Tri-State Synfuels Project Peabody Coal Company Marissa Mine
Sample taken at	Marissa Mine Randolph County, Indiana	Crushed Raw Coal. Total Product. PB-25
Sample taken by	CT&E	
Date sampled	June 23, 1981	
Date received	June 23, 1981	

Analysis report no. 71-74298

TUMBLER TEST FOR COAL - ASTM D 441-45 (1975)

Retained on	Passing	Weight percent (1)	Average of Sieve Openings Inches (2)	Factor (3)	Product of (1) x (3)
1.06 in.	1.50 in.	100.0	1.280	1	100.00 = S
1.06 in.	1.50 in.	27.8	1.280	1	27.8
1.750 in.	1.06 in.	48.0	0.905	0.7	33.60
1.530 in.	0.750 in.	12.0	0.640	0.5	6.00
.375 in.	0.530 in.	2.1	0.452	0.35	.735
.0469 in.	0.375 in.	4.1	0.211	0.16	.656
.0117 in.	0.0469 in.	2.4	0.029	0.023	.0552
	0.0117 in.	3.6	0.006	0.005	.0180
Total (Sum of products (1) x (3)					68.86 = s

Friability, 31.0 percent: with dust index of 4

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division D-136.

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OFFICE TEL. (312) 264-1173

TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample Identification
by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Peabody Coal Company Marissa Mine Crushed Raw Coal. Total Product. PB-25
Sample taken at	Marissa Mine Randolph County, Illinois	
Sample taken by	CT&E	
Date sampled	June 23, 1981	
Date received	June 23, 1981	

Analysis report no. 71-74298

Caking Index (Damm's Method) = 12 - 13

	As Received	Dry Basis
Moisture, %	15.19	XXXXX
Fluorine, (F)[1], ug/g	254	300
Mercury (Hg)[2], ug/g	0.11	0.13

1. Preparation by oxygen bomb combustion; analysis by ion selective electrode. ASTM, Part 26, D3761-79.

2. Preparation by oxygen train combustion; analysis by flameless cold vapor atomic absorption spectroscopy. ASTM, Part 26, D3684-78

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division D-137.

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OFFICE TEL. (312) 264-1173

TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Peabody Coal Company Marissa Mine Crushed Raw Coal. Total Product. PB-25
Sample taken at	Marissa Mine Randolph County, Illinois	
Sample taken by	CT&E	
Date sampled	June 23, 1981	
Date received	June 23, 1981	

Analysis report no. 71-74298

Alkalies, dry coal basis

	Water soluble	Non Water Soluble
Sodium oxide, Na_2O, ppm	2392	2046
Potassium oxide, K_2O, ppm	97	7709

% Ash in non water soluble coal = 29.65

% Ash in original sample = 32.51

Alkalies calculated to ignited basis from above:

	Ignited basis
% Sodium oxide, Na_2O	1.43
% Potassium oxide, K_2O	2.63

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division D-138.

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February 5, 1982

TEXAS EASTERN SYNFUELS, INC.
Houston, TX 77001

Lab. No. 71-74298

Tri-State Synfuels Project
Peadody Coal Company
Marissa Mine
Crushed Raw Coal. Total Product.
PB-25

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS
CONCENTRATION IN PPM WEIGHT

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium	5 (3.1)	Terbium		Ruthenium		Vanadium	47
Thorium	7	Gadolinium		Molybdenum	6	Titanium	MC
Bismuth		Europium	<0.1	Niobium	14	Scandium	9
Lead	11	Samarium	1	Zirconium	40	Calcium	MC
Thallium		Neodymium	3	Yttrium	9	Potassium	MC
Mercury	NR	Praseodymium	3	Strontium	45	Chlorine	140
Gold		Cerium	36	Rubidium	43	Sulfur	MC
[illegible]inum		Lanthanum	29	Bromine	5	Phosphorus	720
Iridium		Barium	670	Selenium	2	Silicon	MC
Osmium		Cesium	2	Arsenic	3	Aluminum	MC
Rhenium		Iodine	0.3	Germanium	1	Magnesium	MC
Tungsten		Tellurium	0.1	Gallium	21	Sodium	MC
Tantalum		Antimony		Zinc	41	Fluorine	NR
Hafnium		Tin	0.6	Copper	21	Oxygen	NR
Lutetium		Indium	STD	Nickel	11	Nitrogen	NR
Ytterbium		Cadmium	0.5	Cobalt	12	Carbon	NR
Thulium		Silver		Iron	MC	Boron	59
Erbium		Palladium		Manganese	210	Beryllium	0.5
Holmium		Rhodium		Chromium	18	Lithium	9
Dysprosium		Neptunium	<0.1			Hydrogen	NR

STD - Internal Standard
NR - Not Reported
All elements not detected<0.1ppm
MC - Major Component
JNT - Interference
- Delayed Neutron Activation - d.c.b. (MPC)

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division D-139.

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TABLE NO. II
Trace Elements by Atomic Absorption
(concentration in ug/g)

Parameter	IC-30 As Rec'd	IC-30 Dry	IC-41 As Rec'd	IC-41 Dry	PB-25 As Rec'd	PB-25 Dry	AX-1 As Rec'd	AX-1 Dry	AX-4 As Rec'd	AX-4 Dry
Moisture (%)[1]	7.14	XXXX	7.82	XXXX	15.19	XXXX	11.61	XXXX	7.39	XXXX
Antimony	0.3	0.3	0.4	0.4	0.1	0.1	0.3	0.3	0.3	0.3
Arsenic	4.2	4.5	4.1	4.5	2.3	2.7	13.4	15.2	2.1	2.3
Beryllium	1	1	1	1	1	1	1	1	1	1
Boron[2]	100	110	110	120	220	260	130	150	80	90
Cadmium	0.8	0.9	1.6	1.7	0.4	0.5	0.2	0.2	0.4	0.4
Chromium	20	22	32	35	23	27	19	22	19	21
Copper	12	13	14	15	14	16	17	19	10	11
Fluorine[3]	90	97	140	155	250	300	120	140	95	105
Lead	7	7	14	15	4	5	16	18	8	9
Lithium	14	15	16	17	14	16	24	27	9	10
Manganese	73	79	91	99	88	104	63	71	63	68
Mercury	0.10	0.11	0.16	0.17	0.11	0.13	0.09	0.10	0.13	0.14
Nickel	13	14	17	18	20	24	21	24	12	13
Selenium	3.3	3.6	4.9	5.3	4.2	4.9	0.9	1	2.5	2.7
Uranium[4]	2.8	3.0	3.5	3.8	2.6	3.1	1.4	1.6	16.5	17.8
Vanadium	80	86	62	67	58	68	19	22	34	37
Zinc	113	122	153	166	98	116	50	57	95	103

1 Determination by ASTM Method D3173
2 Determination by curcumin colorimetric technique
3 Determination by ASTM Method D3761
4 Determination by delayed neutron activation

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TEXAS EASTERN SYNFUELS, INC.

PAUL WEIR CO. JOB NO. 2753-B

Analysis report No. 71-74298
Date: 9/10/81
Sample No. PB 25
TERMINAL TEMP 932 DEG. F

FISCHER ASSAY YIELDS	AS ANALYZED	NORMALIZED
OIL (LB/TON)	214.4	215.1
(GAL/TON)	24.9	25.0
API GRAVITY	5.6	5.6
GAS (LB/TON)	89.5	89.8
(SCF/TON)	1287.4	1291.8
WATER (LB/TON)	92.9	93.2
(GAL/TON)	11.1	11.2
SS (LB/TON)	1596.6	1601.9
TOTAL (LB/TON)	1993.3	2000.0
VARIANCE (PC)	-0.3	

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GAS (NORMALIZED)	(LB/TON)	(LB/100 LB) (FA OIL)
H2	0.62	0.29
CO	5.74	2.67
CO2	17.62	8.19
H2S	22.27	10.35
C1	19.14	8.90
C2	9.33	4.34
C2-	2.27	1.05
C3	4.20	1.95
C3-	3.01	1.40
I-C4	0.28	0.13
N-C4	1.11	0.51
C4-	1.87	0.87
C5	1.02	0.47
C6	0.81	0.38
C7	0.47	0.22
C8	0.00	0.00
C9	0.00	0.00

ADJUSTED YIELDS (NORMALIZED)	LB/TON	SCF/TON	LB/100 LB F A OIL
C3 & LIGHTER	84.2	1259.3	39.3
SCRUBBED C3 & LIGHTER [LESS CO2 & H2S]	44.3	860.0	20.7
C4 & HEAVIER	220.7		102.9
TOTAL HYDROCARBONS INCL. H2 & CO, LB/TON	265.0		123.6
C4 & HEAVIER (GAL/TON)		26.1	
API GRAVITY		7.8	

