LITTLE SIOUX CORN PROCESSORS

April 1, 2013

Re: Method 2A Application- Excluding Confidential Business Information

California Air Resources Board
Stationary Source Division
Criteria Pollutants Branch - 6th Floor
1001 I Street
P.O. BOX 2815
Sacramento, CA 95812

To: The Executive Officer

Herewith, please find our application and supporting documents for a fuel lifecycle GHG emissions pathway using the Method 2A application process described in "Establishing New Fuel Pathways under the California Low Carbon Fuel Standard (LCFS) Procedures and Guidelines for Regulated Parties" report by ARB (California Air Resources Board) as updated on January 3, 2013, as well as the recently revised LCFS Regulations.

We seek three new pathways for our Little Sioux Corn Processors, LLLP ("Little Sioux") ethanol plant located near Marcus, Iowa. At our facility, we produce ethanol from U.S. corn. Our facility uses natural gas for its process energy and electricity from the local grid. We co-produce modified distillers grains solubles (MDGS), dry distillers grains solubles (DDGS) and corn oil.

The CARB LCFS regulations stipulate that only pathways lower in carbon intensity value than the main pathway they deviate from can use the Method 2A application. Our pathways are a sub-pathway of the Corn Ethanol (Midwest; Dry Mill; Dry DGS, NG) Pathway because, except for the points of deviation summarized below, our pathways are identical to the Corn Ethanol (Midwest; Dry Mill; Dry DGS, NG) Pathway described in the Detailed California-Modified GREET Pathway for Corn Ethanol Well-to-Wheel (WTW) lifecycle analysis.[1]

We have used the CA-GREET Model 1.8b to calculate the lifecycle greenhouse gas emissions from these sub-pathways. Based on the input changes to the model described in the attachments, the carbon intensity value of the new pathway with 100% DDGS production is

[1] Detailed California-Modified GREET Pathway for Corn Ethanol Well-to-Wheel (WTW) lifecycle analysis, Version 2.1, published February 27, 2009.

4808 F AVENUE, MARCUS, IA 51035 • PHONE: 712-376-2800 • 1-866-436-2676 • FAX: 712-376-2815

89.09 gCO2e/MJ and the carbon intensity value of the new pathway with 100% MDGS production is 82.36 gCO2e/MJ and the carbon intensity value of the mixed DGS (62% DDGS and 38% MDGS) new pathway is 86.54 gCO2e/MJ. These CI intensity values and our production volumes more than meet the "5-10" substantiality rule and the other requirements of a new pathway.

The following sections to this application provide the details and documentation of our application for new pathways under Method 2A. Portions of the following information that we consider Confidential Business Information have been clearly marked as such, *but are not included in this non-confidential version of the application. In this version of the application, the points where elements of Confidential Business Information have been removed from the text or accompanying tables are indicated so as to inform the public that the complete application to the ARB contained additional information to support this application, but that such information is considered by us to be Confidential Business Information.*

We request your approval and would be glad to answer any questions you may have about our application. Following please find the names and contact information of the persons who are available to answer any questions about our application. Please note that Houston BioFuels Consultants, LLC are assisting us with the application and may be contacted if you have questions or comments about our application

Affiliation:	Little Sioux Corn Processors, LLLP	Houston BioFuels Consultants, LLC
Name:	Mr. Steve Roe	Mr. Logan Caldwell, Consultant
Telephone number:	1-712-376-2800	1-281-360-8515
e-mail address	steve.roe@littlesiouxcornprocessors.com	lc@hbioc.net
Mailing Address	4808 F Avenue	5707 Ridge Vista Drive
	Marcus, IA 51035	Kingwood, TX 77345

Sincerely,

Stephen Roe
General Manager
LSCP, LLLP

Attachments

Section Number and Contents

I. WTW Diagram of Little Sioux Sub-Pathway of the Midwest Corn Ethanol Pathway

Figure 1: WTW Components of the Little Sioux Pathway are Identical to the Corn Ethanol (Midwest; Dry/Wet Mill; Dry DGS, NG) Pathway[2]