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SAMPLE NO. PB 25

COMPONENT MOLE PERCENT

H2	9.09
CO	6.01
CO2	11.75
H2S	19.16
C1	35.10
C2	9.09
C2-	2.38
C3	2.80
C3-	2.10
I-C4	0.14
N-C4	0.56
C4-	0.98
C5	0.42
C6	0.28
C7	0.14
C8	0.00
C9	0.00
SUM	100.00

AVERAGE MOLE WT 26.34

LBS C IN GAS/TON SHALE 41.70

WT. PERCENT TOTAL CARBON 46.46
WT. PERCENT SULFUR 23.35

BTU VALUE OF GAS (CALC.)		GROSS	NET
C3 & LIGHTER*	(BTU/SCF)	864.91	789.31
SCRUBBED C3 & LIGHTER	(BTU/SCF)	1082.62	986.15
WHOLE GAS*	(BTU/SCF)	933.27	853.11
SCRUBBED WHOLE GAS	(BTU/SCF)	1173.62	1071.33

*[INCL. H2S & CO2]

Tri-State Synfuels Project
Peabody Coal Company
Marissa Mine
Crushed Raw Coal. Total Product.
PB-25

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OFFICE TEL. (312) 264-1173

TEXAS EASTERN SYNFUELS
HOUSTON, TX 77001

February 5, 1982

Kind of sample reported to us: Coal

Sample identification by C. T. & E. CO.

Sample taken at: Marissa Mine, Randolph County, Illinois

Tri-State Synfuels Project
Peabody Coal Company
Marissa Mine
Plus 1/4" Rd. screen fraction.
PB-26

Sample taken by: CT&E

Date sampled: June 23, 1981

Date received: June 23, 1981 Analysis report no. 71-74299

PROXIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	13.61	XXXXX
Ash	30.05	34.78
Volatile	27.46	31.79
Fixed Carbon	28.88	33.43
	100.00	100.00
Btu/lb.	7813	9044
Sulfur	3.59	4.15
Alk. as Na_2O	0.92	1.07
SULFUR FORMS		
Pyritic Sulfur	2.18	2.52
Sulfate Sulfur	0.03	0.03
Organic Sulfur	1.38	1.59
WATER SOLUBLE ALKALIES		
Na_2O	XXXX	XXXX
K_2O	XXXX	XXXX

MAF 13867

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	13.61	XXXXX
Carbon	43.54	50.40
Hydrogen	3.20	3.70
Nitrogen	0.67	0.78
Chlorine	0.15	0.17
Sulfur	3.59	4.15
Ash	30.05	34.78
Oxygen (diff)	5.19	6.02
	100.00	100.00

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	55.30
Alumina, Al_2O_3	17.91
Titania, TiO_2	0.79
Ferric oxide, Fe_2O_3	11.78
Lime, CaO	4.19
Magnesia, MgO	1.51
Potassium oxide, K_2O	2.52
Sodium oxide, Na_2O	1.41
Sulfur trioxide, SO_3	3.65
Phos. pentoxide, P_2O_5	0.73
Strontium Oxide, SrO	0.00
Barium Oxide, BaO	0.04
Manganese Oxide, Mn_3O_4	0.05
Undetermined	0.12
	100.00
Fouling Index	0.41
Slagging Index	1.20

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	2040 °F	2100 °F
H is Cone Height: Softening (H=W)	2280 °F	2330 °F
W is Cone Width: Softening (H=½W)	2320 °F	2380 °F
Fluid	2610 °F	2670 °F

% EQUILIBRIUM MOISTURE 10.85
HARDGROVE GRINDABILITY INDEX 62 @7.00% moisture
FREE SWELLING INDEX 1

Silica Value 75.98
Base: Acid Ratio 0.29
T_{250} Temperature 2575

ATED VISCOSITY at critical viscosity
emperature of 2520°F = 860 poise

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

D-143.

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OFFICE TEL. (312) 264-1173

TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Peabody Coal Company Marissa Mine Plus 1/4" Rd. screen fraction. PB-26
Sample taken at	Marissa Mine Randolph County, Illinois	
Sample taken by	CT&E	
Date sampled	June 23, 1981	
Date received	June 23, 1981	

Analysis report no. 71-74299

Caking Index (Damm's Method) = 12 - 13

	As Received	Dry Basis
Moisture, %	13.61	XXXXX
Fluorine, (F)[1], ug/g	302	350
Mercury (Hg)[2], ug/g	0.07	0.08

1. Preparation by oxygen bomb combustion; analysis by ion selective electrode. ASTM, Part 26, D3761-79.

2. Preparation by oxygen train combustion; analysis by flameless cold vapor atomic absorption spectroscopy. ASTM, Part 26, D3684-78

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division D-144.

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TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification
by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Peabody Coal Company Marissa Mine Plus 1/4" Rd. screen fraction. PB-26
Sample taken at	Marissa Mine Randolph County, Illinois	
Sample taken by	CT&E	
Date sampled	June 23, 1981	
Date received	June 23, 1981	

Analysis report no. 71-74299

Alkalies, dry coal basis

	Water soluble	Non Water Soluble
Sodium oxide, Na_2O, ppm	2234	2399
Potassium oxide, K_2O, ppm	106	7632

% Ash in non water soluble coal = 31.15

% Ash in original sample = 34.78

Alkalies calculated to ignited basis from above:

	Ignited basis
% Sodium oxide, Na_2O	1.41
% Potassium oxide, K_2O	2.48

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division D-145.

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TEXAS EASTERN SYNFUELS, INC.

PAUL WEIR CO. JOB NO. 2753-B

Analysis report No. 71-74299
Date: 10/07/81
Sample No. PB 26
TERMINAL TEMP 932 DEG. F

FISCHER ASSAY YIELDS	AS ANALYZED	NORMALIZED
OIL (LB/TON)	239.9	240.9
(GAL/TON)	27.3	27.4
API GRAVITY	2.9	2.9
GAS (LB/TON)	99.2	99.6
(SCF/TON)	1473.4	1479.0
WATER (LB/TON)	87.2	87.5
(GAL/TON)	10.4	10.5
SS (LB/TON)	1566.1	1572.1
TOTAL (LB/TON)	1992.4	2000.0
VARIANCE (PC)	-0.4	

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GAS (NORMALIZED)	(LB/TON)	(LB/100 LB) (FA OIL)
H2	0.76	0.31
CO	6.67	2.77
CO2	19.34	8.03
H2S	23.73	9.85
C1	23.05	9.57
C2	10.84	4.50
C2-	2.56	1.06
C3	4.85	2.01
C3-	3.08	1.28
I-C4	0.35	0.15
N-C4	1.06	0.44
C4-	1.71	0.71
C5	0.87	0.36
C6	0.52	0.22
C7	0.18	0.08
C8	0.00	0.00
C9	0.00	0.00

ADJUSTED YIELDS (NORMALIZED)	LB/TON	SCF/TON	LB/100 LB F A OIL
C3 & LIGHTER	94.9	1450.5	39.5
SCRUBBED C3 & LIGHTER [LESS CO2 & H2S]	51.8	1020.2	21.6
C4 & HEAVIER	245.5		102.3
TOTAL HYDROCARBONS INCL. H2 & CO, LB/TON	297.4		123.9
C4 & HEAVIER (GAL/TON)		28.3	
API GRAVITY		4.6	

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SAMPLE NO. PB 26

COMPONENT MOLE PERCENT

H2	9.70
CO	6.10
CO2	11.26
H2S	17.83
C1	36.92
C2	9.23
C2-	2.35
C3	2.82
C3-	1.88
I-C4	0.16
N-C4	0.47
C4-	0.78
C5	0.31
C6	0.16
C7	0.05
C8	0.00
C9	0.00
SUM	100.00

AVERAGE MOLE WT	25.52
LBS C IN GAS/TON SHALE	46.82
WT. PERCENT TOTAL CARBON	47.02
WT. PERCENT SULFUR	22.43

BTU VALUE OF GAS (CALC.)		GROSS	NET
C3 & LIGHTER*	(BTU/SCF)	869.09	792.58
SCRUBBED C3 & LIGHTER	(BTU/SCF)	1070.50	974.52
WHOLE GAS*	(BTU/SCF)	919.03	839.23
SCRUBBED WHOLE GAS	(BTU/SCF)	1135.48	1035.38

*[INCL. H2S & CO2]

Tri-State Synfuels Project
Peabody Coal Company
Marissa Mine
Plus 1/4" Rd. screen fraction.
PB-26

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COMMERCIAL TESTING & ENGINEERING CO.