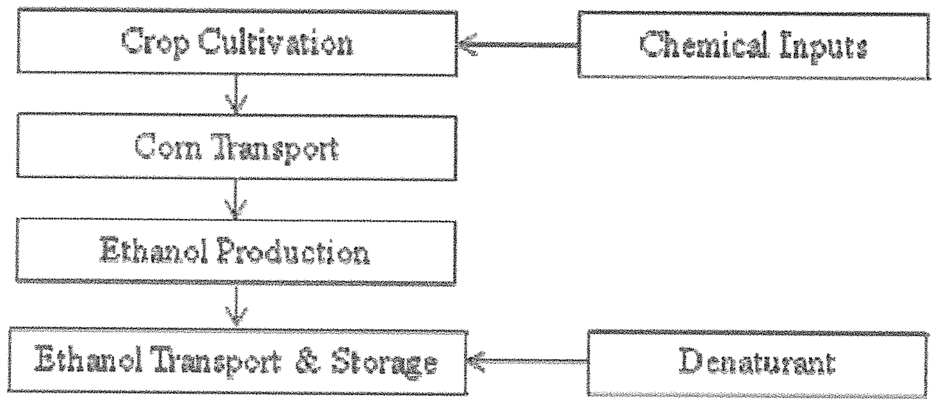


Figure 1. WTT Components for Ethanol Transported to California

[2] Detailed California-Modified GREET Pathway for Corn Ethanol Well-to-Wheel (WTW) lifecycle analysis, Page 4, Version 2.1, published February 27, 2009.

II. Little Sioux Plant Information - Confidential Business Information

Little Sioux Plant Info

1. EPA Facility ID Number - 70015
2. Plant Location – Marcus, Iowa
3. History – *Plant began production in April 2003 as a 40 million gallon per year production facility. LSCP has undergone 2 expansions since the original plant startup and is currently operating at close to permitted capacity. The plant is located in NW Iowa on the CN Railroad*
4. Capacity Notes – *Permitted for 120,000,000 million gallons annual production*
5. Technology - ICM
6. Feedstock Type - Corn
7. Product - Ethanol
8. Co-Products – DDGS, MDGS and Corn Oil
9. Process fuel – Natural Gas
10. Power supply – from the local grid

11. Process Flow Description – The following description and diagram of the dry mill process is from the ICM Inc. web site.

Delivery/Storage
Grain is delivered by truck or rail to the ethanol plant where it's loaded in storage bins designed to hold enough grain to supply the plant for 6-8 days.

Milling
The grain is screened to remove debris and ground into course flour.

Cooking (Hot Slurry, Primary Liquefaction, and Secondary Liquefaction)
During the cook process, the starch in the flour is physically and chemically prepared for fermentation.

Hot Slurry
The milled grain is mixed with process water, the pH is adjusted to about 5.8, and an alpha-amylase enzyme is added. The slurry is heated to 180–190°F for 30–45 minutes to reduce viscosity.

Primary Liquefaction
The slurry is then pumped through a pressurized jet cooker at 221°F and held for 5 minutes. The mixture is then cooled by an atmospheric or vacuum flash condenser.

Secondary Liquefaction
After the flash condensation cooling, the mixture is held for 1–2 hours at 180–190°F to give the alpha-amylase enzyme time to break down the starch into short chain dextrins. After pH and temperature adjustment, a second enzyme, glucoamylase, is added as the mixture is pumped into the fermentation tanks.

Simultaneous Saccharification Fermentation
Once inside the fermentation tanks, the mixture is referred to as mash. The glucoamylase enzyme breaks down the dextrins to form simple sugars. Yeast is added to convert the sugar to ethanol and carbon dioxide. The mash is then allowed to ferment for 40-50 hours, resulting in a mixture that contains about 15% ethanol as well as the solids from the grain and added yeast.

Distillation
The fermented mash is pumped into a multi-column distillation system where additional heat is added. The columns utilize the differences in the boiling points of ethanol and water to boil off and separate the ethanol. By the time the product stream is ready to leave the distillation columns, it contains about 95% ethanol by volume (190-proof). The residue from this process, called stillage, contains non-fermentable solids and water and is pumped out from the bottom of the columns into the centrifuges.