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SOUTH HOLLAND, IL 60473
OFFICE TEL. (312) 264-1173

TEXAS EASTERN SYNFUELS
HOUSTON, TX 77001

February 5, 1982

Kind of sample reported to us: Coal

Sample identification by C. T. & E. CO.

Sample taken at: Marissa Mine
Randolph County, Illinois

Sample taken by: CT&E

Tri-State Synfuels Project
Peabody Coal Company
Marissa Mine
Minus 1/4" Rd. screen fraction.
PB-27

Date sampled: June 23, 1981

Date received: June 23, 1981 Analysis report no. 71-74300

PROXIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	17.39	XXXXX
Ash	26.87	32.53
Volatile	26.36	31.91
Fixed Carbon	29.38	35.56
	100.00	100.00
Btu/lb.	7732	9360
Sulfur	2.57	3.11
Alk. as Na_2O	0.83	1.01

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	17.39	XXXXX
Carbon	43.85	53.08
Hydrogen	3.04	3.69
Nitrogen	0.64	0.77
Chlorine	0.13	0.16
MAF 13873 Sulfur	2.57	3.11
Ash	26.87	32.53
Oxygen (diff)	5.51	6.67
	100.00	100.00

SULFUR FORMS		
Pyritic Sulfur	1.43	1.73
Sulfate Sulfur	0.07	0.09
Organic Sulfur	1.07	1.29

WATER SOLUBLE ALKALIES		
Na_2O	XXXX	XXXX
K_2O	XXXX	XXXX

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	2050 °F	2100 °F
Softening (H=W)	2320 °F	2400 °F
Softening (H=½W)	2370 °F	2470 °F
Fluid	2580 °F	2630 °F

H is Cone Height
W is Cone Width

% EQUILIBRIUM MOISTURE	10.51
HARDGROVE GRINDABILITY INDEX	74 @7.80% moisture
FREE SWELLING INDEX	2
Silica Value	77.41
Base: Acid Ratio	0.27
T_{250} Temperature	2605

IMATED VISCOSITY at critical viscosity
rature of 2570°F = 680 poises

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	55.69
Alumina, Al_2O_3	18.25
Titania, TiO_2	0.81
Ferric oxide, Fe_2O_3	9.32
Lime, CaO	5.39
Magnesia, MgO	1.54
Potassium oxide, K_2O	2.34
Sodium oxide, Na_2O	1.57
Sulfur trioxide, SO_3	4.73
Phos. pentoxide, P_2O_5	0.22
Strontium Oxide, SrO	0.00
Barium Oxide, BaO	0.09
Manganese Oxide, Mn_3O_4	0.05
Undetermined	0.00
	100.00
Fouling Index	0.42
Slagging Index	0.84

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

D-148. Charter Member

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SOUTH HOLLAND, IL 60473
OFFICE TEL. (312) 264-1173

TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Peabody Coal Company Marissa Mine Minus 1/4" Rd. screen fraction. PB-27
Sample taken at	Marissa Mine Randolph County, Illinois	
Sample taken by	CT&E	
Date sampled	June 23, 1981	
Date received	June 23, 1981	

Analysis report no. 71-74300

Alkalies, dry coal basis

	Water soluble	Non Water Soluble
Sodium oxide, Na_2O, ppm	3027	1761
Potassium oxide, K_2O, ppm	160	7460

% Ash in non water soluble coal = 29.84

% Ash in original sample = 32.53

Alkalies calculated to ignited basis from above:

	Ignited basis
% Sodium oxide, Na_2O	1.52
% Potassium oxide, K_2O	2.55

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division D-149.

Official Member

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SOUTH HOLLAND, IL 60473
OFFICE TEL. (312) 264-1173

TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Peabody Coal Company Marissa Mine Minus 1/4" Rd. screen fraction. PB-27
Sample taken at	Marissa Mine Randolph County, Illinois	
Sample taken by	CT&E	
Date sampled	June 23, 1981	
Date received	June 23, 1981	

Analysis report no. 71-74300

Caking Index (Damm's Method) = 11 - 12

	As Received	Dry Basis
Moisture, %	17.39	XXXXX
Fluorine, (F)[1], ug/g	248	300
Mercury (Hg)[2], ug/g	0.08	0.10

1. Preparation by oxygen bomb combustion; analysis by ion selective electrode. ASTM, Part 26, D3761-79.

2. Preparation by oxygen train combustion; analysis by flameless cold vapor atomic absorption spectroscopy. ASTM, Part 26, D3684-78

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division D-150.

Charter Member

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TEXAS EASTERN SYNFUELS, INC.

PAUL WEIR CO. JOB NO. 2753-B

Analysis report No. 71-74300
Date: 09/10/81
Sample No. PB 27
TERMINAL TEMP 932 DEG. F

FISCHER ASSAY YIELDS	AS ANALYZED	NORMALIZED
OIL (LB/TON)	199.3	200.2
(GAL/TON)	23.1	23.2
API GRAVITY	5.1	5.1
GAS (LB/TON)	83.4	83.8
(SCF/TON)	1178.1	1183.7
WATER (LB/TON)	90.3	90.7
(GAL/TON)	10.8	10.9
SS (LB/TON)	1617.5	1625.2
TOTAL (LB/TON)	1990.4	2000.0
VARIANCE (PC)	-0.5	

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GAS (NORMALIZED)	(LB/TON)	(LB/100 LB) (FA OIL)
H2	0.53	0.26
CO	5.21	2.60
CO2	17.23	8.61
H2S	21.70	10.84
C1	17.15	8.57
C2	8.25	4.12
C2-	2.06	1.03
C3	3.89	1.94
C3-	2.68	1.34
I-C4	0.28	0.14
N-C4	0.85	0.43
C4-	1.37	0.69
C5	0.70	0.35
C6	0.42	0.21
C7	1 46	0.73
C8	0.00	0.00
C9	0.00	0.00

ADJUSTED YIELDS (NORMALIZED)	LB/TON	SCF/TON	LB/100 LB F A OIL
C3 & LIGHTER	78.7	1155.9	39.5
SCRUBBED C3 & LIGHTER [LESS CO2 & H2S]	39.8	766.3	20.0
C4 & HEAVIER	205.3		103.0
TOTAL HYDROCARBONS INCL. H2 & CO, LB/TON	245.1		123.0
C4 & HEAVIER (GAL/TON)		24.1	
API GRAVITY		7.2	

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SAMPLE NO. PB 27

COMPONENT MOLE PERCENT

H2	8.46
CO	5.96
CO2	12.54
H2S	20.38
C1	34.33
C2	8.78
C2-	2.35
C3	2.82
C3-	2.04
I-C4	0.16
N-C4	0.47
C4-	0.78
C5	0.31
C6	0.16
C7	0.47
C8	0.00
C9	0.00
SUM	100.00

AVERAGE MOLE WT	26.82
LBS C IN GAS/TON SHALE	37.89
WT. PERCENT TOTAL CARBON	45.23
WT. PERCENT SULFUR	24.38

BTU VALUE OF GAS (CALC.)		GROSS	NET
C3 & LIGHTER*	(BTU/SCF)	854.15	779.73
SCRUBBED C3 & LIGHTER	(BTU/SCF)	1087.39	990.69
WHOLE GAS*	(BTU/SCF)	923.77	844.64
SCRUBBED WHOLE GAS	(BTU/SCF)	1182.99	1080.07

*[INCL. H2S & CO2]

Tri-State Synfuels Project
Peabody Coal Company
Marissa Mine
Minus 1/4" Rd. screen fraction.
PB-27

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APPENDIX D-9

Wabash Mine - Illinois No. 5 Seam

	Page
AX-1 - Total Product: a-o	D-154
AX-2 - 2" Rd. x 1/4" Rd.: a-d, f-k, n	D-162
AX-3 - 1/4" Rd. x 0: a-d, f-k, n-o	D-165

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PLEASE ADDRESS ALL CORRESPONDENCE TO
P.O. BOX 752, HENDERSON, KY 42420
OFFICE TEL. (502) 827-1187

TEXAS EASTERN SYNFUELS
HOUSTON, TX 77001

February 5, 1982

Kind of sample reported to us: Coal

Sample identification by C. T. & E. CO.

Sample taken at: Wabash Mine, Wabash County, Illinois

Tri-State Synfuels Project
Amax Coal Company
Wabash Mine
Crushed Raw Coal. Total Product.
AX-1

Sample taken by: CT&E

Date sampled: June 17, 1981

Date received: June 17, 1981 Analysis report no. 71-74295

PROXIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	11.61	XXXXX
Ash	18.40	20.82
Volatile	26.78	30.30
Fixed Carbon	43.21	48.88
	100.00	100.00
Btu/lb.	9986	11298 MAF 14269
Sulfur	1.10	1.24
Alk. as Na_2O	0.59	0.67

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	11.61	XXXXX
Carbon	56.60	64.03
Hydrogen	3.77	4.26
Nitrogen	0.76	0.86
Chlorine	0.19	0.22
Sulfur	1.10	1.24
Ash	18.40	20.82
Oxygen (diff)	7.57	8.57
	100.00	100.00

SULFUR FORMS		
Pyritic Sulfur	0.71	0.80
Sulfate Sulfur	0.00	0.00
Organic Sulfur	0.39	0.44

WATER SOLUBLE ALKALIES		
Na_2O	XXXX	XXXX
K_2O	XXXX	XXXX

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	2190 °F	2260 °F
Softening (H=W)	2460 °F	2700+ °F
Softening (H=½W)	2510 °F	2700+ °F
Fluid	2700+ °F	2700+ °F

H is Cone Height
W is Cone Width

% EQUILIBRIUM MOISTURE 12.63
HARDGROVE GRINDABILITY INDEX 50 @7.90% moisture
FREE SWELLING INDEX 1

Silica Value 82.95
Base: Acid Ratio 0.20
T_{250} Temperature 2765

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	57.93
Alumina, Al_2O_3	22.97
Titania, TiO_2	1.04
Ferric oxide, Fe_2O_3	8.37
Lime, CaO	2.20
Magnesia, MgO	1.34
Potassium oxide, K_2O	3.07
Sodium oxide, Na_2O	1.19
Sulfur trioxide, SO_3	1.41
Phos. pentoxide, P_2O_5	0.36
Strontium Oxide, SrO	0.00
Barium Oxide, BaO	0.05
Manganese Oxide, Mn_3O_4	0.07
Undetermined	0.00
	100.00
Fouling Index	0.24
Slagging Index	0.25

...ATED VISCOSITY at critical viscosity temperature of 2710°F = 480 poises

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division

D-154.

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SOUTH HOLLAND, IL 60473
OFFICE TEL. (312) 254-1173

TEXAS EASTERN Synfuels, Inc.
Houston, TX 77001

February 5, 1982

Sample identification by CT&E COMPANY

Kind of sample reported to us	Coal	Tri-State Synfuels Project Amax Coal Company Wabash Mine Crushed Raw Coal. Total Product. AX-1
Sample taken at	Wabash Mine Wabash County, Indiana	
Sample taken by	CT&E	
Date sampled	June 17, 1981	
Date received	June 17, 1981	

Analysis report no. 71-74295

TUMBLER TEST FOR COAL - ASTM D 441-45 (1975)

etained on	Passing	Weight percent (1)	Average of Sieve Openings Inches (2)	Factor (3)	Product of (1) x (3)
.06 in.	1.50 in.	100.0	1.280	1	100.00 = S
.06 in.	1.50 in.	21.4	1.280	1	21.4
.750 in.	1.06 in.	46.5	0.905	0.7	32.55
.530 in.	0.750 in.	16.3	0.640	0.5	8.15
.375 in.	0.530 in.	2.3	0.452	0.35	.805
.0469 in.	0.375 in.	2.7	0.211	0.16	.432
.0117 in.	0.0469 in.	0.8	0.029	0.023	.0184
	0.0117 in.	10.0	0.006	0.005	.0500
otal (Sum of products (1) x (3)					63.41 = s

Friability, 36.5 percent: with dust index of 10

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

D-155. Charter Member

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SOUTH HOLLAND, IL 60473
OFFICE TEL. (312) 284-1173

TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Amax Coal Company Wabash Mine Crushed Raw Coal. Total Product. AX-1
Sample taken at	Wabash Mine Wabash County, Illinois	
Sample taken by	CT&E	
Date sampled	June 17, 1981	
Date received	June 17, 1981	

Analysis report no. 71-74295

Caking Index (Damm's Method) = 11 - 12

	As Received	Dry Basis
Moisture, %	11.61	XXXXX
Fluorine, (F)[1], ug/g	124	140
Mercury (Hg)[2], ug/g	0.09	0.10

1. Preparation by oxygen bomb combustion; analysis by ion selective electrode. ASTM, Part 26, D3761-79.

2. Preparation by oxygen train combustion; analysis by flameless cold vapor atomic absorption spectroscopy. ASTM, Part 26, D3684-78

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

D-156. Charter Member

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OFFICE TEL. (312) 264-1173

TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Amax Coal Company Wabash Mine Crushed Raw Coal. Total Product. AX-1
Sample taken at	Wabash Mine Wabash County, Illinois	
Sample taken by	CT&E	
Date sampled	June 17, 1981	
Date received	June 17, 1981	

Analysis report no. 71-74295

Alkalies, dry coal basis

	Water soluble	Non Water Soluble
Sodium oxide, Na_2O, ppm	1031	1065
Potassium oxide, K_2O, ppm	91	5686

% Ash in non water soluble coal = 18.05

% Ash in original sample = 20.82

Alkalies calculated to ignited basis from above:

	Ignited basis
% Sodium oxide, Na_2O	1.09
% Potassium oxide, K_2O	3.19

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

D-157.

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OFFICE TEL. (312) 284-1173

February 5, 1982

TEXAS EASTERN SYNFUELS, INC.
Houston, TX 77001

Lab. No. 71-74295

Tri-State Synfuels Project
Amax Coal Company
Wabash Mine
Crushed Raw Coal. Total Product.
AX-1

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS
CONCENTRATION IN PPM WEIGHT

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium	2	Terbium	0.3	Ruthenium		Vanadium	100
Thorium	7	Gadolinium	0.7	Molybdenum	3	Titanium	MC
Bismuth		Europium	0.4	Niobium	13	Scandium	4
Lead	11	Samarium	3	Zirconium	40	Calcium	MC
Thallium		Neodymium	2	Yttrium	21	Potassium	MC
Mercury	NR	Praseodymium	3	Strontium	100	Chlorine	88
Gold		Cerium	29	Rubidium	54	Sulfur	MC
[illegible]inum		Lanthanum	26	Bromine	1	Phosphorus	MC
Iridium		Barium	300	Selenium	3	Silicon	MC
Osmium		Cesium	0.9	Arsenic	6	Aluminum	MC
Rhenium		Iodine	0.7	Germanium	4	Magnesium	MC
Tungsten		Tellurium	0.2	Gallium	21	Sodium	MC
Tantalum		Antimony	0.5	Zinc	*41	Fluorine	NR
Hafnium	≤0.4	Tin	0.3	Copper	21	Oxygen	NR
Lutetium		Indium	STD	Nickel	3	Nitrogen	NR
Ytterbium		Cadmium	0.2	Cobalt	48	Carbon	NR
Thulium		Silver		Iron	MC	Boron	6
Erbium	0.6	Palladium		Manganese	130	Beryllium	0.3
Holmium	0.8	Rhodium		Chromium	29	Lithium	9
Dysprosium	1	Neptunium	<0.1			Hydrogen	NR

STD - Internal Standard
NR - Not Reported
All elements not detected<0.1ppm
MC - Major Component
INT - Interference
Heterogeneous

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

D-158.

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TABLE NO. II
Trace Elements by Atomic Absorption
(concentration in ug/g)

Parameter	IC-38 As Rec'd	IC-38 Dry	IC-41 As Rec'd	IC-41 Dry	PB-25 As Rec'd	PB-25 Dry	AX-1 As Rec'd	AX-1 Dry	AX-4 As Rec'd	AX-4 Dry
Moisture (%)[1]	7.14	XXXX	7.82	XXXX	15.19	XXXX	11.61	XXXX	7.39	XXXX
Antimony	0.3	0.3	0.4	0.4	0.1	0.1	0.3	0.3	0.3	0.3
Arsenic	4.2	4.5	4.1	4.5	2.3	2.7	13.4	15.2	2.1	2.3
Beryllium	1	1	1	1	1	1	1	1	1	1
Boron[2]	100	110	110	120	220	260	130	150	80	90
Cadmium	0.8	0.9	1.6	1.7	0.4	0.5	0.2	0.2	0.4	0.4
Chromium	20	22	32	35	23	27	19	22	19	21
Copper	12	13	14	15	14	16	17	19	10	11
Fluorine[3]	90	97	140	155	250	300	120	140	95	105
Lead	7	7	14	15	4	5	16	18	8	9
Lithium	14	15	16	17	14	16	24	27	9	10
Manganese	73	79	91	99	88	104	63	71	63	68
Mercury	0.10	0.11	0.16	0.17	0.11	0.13	0.09	0.10	0.13	0.14
Nickel	13	14	17	18	20	24	21	24	12	13
Selenium	3.3	3.6	4.9	5.3	4.2	4.9	0.9	1	2.5	2.7
Uranium[4]	2.8	3.0	3.5	3.8	2.6	3.1	1.4	1.6	16.5	17.8
Vanadium	80	86	62	67	58	68	19	22	34	37
Zinc	113	122	153	166	98	116	50	57	95	103

1 Determination by ASTM Method D3173
2 Determination by curcumin colorimetric technique
3 Determination by ASTM Method D3761
4 Determination by delayed neutron activation

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TEXAS EASTERN SYNFUELS, INC.