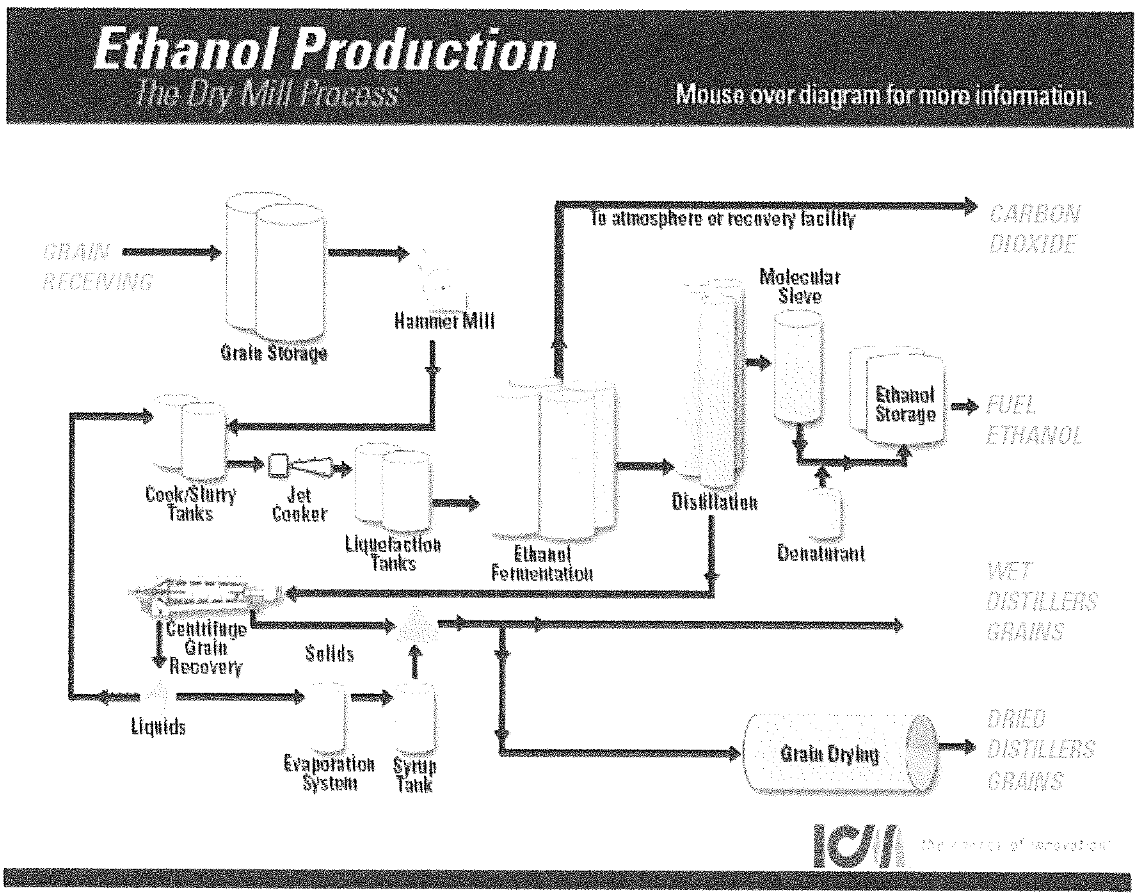
Dehydration
The 190-proof ethanol still contains about 5% water. It's passed through a molecular sieve to physically separate the remaining water from the ethanol based on the different sizes of the

molecules. This step produces 200-proof anhydrous (waterless) ethanol.

Ethanol Storage
Before the ethanol is sent to storage tanks, a small amount of denaturant is added, making it unfit for human consumption. Most ethanol plants' storage tanks are sized to allow storage of 7–10 days' production capacity.

12. Process Block Flow Diagram *(this should tie with the process flow description and the energy and material balance. This can be generic.)*

Source: ICM Inc.



13. Energy and Material Balance. For legibility, the energy and material balance for the Little Sioux ethanol plant is contained in a separate pdf file accompanying the electronic version of this application and is a separate document in the printed, hard copy version of this application. - **However, because it contains Confidential Business Information, it is not included in this non-confidential version of the application.**

14. In a separate document/electronic file accompanying this application due to its size, please find the latest version of the plant's air permits. These permits contain information about the equipment in the plant that generates emissions from the combustion of fuel.