PAUL WEIR CO. JOB NO. 2753-B

Analysis report No. 71-74295
Date: 10/07/81
Sample No. AX 1
TERMINAL TEMP 932 DEG. F

FISCHER ASSAY YIELDS	AS ANALYZED	NORMALIZED
OIL (LB/TON)	202.5	205.6
(GAL/TON)	23.0	23.4
API GRAVITY	2.8	2.6
GAS (LB/TON)	90.3	91.6
(SCF/TON)	1506.4	1528.9
WATER (LB/TON)	88.2	89.5
(GAL/TON)	10.6	10.7
SS (LB/TON)	1589.6	1613.3
TOTAL (LB/TON)	1970.6	2000.0
VARIANCE (PC)	-1.5	

GAS (NORMALIZED)	(LB/TON)	(LB/100 LB) (FA OIL)
H2	1.08	0.53
CO	8.13	3.96
CO2	17.04	8.29
H2S	7.61	3.70
C1	29.40	14.30
C2	11.49	5.59
C2-	2.68	1.30
C3	4.80	2.34
C3-	3.11	1.51
I-C4	0.32	0.16
N-C4	1.29	0.63
C4-	1.87	0.91
C5	1.19	0.58
C6	0.95	0.46
C7	0.60	0.29
C8	0.06	0.03
C9	0.00	0.00

ADJUSTED YIELDS (NORMALIZED)	LB/TON	SCF/TON	LB/100 LB F A OIL
C3 & LIGHTER	85.3	1492.7	42.1
SCRUBBED C3 & LIGHTER [LESS CO2 & H2S]	60.7	1261.3	30.0
C4 & HEAVIER	211.8		104.6
TOTAL HYDROCARBONS INCL. H2 & CO, LB/TON	272.5		134.6
C4 & HEAVIER (GAL/TON)		24.6	
API GRAVITY		5.5	

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SAMPLE NO. AX 1

COMPONENT MOLE PERCENT

H2	13.39
CO	7.20
CO2	9.60
H2S	5.54
C1	45.55
C2	9.46
C2-	2.37
C3	2.70
C3-	1.83
I-C4	0.14
N-C4	0.55
C4-	0.83
C5	0.41
C6	0.28
C7	0.15
C8	0.01
C9	0.00
SUM	100.00

AVERAGE MOLE WT 22.71

LBS C IN GAS/TON SHALE 53.52

WT. PERCENT TOTAL CARBON 58.41
WT. PERCENT SULFUR 7.82

BTU VALUE OF GAS (CALC.)		GROSS	NET
C3 & LIGHTER*	(BTU/SCF)	898.01	816.61
SCRUBBED C3 & LIGHTER	(BTU/SCF)	1019.89	926.88
WHOLE GAS*	(BTU/SCF)	962.75	877.10
SCRUBBED WHOLE GAS	(BTU/SCF)	1092.78	995.08

*[INCL. H2S & CO2]

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PLEASE ADDRESS ALL CORRESPONDENCE TO
P.O. BOX 752, HENDERSON, KY 42420
OFFICE TEL. (502) 827-1187

TEXAS EASTERN SYNFUELS
HOUSTON, TX 77001

February 5, 1982

Kind of sample reported to us. Coal

Sample taken at Wabash Mine
Wabash County, Illinois

Sample taken by CT&E

Date sampled June 17, 1981

Date received June 17, 1981 Analysis report no. 71-74296

Sample identification by C. T. & E. CO.

Tri-State Synfuels Project
Amax Coal Company
Wabash Mine
Plus 1/4" Rd. screen fraction.
AX-2

PROXIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	10.70	XXXXX
Ash	12.79	14.32
Volatile	29.30	32.81
Fixed Carbon	47.21	52.87
	100.00	100.00
Btu/lb.	11104	12435
Sulfur	1.44	1.61
Alk. as Na_2O	0.39	0.44
SULFUR FORMS		
Pyritic Sulfur	0.99	1.11
Sulfate Sulfur	0.01	0.01
Organic Sulfur	0.44	0.49
WATER SOLUBLE ALKALIES		
Na_2O	XXXX	XXXX
K_2O	XXXX	XXXX

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	2140 °F	2220 °F
Softening (H=W)	2430 °F	2700+ °F
Softening (H=½W)	2490 °F	2700+ °F
Fluid	2700+ °F	2700+ °F

H is Cone Height
W is Cone Width

% EQUILIBRIUM MOISTURE 10.73
HARDGROVE GRINDABILITY INDEX 50 @5.10% moisture
FREE SWELLING INDEX 4-1/2

Silica Value 79.06
Base: Acid Ratio 0.24
T_{250} Temperature 2660

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	10.70	XXXXX
Carbon	62.29	69.75
Hydrogen	4.32	4.84
Nitrogen	0.97	1.09
Chlorine	0.21	0.24
Sulfur	1.44	1.61
Ash	12.79	14.32
Oxygen (diff)	7.28	8.15
	100.00	100.00

MAF 14513

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	55.83
Alumina, Al_2O_3	23.18
Titania, TiO_2	1.07
Ferric oxide, Fe_2O_3	12.63
Lime, CaO	0.92
Magnesia, MgO	1.24
Potassium oxide, K_2O	2.93
Sodium oxide, Na_2O	1.16
Sulfur trioxide, SO_3	0.62
Phos. pentoxide, P_2O_5	0.33
Strontium Oxide, SrO	0.00
Barium Oxide, BaO	0.04
Manganese Oxide, Mn_3O_4	0.05
Undetermined	0.00
	100.00
Fouling Index	0.28
Slagging Index	0.39

b. CALCULATED VISCOSITY at critical viscosity temperature of 2690°F = 320 poises

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division

D-162.

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SOUTH HOLLAND, IL 60473
OFFICE TEL. (312) 264-1173

TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Amax Coal Company Wabash Mine Plus 1/4" Rd. screen fraction. AX-2
Sample taken at	Wabash Mine Wabash County, Illinois	
Sample taken by	CT&E	
Date sampled	June 17, 1981	
Date received	June 17, 1981	

Analysis report no. 71-74296

Caking Index (Damm's Method) = 12 - 13

	As Received	Dry Basis
Moisture, %	10.70	XXXXX
Fluorine, (F)[1], ug/g	85	95
Mercury (Hg)[2], ug/g	0.13	0.14

1. Preparation by oxygen bomb combustion; analysis by ion selective electrode. ASTM, Part 26, D3761-79.

2. Preparation by oxygen train combustion; analysis by flameless cold vapor atomic absorption spectroscopy. ASTM, Part 26, D3684-78

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division D-163.

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OFFICE TEL. (312) 264-1173

TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Amax Coal Company Wabash Mine Plus 1/4" Rd. screen fraction. AX-2
Sample taken at	Wabash Mine Wabash County, Illinois	
Sample taken by	CT&E	
Date sampled	June 17, 1981	
Date received	June 17, 1981	

Analysis report no. 71-74296

Alkalies, dry coal basis

	Water soluble	Non Water Soluble
Sodium oxide, Na_2O, ppm	841	806
Potassium oxide, K_2O, ppm	84	3770

% Ash in non water soluble coal = 13.00

% Ash in original sample = 14.32

Alkalies calculated to ignited basis from above:

	Ignited basis
% Sodium oxide, Na_2O	1.21
% Potassium oxide, K_2O	2.96

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

D-164.