III. Table of CA-GREET Model Inputs for Little Sioux Pathways - Confidential Business Information

Table 1: CA-GREET Model Inputs for the Little Sioux Mixed DGS Pathway (62% DDGS, 38% MDGS)

CA-GREET Model Sheet Name	Cell number	Default Pathway Value	Little Sioux Mixed DGS Pathway Value	Units	Description	Comments
Fuel_Prod_TS	L277	36,000	Confidential Business Information	btu/gal	Corn Ethanol Plant Energy Use, Dry Mill	With modern plant, lower power use
Fuel_Prod_TS	D277	2.72	Confidential Business Information	gal/bu	Ethanol yield of Corn Ethanol Plant, Dry Mill	With modern plant, optimized yield
Inputs	C247	10.19%	Confidential Business Information	%	Share of process energy for Electricity	With modern plant, lower power use
Inputs	C254	32,330	Confidential Business Information	btu/gal	Process fuel, 100%	Shown here for reference only. This cell is calculated based on cell L277 in Fuel_Prod_TS and Inputs C247
Inputs	C258	1.08	Confidential Business Information	kwh/gal	Electricity used for ethanol production	Shown here for reference only. This cell is calculated based on cell L277 in Fuel_Prod_TS and Inputs C247

Table 2: CA-GREET Model Inputs for the Little Sioux Pathway 100% DDGS

CA-GREET Model Sheet Name	Cell number	Default Pathway Value	Little Sioux 100% DDGS Pathway Value	Units	Description	Comments
Fuel_Prod_TS	L277	36,000	Confidential Business Information	btu/gal	Corn Ethanol Plant Energy Use, Dry Mill	With modern plant, lower power use
Fuel_Prod_TS	D277	2.72	Confidential Business Information	gal/bu	Ethanol yield of Corn Ethanol Plant, Dry Mill	With modern plant, optimized yield
Inputs	C247	10.19%	Confidential Business Information	%	Share of process energy for Electricity	With modern plant, lower power use
Inputs	C254	32,330	Confidential Business Information	btu/gal	Process fuel, 100%	Shown here for reference only. This cell is calculated based on cell L277 in Fuel_Prod_TS and Inputs C247
Inputs	C258	1.08	Confidential Business Information	kwh/gal	Electricity used for ethanol production	Shown here for reference only. This cell is calculated based on cell L277 in Fuel_Prod_TS and Inputs C247

Table 3: CA-GREET Model Inputs for the Little Sioux Pathway 100% DDGS

CA-GREET Model Sheet Name	Cell number	Default Pathway Value	Little Sioux 100% MDGS Pathway Value	Units	Description	Comments
Fuel_Prod_TS	L277	36,000	Confidential Business Information	btu/gal	Corn Ethanol Plant Energy Use, Dry Mill	With modern plant, lower power use
Fuel_Prod_TS	D277	2.72	Confidential Business Information	gal/bu	Ethanol yield of Corn Ethanol Plant, Dry Mill	With modern plant, optimized yield
Inputs	C247	10.19%	Confidential Business Information	%	Share of process energy for Electricity	With modern plant, lower power use
Inputs	C254	32,330	Confidential Business Information	btu/gal	Process fuel, 100%	Shown here for reference only. This cell is calculated based on cell L277 in Fuel_Prod_TS and Inputs C247
Inputs	C258	1.08	Confidential Business Information	kwh/gal	Electricity used for ethanol production	Shown here for reference only. This cell is calculated based on cell L277 in Fuel_Prod_TS and Inputs C247

IV. Basis for the Input Values - Confidential Business Information

The input values presented in this application are based on the period from January 2012 through December 2012, the "Production Period".

Table 4: Calculation of the Input Values for the Little Sioux Mixed DGS Pathway (62% DDGS, 38% MDGS)

Table 4 is considered Confidential Business Information and is not included in this non-confidential version of the application.

[redacted]

Table 5: Calculation of the Input Values for the Little Sioux 100% DDGS Pathway

Table 5 is considered Confidential Business Information and is not included in this non-confidential version of the application.

Table 6: Calculation of the Input Values for the Little Sioux 100% MDGS Pathway

Table 6 is considered Confidential Business Information and is not included in this non-confidential version of the application.

The plant simultaneously produces modified distillers grains solubles (MDGS) and dried distillers grains solubles (DDGS). To determine the amount of natural gas to produce ethanol while making just one or the other DGS products, [redacted] calculations have been carried out, as shown below, [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

V. CA-GREET Model Output and Analysis of Results

The Little Sioux pathway carbon intensity value is a sub-pathway of the Midwest, Dry-Mill, 100% DDGS Co-product, 100% natural gas fuel ethanol plant pathway. The carbon intensity value of the base pathway is 98.4 gCO2e/MJ.