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OFFICE TEL. (502) 827-1187

TEXAS EASTERN SYNFUELS
HOUSTON, TX 77001

February 5, 1982

Kind of sample reported to us	Coal	Sample identification by	C. T. & E. CO.
Sample taken at	Wabash Mine Wabash County, Illinois		Tri-State Synfuels Project Amax Coal Company Wabash Mine
Sample taken by	CT&E		Minus 1/4" Rd. screen fraction. AX-3
Date sampled	June 17, 1981		
Date received	June 17, 1981	Analysis report no.	71-74297

PROXIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	12.73	XXXXX
Ash	15.24	17.46
Volatile	28.63	32.81
Fixed Carbon	43.40	49.73
	100.00	100.00
Btu/lb.	10375	11888
Sulfur	1.29	1.48
Alk. as Na_2O	0.46	0.53
SULFUR FORMS		
Pyritic Sulfur	0.80	0.92
Sulfate Sulfur	0.02	0.02
Organic Sulfur	0.47	0.54
WATER SOLUBLE ALKALIES		
Na_2O	XXXX	XXXX
K_2O	XXXX	XXXX

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	2150 °F	2220 °F
H is Cone Height: Softening (H=W)	2350 °F	2500 °F
W is Cone Width: Softening (H=½W)	2390 °F	2550 °F
Fluid	2700	2700+
% EQUILIBRIUM MOISTURE	10.77	
HARDGROVE GRINDABILITY INDEX	53 @7.70% moisture	
FREE SWELLING INDEX	1	
Silica Value	76.51	
Base: Acid Ratio	0.26	
T_{250} Temperature	2605	

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	12.73	XXXXX
Carbon	58.51	67.04
Hydrogen	3.99	4.58
Nitrogen	1.02	1.17
Chlorine	0.24	0.27
Sulfur	1.29	1.48
Ash	15.24	17.46
Oxygen (diff)	6.98	8.01
	100.00	100.00

MAF 14403

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	52.30
Alumina, Al_2O_3	22.66
Titania, TiO_2	0.93
Ferric oxide, Fe_2O_3	10.10
Lime, CaO	4.79
Magnesia, MgO	1.17
Potassium oxide, K_2O	2.66
Sodium oxide, Na_2O	1.31
Sulfur trioxide, SO_3	3.48
Phos. pentoxide, P_2O_5	0.47
Strontium Oxide, SrO	0.01
Barium Oxide, BaO	0.05
Manganese Oxide, Mn_3O_4	0.07
Undetermined	0.00
	100.00
Fouling Index	0.34
Slagging Index	0.38

: ATED VISCOSITY at critical viscosity
emperature of 2590°F = 500 poises

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO

L. W. TAYLOR III, Manager, Central Division

D-165.

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TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Amax Coal Company Wabash Mine Minus 1/4" Rd. screen fraction. AX-3
Sample taken at	Wabash Mine Wabash County, Illinois	
Sample taken by	CT&E	
Date sampled	June 17, 1981	
Date received	June 17, 1981	

Analysis report no. 71-74297

Caking Index (Damm's Method) = 11 - 12

	As Received	Dry Basis
Moisture, %	12.73	XXXXX
Fluorine, (F)[1], ug/g	157	180
Mercury (Hg)[2], ug/g	0.13	0.15

1. Preparation by oxygen bomb combustion; analysis by ion selective electrode. ASTM, Part 26, D3761-79.

2. Preparation by oxygen train combustion; analysis by flameless cold vapor atomic absorption spectroscopy. ASTM, Part 26, D3684-78

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division D-166.

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OFFICE TEL. (312) 264-1173

TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification
by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Amax Coal Company Wabash Mine Minus 1/4" Rd. screen fraction. AX-3
Sample taken at	Wabash Mine Wabash County, Illinois	
Sample taken by	CT&E	
Date sampled	June 17, 1981	
Date received	June 17, 1981	

Analysis report no. 71-74297

Alkalies, dry coal basis

	Water soluble	Non Water Soluble
Sodium oxide, Na_2O, ppm	1128	960
Potassium oxide, K_2O, ppm	87	4260

% Ash in non water soluble coal = 15.49

% Ash in original sample = 17.46

Alkalies calculated to ignited basis from above:

	Ignited basis
% Sodium oxide, Na_2O	1.27
% Potassium oxide, K_2O	2.80

Respectfully submitted.
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division D-167.

Chemist Monitor

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TEXAS EASTERN SYNFUELS, INC.

PAUL WEIR CO. JOB NO. 2753-B

Analysis report No. 71-74297
Date: 10/12/81
Sample No. AX 3
TERMINAL TEMP 932 DEG. F

FISCHER ASSAY YIELDS	AS ANALYZED	NORMALIZED
OIL (LB/TON)	186.8	189.0
(GAL/TON)	21.4	21.6
API GRAVITY	3.6	3.6
GAS (LB/TON)	87.6	88.6
(SCF/TON)	1480.4	1497.4
WATER (LB/TON)	98.4	99.5
(GAL/TON)	11.8	11.9
SS (LB/TON)	1604.5	1623.0
TOTAL (LB/TON)	1977.3	2000.0
VARIANCE (PC)	-1.1	

GAS (NORMALIZED)	(LB/TON)	(LB/100 LB) (FA OIL)
H2	1.12	0.59
CO	8.53	4.51
CO2	16.69	8.83
H2S	7.25	3.84
C1	29.06	15.38
C2	10.21	5.40
C2-	2.25	1.19
C3	4.31	2.28
C3-	2.90	1.54
I-C4	0.33	0.18
N-C4	1.00	0.53
C4-	1.93	1.02
C5	1.23	0.65
C6	0.98	0.52
C7	0.57	0.30
C8	0.20	0.10
C9	0.00	0.00

ADJUSTED YIELDS (NORMALIZED)	LB/TON	SCF/TON	LB/100 LB F A OIL
C3 & LIGHTER	82.3	1461.9	44.1
SCRUBBED C3 & LIGHTER [LESS CO2 & H2S]	58.4	1237.5	31.3
C4 & HEAVIER	195.2		104.5
TOTAL HYDROCARBONS INCL. H2 & CO, LB/TON	253.6		135.7
C4 & HEAVIER (GAL/TON)		22.8	
API GRAVITY		6.5	

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SAMPLE NO. AX 3

COMPONENT MOLE PERCENT

H2	14.11
CO	7.71
CO2	9.60
H2S	5.38
C1	45.98
C2	8.58
C2-	2.04
C3	2.47
C3-	1.75
I-C4	0.15
N-C4	0.44
C4-	0.87
C5	0.44
C6	0.29
C7	0.15
C8	0.04
C9	0.00
SUM	100.00

AVERAGE MOLE WT	22.42
LBS C IN GAS/TON SHALE	51.35
WT. PERCENT TOTAL CARBON	57.98
WT. PERCENT SULFUR	7.71

BTU VALUE OF GAS (CALC.)		GROSS	NET
C3 & LIGHTER*	(BTU/SCF)	876.26	796.40
SCRUBBED C3 & LIGHTER	(BTU/SCF)	993.55	902.43
WHOLE GAS*	(BTU/SCF)	942.73	858.51
SCRUBBED WHOLE GAS	(BTU/SCF)	1068.46	972.53

*[INCL. H2S & CO2]

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APPENDIX D-10

Delta Mine - Illinois No. 6 Seam

	Page
AX-4 - Total Product: a-n	D-171
AX-5 - 2" Rd. x 1/4" Rd.: a-d, f-k, n	D-177
AX-6 - 1/4" Rd. x 0: a-d, f-k, n	D-180

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OFFICE TEL. (502) 827-1187

TEXAS EASTERN SYNFUELS
HOUSTON, TX 77001

February 5, 1982

Kind of sample reported to us: Coal

Sample identification by C. T. & E. CO.

Sample taken at: Delta Mine
Saline County, Illinois

Tri-State Synfuels Project
Amax Coal Company
Delta Mine
Crushed Raw Coal. Total Product.
AX-4

Sample taken by: CT&E

Date sampled: June 18, 1981

Date received: June 18, 1981 Analysis report no. 71-74327

PROXIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	7.39	XXXXX
Ash	12.38	13.37
Volatile	31.53	34.05
Fixed Carbon	48.70	52.58
	100.00	100.00
Btu/lb.	11598	12523
Sulfur	3.48	3.76
Alk. as Na_2O	0.21	0.23

MAF 14456

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	7.39	XXXXX
Carbon	64.38	69.52
Hydrogen	4.34	4.69
Nitrogen	1.03	1.11
Chlorine	0.08	0.09
Sulfur	3.48	3.76
Ash	12.38	13.37
Oxygen (diff)	6.92	7.46
	100.00	100.00

SULFUR FORMS		
Pyritic Sulfur	2.14	2.31
Sulfate Sulfur	0.10	0.11
Organic Sulfur	1.24	1.34

WATER SOLUBLE ALKALIES		
Na_2O	XXXX	XXXX
K_2O	XXXX	XXXX

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	2000 °F	2250 °F
H = Cone Height; Softening (H=W)	2120 °F	2320 °F
W = Cone Width; Softening (H=½W)	2160 °F	2400 °F
Fluid	2260 °F	2480 °F

% EQUILIBRIUM MOISTURE 5.90
HARDGROVE GRINDABILITY INDEX 54 @3.90% moisture
FREE SWELLING INDEX 5

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	36.78
Alumina, Al_2O_3	15.37
Titania, TiO_2	0.60
Ferric oxide, Fe_2O_3	26.04
Lime, CaO	11.12
Magnesia, MgO	0.80
Potassium oxide, K_2O	1.58
Sodium oxide, Na_2O	0.67
Sulfur trioxide, SO_3	6.70
Phos. pentoxide, P_2O_5	0.24
Strontium Oxide, SrO	0.00
Barium Oxide, BaO	0.02
Manganese Oxide, Mn_3O_4	0.08
Undetermined	0.00
	100.00

Silica Value	49.21
Base: Acid Ratio	0.76
T_{250} Temperature	2190
Fouling Index	0.51
Slagging Index	2.86

...TED VISCOSITY at critical viscosity temperature of 2360°F = 25 poises

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division D-171.

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16130 VAN DRUNEN RD., P.O. BOX 127
SOUTH HOLLAND, IL 60473
OFFICE TEL. (312) 264-1173

TEXAS EASTERN Synfuels, Inc.
Houston, TX 77001

February 5, 1982

Sample identification
by CT&E COMPANY

Kind of sample reported to us	Coal	Tri-State Synfuels Project Amax Coal Company Delta Mine Crushed Raw Coal. Total Product. AX-4
Sample taken at	Delta Mine Saline County, Illinois	
Sample taken by	CT&E	
Date sampled	June 18, 1981	
Date received	June 18, 1981	

Analysis report no. 71-74327

TUMBLER TEST FOR COAL - ASTM D 441-45 (1975)

etained on	Passing	Weight percent (1)	Average of Sieve Openings Inches (2)	Factor (3)	Product of (1) x (3)
.06 in.	1.50 in.	100.0	1.280	1	100.00 = S
.06 in.	1.50 in.	24.2	1.280	1	24.2
.750 in.	1.06 in.	49.1	0.905	0.7	34.37
.530 in.	0.750 in.	9.8	0.640	0.5	4.90
.375 in.	0.530 in.	2.8	0.452	0.35	.980
.0469 in.	0.375 in.	3.0	0.211	0.16	.480
0117 in.	0.0469 in.	2.0	0.029	0.023	.0460
	0.0117 in.	9.1	0.006	0.005	.0455
tal (Sum of products (1) x (3)					65.02 = s

Friability, 35.0 percent: with dust index of 9

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division D-172.

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SOUTH HOLLAND, IL 60473
OFFICE TEL. (312) 264-1173

TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Amax Coal Company Delta Mine Crushed Raw Coal. Total Product. AX-4
Sample taken at	Delta Mine Saline County, Illinois	
Sample taken by	CT&E	
Date sampled	June 18, 1981	
Date received	June 18, 1981	

Analysis report no. 71-74327

Caking Index (Damm's Method) = 14 - 15

	As Received	Dry Basis
Moisture, %	7.39	XXXXX
Fluorine, (F)[1], ug/g	97	105
Mercury (Hg)[2], ug/g	0.13	0.14

1. Preparation by oxygen bomb combustion; analysis by ion selective electrode. ASTM, Part 26, D3761-79.

2. Preparation by oxygen train combustion; analysis by flameless cold vapor atomic absorption spectroscopy. ASTM, Part 26, D3684-78

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

D-173.

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SOUTH HOLLAND, IL 60473
OFFICE TEL. (312) 264-1173

TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification
by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Amax Coal Company Delta Mine Crushed Raw Coal. Total Product. AX-4
Sample taken at	Delta Mine Saline County, Illinois	
Sample taken by	CT&E	
Date sampled	June 18, 1981	
Date received	June 18, 1981	

Analysis report no. 71-74327

Alkalies, dry coal basis

	Water soluble	Non Water Soluble
Sodium oxide, Na_2O, ppm	198	569
Potassium oxide, K_2O, ppm	80	2299

% Ash in non water soluble coal = 12.10

% Ash in original sample = 13.37

Alkalies calculated to ignited basis from above:

	Ignited basis
% Sodium oxide, Na_2O	0.62
% Potassium oxide, K_2O	1.96

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

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February 5, 1982

TEXAS EASTERN SYNFUELS, INC.
Houston, TX 77001

Lab. No. 71-74327

Tri-State Synfuels Project
Amax Coal Company
Delta Mine
Crushed Raw Coal. Total Product.
AX-4

SPARK SOURCE MASS SPECTROGRAPHIC ANALYSIS
CONCENTRATION IN PPM WEIGHT

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium	27	Terbium		Ruthenium		Vanadium	25
Thorium	3	Gadolinium		Molybdenum	38	Titanium	MC
Bismuth		Europium	0.1	Niobium	4	Scandium	1
Lead	6	Samarium	0.7	Zirconium	22	Calcium	MC
Thallium		Neodymium	0.8	Yttrium	10	Potassium	MC
Mercury	NR	Praseodymium	4	Strontium	30	Chlorine	110
Gold		Cerium	20	Rubidium	16	Sulfur	MC
[illegible]inum		Lanthanum	20	Bromine	7	Phosphorus	MC
Iridium		Barium	81	Selenium	4	Silicon	MC
Osmium		Cesium	0.4	Arsenic	4	Aluminum	MC
Rhenium		Iodine	0.4	Germanium	0.4	Magnesium	MC
Tungsten	7	Tellurium	0.1	Gallium	6	Sodium	MC
Tantalum		Antimony	0.3	Zinc	22	Fluorine	NR
Hafnium		Tin	0.2	Copper	10	Oxygen	NR
Lutetium		Indium	STD	Nickel	3	Nitrogen	NR
Ytterbium		Cadmium	0.2	Cobalt	6	Carbon	NR
Thulium		Silver		Iron	MC	Boron	7
Erbium		Palladium		Manganese	38	Beryllium	<0.1
Holmium		Rhodium		Chromium	9	Lithium	3
Dysprosium		Neptunium	<0.1			Hydrogen	NR

STD - Internal Standard
NR - Not Reported
All elements not detected<0.1ppm
MC - Major Component
INT - Interference

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

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TABLE NO. II
Trace Elements by Atomic Absorption
(concentration in ug/g)

Parameter	IC-38 As Rec'd	IC-38 Dry	IC-41 As Rec'd	IC-41 Dry	PB-25 As Rec'd	PB-25 Dry	AX-1 As Rec'd	AX-1 Dry	AX-4 As Rec'd	AX-4 Dry
Moisture (%)[1]	7.14	XXXX	7.82	XXXX	15.19	XXXX	11.61	XXXX	7.39	XXXX
Antimony	0.3	0.3	0.4	0.4	0.1	0.1	0.3	0.3	0.3	0.3
Arsenic	4.2	4.5	4.1	4.5	2.3	2.7	13.4	15.2	2.1	2.3
Beryllium	1	1	1	1	1	1	1	1	1	1
Boron[2]	100	110	110	120	220	260	130	150	80	90
Cadmium	0.8	0.9	1.6	1.7	0.4	0.5	0.2	0.2	0.4	0.4
Chromium	20	22	32	35	23	27	19	22	19	21
Copper	12	13	14	15	14	16	17	19	10	11
Fluorine[3]	90	97	140	155	250	300	120	140	95	105
Lead	7	7	14	15	4	5	16	18	8	9
Lithium	14	15	16	17	14	16	24	27	9	10
Manganese	73	79	91	99	88	104	63	71	63	68
Mercury	0.10	0.11	0.16	0.17	0.11	0.13	0.09	0.10	0.13	0.14
Nickel	13	14	17	18	20	24	21	24	12	13
Selenium	3.3	3.6	4.9	5.3	4.2	4.9	0.9	1	2.5	2.7
Uranium[4]	2.8	3.0	3.5	3.8	2.6	3.1	1.4	1.6	16.5	17.8
Vanadium	80	86	62	67	58	68	19	22	34	37
Zinc	113	122	153	166	98	116	50	57	95	103

1 Determination by ASTM Method D3173
2 Determination by curcumin colorimetric technique
3 Determination by ASTM Method D3761
4 Determination by delayed neutron activation

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OFFICE TEL. (502) 827-1187

TEXAS EASTERN SYNFUELS
HOUSTON, TX 77001

February 5, 1982

Kind of sample reported to us: Coal

Sample identification by C. T. & E. CO.