The carbon intensity value of the Little Sioux ethanol plant ethanol three pathways are:

- Mixed DGS (62% DDGS/38% MDGS): 86.54 gCO2e/MJ
- 100% DDGS: 89.09 gCO2e/MJ
- 100% MDGS: 82.36 gCO2e/MJ.

Table 7: CI of Existing Midwest Dry Mill, 100% DDGS, 100% Natural Gas Fuel Pathway

CARB Lookup Table Reference Pathway: Midwest Dry Mill Ethanol Plant, 100% DDGS, NG Fuel Pathway							
		CA-GREET Model Output					
	IPPC factors	Corn	Ethanol	Calculations to convert Output to g/CO2e/MJ			
	gCO2e/g	Btu or Grams per mmbtu of Fuel Throughput				gCO2e/mmbtu	**gCO2e/MJ**
		US Avg Corn	100% DDGS	Corn w/loss	Total corn + EtOH		
Total energy		187,247	1,469,428	187,342	1,656,770		
VOC		16.768	55.519	17	72		
CO		151.276	31.385	151	183		
CH4	25	17.400	73.663	17	91	2,276.8	2.16
N2O	298	41.743	0.400	42	42	12,564.9	11.91
CO2	1	15,064	41,354	15,071	56,426	56,425.9	53.48
Sub-total lifecycle CI before denaturant and lt. vehicle combustion						71,267.6	67.55
Denaturant and lt. vehicle combustion effects factor							0.80
Total Lifecycle CI before ILUC with denaturant and lt. vehicle combustion effects included							68.35
Indirect Land Use Change Factor (ILUC)							30
Total CI of Pathway including Indirect Land Use Change							98.35
Note: The calculated result of this pathway prior to making the input changes for the subpathway ethanol plant is 67.55 gCO2e/MJ. This matches the Corn Ethanol WTW Analysis result of 67.6 gCO2e/MJ (Table B. GHG Emissions Summary for Dry and Wet Mill Corn Ethanol, page 5) before the denaturant and light vehicle combustion factor of 0.8 gCO2e/MJ is added.							

Table 8: CI Calculation of Little Sioux Mixed DGS Pathway (62% DDGS/38% MDGS)

Little Sioux Ethanol Plant, Midwest Dry Mill Ethanol Plant Sub-Pathway, 62% DDGS/38% MDGS, NG Fuel Pathway							
		CA-GREET Model Output					
	IPPC factors	Corn	Ethanol	Calculations to convert Output to g/CO2e/MJ			
	gCO2e/g	Btu or Grams per mmbtu of Fuel Throughput				gCO2e/mmbtu	**gCO2e/MJ**
		US Avg Corn	62% DDGS/38% MDGS	Corn w/ loss	Total Corn + EtOH		
Total energy		186,700	1,293,883	186,794	1,480,677		
VOC		16.719	54.150	17	71		
CO		150.835	23.073	151	174		
CH4	25	17.349	53.153	17	71	1,762.8	1.67
N2O	298	41.621	0.281	42	42	12,493.2	11.84
CO2	1	15,020	29,519	15,027	44,546	44,546.5	42.22
Sub-total lifecycle CI before denaturant and lt. vehicle combustion						58,802.4	55.74
Denaturant and lt. vehicle combustion effects factor							0.80
Total Lifecycle CI before ILUC with denaturant and lt. vehicle combustion effects included							56.54
Indirect Land Use Change Factor (ILUC)							30
Total CI of Pathway including Indirect Land Use Change							86.54

Table 9: CI Calculation of Little Sioux Mixed 100% DDGS Pathway

Little Sioux Ethanol Plant, Midwest Dry Mill Ethanol Plant Sub-Pathway, DDGS only, NG Fuel Pathway							
		CA-GREET Model Output					
	IPPC factors	Corn	Ethanol	Calculations to convert Output to g/CO2e/MJ			
	gCO2e/g	*Btu or Grams per mmbtu of Fuel Throughput*				gCO2e/mmbtu	**gCO2e/MJ**
		US Avg Corn	DDGS only	Corn w/ loss	Total Corn + EtOH		
Total energy		186,700	1,337,055	186,794	1,523,850		
VOC		16.719	54.483	17	71		
CO		150.835	24.454	151	175		
CH4	25	17.349	58.395	17	76	1,893.8	1.80
N2O	298	41.621	0.296	42	42	12,497.8	11.85
CO2	1	15,020	32,081	15,027	47,109	47,108.6	44.65
Sub-total lifecycle CI before denaturant and lt. vehicle combustion						61,500.2	58.29
Denaturant and lt. vehicle combustion effects factor							0.80
Total Lifecycle CI before ILUC with denaturant and lt. vehicle combustion effects included							59.09
Indirect Land Use Change Factor (ILUC)							30
Total CI of Pathway including Indirect Land Use Change							89.09

Table 10: CI Calculation of Little Sioux Mixed 100% MDGS Pathway

Little Sioux Ethanol Plant, Midwest Dry Mill Ethanol Plant Sub-Pathway, MDGS only, NG Fuel Pathway							
		CA-GREET Model Output					
	IPPC factors	Corn	Ethanol	Calculations to convert Output to g/CO2e/MJ			
	gCO2e/g	*Btu or Grams per mmbtu of Fuel Throughput*				gCO2e/mmbtu	**gCO2e/MJ**
		US Avg Corn	MDGS only	Corn w/ loss	Total Corn + EtOH		
Total energy		186,700	1,223,443	186,794	1,410,237		
VOC		16.719	53.605	17	70		
CO		150.835	20.819	151	172		
CH4	25	17.349	44.600	17	62	1,548.9	1.47
N2O	298	41.621	0.256	42	42	12,485.7	11.83
CO2	1	15,020	25,339	15,027	40,366	40,366.2	38.26
Sub-total lifecycle CI before denaturant and lt. vehicle combustion						54,400.8	51.56
Denaturant and lt. vehicle combustion effects factor							0.80
Total Lifecycle CI before ILUC with denaturant and lt. vehicle combustion effects included							52.36
Indirect Land Use Change Factor (ILUC)							30
Total CI of Pathway including Indirect Land Use Change							82.36

VI. Production Range of Little Sioux Pathway

The new pathway should be applicable to the Little Sioux facilities for at least 90 MGY to 120 MGY of ethanol production.

VII. Sustainability of Little Sioux Pathway

The Little Sioux facility was designed and constructed using well-established modern designs and equipment and is managed by professional staff well-qualified to assure that over time the energy efficiency of and emissions from the facility do not deteriorate. Any deterioration would result in a less profitable business. Thus the sustainability of the plant is well aligned with the business objectives of the owners.

VIII. Impact on Land Use

There is negligible difference between the land use of this sub-pathway and that of the Corn Ethanol (Midwest; Dry Mill; Dry DGS, NG) Pathway described in the Detailed California-Modified GREET Pathway for Corn Ethanol Well-to-Wheel (WTW) lifecycle analysis.[3].

---

[3] Detailed California-Modified GREET Pathway for Corn Ethanol Well-to-Wheel (WTW) lifecycle analysis, Version 2.1, published February 27, 2009.

IX. Documents supporting Annual Quantities of Ethanol, Natural Gas and Power –Confidential Business Information

Table 11: Summary of Inputs and Outputs during "Production Period"

Table 11 is considered Confidential Business Information and is not included in this non-confidential version of the application.

Documents authenticating the amounts shown in the table above are listed below. Utility Invoices are shown in separate pdf files. These are:

The natural gas invoices coincide with the calendar month.

• Natural Gas:

NG Invoices 2011-2012.pdf

While the monthly electricity invoices coincide with the calendar months, there are multiple invoices for each month. The invoices have been tabulated and summed for each calendar month during the production period and 12 months prior to the production period on a separate Excel Spreadsheet. This file is named:

Electricity Monthly Invoices Tabulation LSCP 29Mar13.xlsx

• Electricity:

Meter 6932 Electricity Invoices 24 Months 25Jan13.pdf
Meter 5584 Electricity Invoices 24 mo only used Nov12 25Jan13.pdf
Meter 5010 Second Electricity Invoices 24 months 25Jan13.pdf
Meter 1100 Electricity Invoices 24 months 25Jan13.pdf

By separate file, *LSCP Accuracy of Data 29Mar13.docx*, please find a letter from Mr. Steve Roe, Chief Executive Officer of Little Sioux Corn Processors LLLP, attesting to the accuracy and authenticity of the data used in this new pathway application.