Sample taken at: Delta Mine, Saline County, Illinois

Sample taken by: CT&E

Date sampled: June 18, 1981

Tri-State Synfuels Project
Amax Coal Company
Delta Mine
Plus 1/4" Rd. screen fraction.
AX-5

Date received: June 18, 1981 Analysis report no. 71-74328

PROXIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	6.22	XXXXX
Ash	10.37	11.06
Volatile	32.98	35.17
Fixed Carbon	50.43	53.77
	100.00	100.00
Btu/lb.	12189	12997
Sulfur	3.26	3.48
Alk. as Na_2O	0.21	0.22

MAF 14613

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	6.22	XXXXX
Carbon	67.19	71.65
Hydrogen	4.55	4.85
Nitrogen	1.12	1.19
Chlorine	0.09	0.10
Sulfur	3.26	3.48
Ash	10.37	11.06
Oxygen (diff)	7.20	7.67
	100.00	100.00

SULFUR FORMS		
Pyritic Sulfur	1.78	1.90
Sulfate Sulfur	0.01	0.01
Organic Sulfur	1.47	1.57

WATER SOLUBLE ALKALIES		
Na_2O	XXXX	XXXX
K_2O	XXXX	XXXX

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	1930 °F	2060 °F
Softening (H = W)	2170 °F	2230 °F
Softening (H = ½W)	2210 °F	2400 °F
Fluid	2360 °F	2535 °F

H is Cone Height
W is Cone Width

% EQUILIBRIUM MOISTURE	5.80
HARDGROVE GRINDABILITY INDEX	49 @4.00% moisture
FREE SWELLING INDEX	5-1/2
Silica Value	60.80
Base: Acid Ratio	0.50
T_{250} Temperature	2310

ESTIMATED VISCOSITY at critical viscosity temperature of 2410°F = 125 poises

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	45.55
Alumina, Al_2O_3	18.26
Titania, TiO_2	0.86
Ferric oxide, Fe_2O_3	24.87
Lime, CaO	3.56
Magnesia, MgO	0.94
Potassium oxide, K_2O	1.98
Sodium oxide, Na_2O	0.70
Sulfur trioxide, SO_3	3.09
Phos. pentoxide, P_2O_5	0.11
Strontium Oxide, SrO	0.01
Barium Oxide, BaO	0.03
Manganese Oxide, Mn_3O_4	0.04
Undetermined	0.00
	100.00
Fouling Index	0.35
Slagging Index	1.74

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division

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OFFICE TEL. (312) 264-1173

TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification
by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Amax Coal Company Delta Mine Plus 1/4" screen fraction. AX-5
Sample taken at	Delta Mine Saline County, Illinois	
Sample taken by	CT&E	
Date sampled	June 18, 1981	
Date received	June 18, 1981	

Analysis report no. 71-74328

Caking Index (Damm's Method) = 14 - 15

	As Received	Dry Basis
Moisture, %	6.22	XXXXX
Fluorine, (F)[1], ug/g	98	105
Mercury (Hg)[2], ug/g	0.08	0.09

1. Preparation by oxygen bomb combustion; analysis by ion selective electrode. ASTM, Part 26, D3761-79.

2. Preparation by oxygen train combustion; analysis by flameless cold vapor atomic absorption spectroscopy. ASTM, Part 26, D3684-78

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

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OFFICE TEL. (312) 284-1773

TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification
by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Amax Coal Company Delta Mine Plus 1/4" screen fraction. AX-5
Sample taken at	Delta Mine Saline County, Illinois	
Sample taken by	CT&E	
Date sampled	June 18, 1981	
Date received	June 18, 1981	

Analysis report no. 71-74328

Alkalies, dry coal basis

	Water soluble	Non Water Soluble
Sodium oxide, Na_2O, ppm	130	483
Potassium oxide, K_2O, ppm	80	2071

% Ash in non water soluble coal = 9.86

% Ash in original sample = 11.06

Alkalies calculated to ignited basis from above:

	Ignited basis
% Sodium oxide, Na_2O	0.61
% Potassium oxide, K_2O	2.17

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOLSER, Manager, Midwest Division D-179.

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TEXAS EASTERN SYNFUELS
HOUSTON, TX 77001

February 5, 1982

Kind of sample reported to us: Coal

Sample identification by C. T. & E. CO.

Sample taken at: Delta Mine, Saline County, Illinois

Sample taken by: CT&E

Tri-State Synfuels Project
Amax Coal Company
Delta Mine
Minus 1/4" Rd. screen fraction.
AX-6

Date sampled: June 18, 1981

Date received: June 18, 1981 Analysis report no. 71-74329

PROXIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	7.98	XXXXX
Ash	14.16	15.39
Volatile	29.83	32.42
Fixed Carbon	48.03	52.19
	100.00	100.00
Btu/lb.	11053	12012
Sulfur	3.61	3.92
Alk. as Na_2O	0.22	0.24
SULFUR FORMS		
Pyritic Sulfur	2.34	2.54
Sulfate Sulfur	0.18	0.20
Organic Sulfur	1.09	1.18
WATER SOLUBLE ALKALIES		
Na_2O	XXXX	XXXX
K_2O	XXXX	XXXX

MAF 14197

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	1910 °F	2050 °F
H is Cone Height — Softening (H=W)	2060 °F	2140 °F
W is Cone Width — Softening (H=½W)	2090 °F	2230 °F
Fluid	2180 °F	2320 °F

% EQUILIBRIUM MOISTURE	5.29
HARDGROVE GRINDABILITY INDEX	57 @3.80% moisture
FREE SWELLING INDEX	3
Silica Value	44.56
Base: Acid Ratio	0.90
T_{250} Temperature	2160

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	7.98	XXXXX
Carbon	62.33	67.74
Hydrogen	3.91	4.25
Nitrogen	1.01	1.10
Chlorine	0.06	0.07
Sulfur	3.61	3.92
Ash	14.16	15.39
Oxygen (diff)	6.94	7.53
	100.00	100.00

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	31.78
Alumina, Al_2O_3	13.77
Titania, TiO_2	0.47
Ferric oxide, Fe_2O_3	22.79
Lime, CaO	15.92
Magnesia, MgO	0.83
Potassium oxide, K_2O	1.33
Sodium oxide, Na_2O	0.69
Sulfur trioxide, SO_3	12.07
Phos. pentoxide, P_2O_5	0.20
Strontium Oxide, SrO	0.00
Barium Oxide, BaO	0.03
Manganese Oxide, Mn_3O_4	0.12
Undetermined	0.00
	100.00
Fouling Index	0.62
Slagging Index	3.53

E. MATED VISCOSITY at critical viscosity temperature of 2290°F = <10 poises

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L. W. TAYLOR III, Manager, Central Division

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OFFICE TEL. (312) 264-1173

TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Amax Coal Company Delta Mine Minus 1/4" screen fraction. AX-6
Sample taken at	Delta Mine Saline County, Illinois	
Sample taken by	CT&E	
Date sampled	June 18, 1981	
Date received	June 18, 1981	

Analysis report no. 71-74329

Caking Index (Damm's Method) = 11 - 12

	As Received	Dry Basis
Moisture, %	7.98	XXXXX
Fluorine, (F)[1], ug/g	97	105
Mercury (Hg)[2], ug/g	0.07	0.08

1. Preparation by oxygen bomb combustion; analysis by ion selective electrode. ASTM, Part 26, D3761-79.

2. Preparation by oxygen train combustion; analysis by flameless cold vapor atomic absorption spectroscopy. ASTM, Part 26, D3684-78

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

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TEXAS EASTERN SYNFUELS
Houston, TX 77001

February 5, 1982

Sample identification
by CT&E Company

Kind of sample reported to us	Coal	Tri-State Synfuels Project Amax Coal Company Delta Mine Minus 1/4" screen fraction. AX-6
Sample taken at	Delta Mine Saline County, Illinois	
Sample taken by	CT&E	
Date sampled	June 18, 1981	
Date received	June 18, 1981	

Analysis report no. 71-74329

Alkalies, dry coal basis

	Water soluble	Non Water Soluble
Sodium oxide, Na_2O, ppm	238	673
Potassium oxide, K_2O, ppm	78	1816

% Ash in non water soluble coal = 13.45

% Ash in original sample = 15.39

Alkalies calculated to ignited basis from above:

	Ignited basis
% Sodium oxide, Na_2O	0.66
% Potassium oxide, K_2O	1.40

Respectfully submitted.
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division D-182.

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Charter Member

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