DARLING
INTERNATIONAL INC

August 17, 2009

Clerk of the Board
Air Resources Board
1001 "I" Street, 23rd Floor
Sacramento, California 95814

Re: Notice of Public Availability of Modified Text and Availability of Additional Documents for the Proposed Regulation to Implement the Low Carbon Fuel Standard. LCFS 09.

Subject: **Comments on the:**

(1) Detailed California-GREET Pathway for Biodiesel Produced in CA from Used Cooking Oil (from CA), version 1.0;

(2) Detailed California-Modified GREET Pathway for Renewable Diesel Produced in California from Tallow (U.S. Sourced), version 1.0.

Dear Members of the Air Resources Board:

Darling International Inc. ("Darling") is America's leading provider of rendering, recycling and recovery solutions to the nation's food industry. Darling is headquartered in Irving, Texas and operates a network of facilities across the United States. Darling operates six facilities in the State of California, and intends to supply rendered materials to be used in the production of biodiesel and renewable diesel under the California Low Carbon Fuels program.

The California Environmental Protection Agency Air Resources Board (CARB) on July 20, 2009 released and published the "Detailed California-Greet Pathway for Biodiesel Produced in California from Used Cooking Oil" and the "Detailed California-Modified GREET Pathway for Renewable Diesel Produced in California from Tallow (U.S. Sourced)". CARB has invited public comments on both pathways to be submitted by August 19, 2009.

Darling wishes to thank CARB for the opportunity to comment on the two pathways for the production of biodiesel and renewable diesel produced from waste cooking oil and tallow. Darling is providing its comments to both pathways combined into this one document.

DARLING INTERNATIONAL INC.
America's leading provider of rendering, recycling and recovery solutions to the Nation's food industry.

251 O'CONNOR RIDGE BLVD, SUITE 300 IRVING, TX 75038 972-717-0300 tel 972-717-1588 fax 800-800-4841 toll free WWW.DARLINGII.COM

Darling has reviewed the "Detailed California-GREET Pathway for Biodiesel Produced in California from Used Cooking Oil" document and we have the following comments and questions:

Major Points:

1. The pathway paper is written assuming that only used cooking oil ("UCO") is the only waste product in the rendering industry that can be used to produce biodiesel. However, both UCO and/or rendered animal fats, such as tallow, can be used to produce biodiesel. Darling encourages CARB to develop two separate pathways for biodiesel, one for UCO and one for fats derived from animal by-products ("Tallow"). These two pathways should reflect the different direct energy required to produce biodiesel from either of these very different feedstocks. CARB should also provide a mechanism whereby the carbon intensity of biodiesel made from various blends of UCO and Tallow can be determined.

2. In the first paragraph on page 15, CARB states that when UCO is processed in a facility that also renders animal by-products, the water or moisture in the UCO is removed using cookers. Also, CARB states that since UCO contains much less moisture than animal by-products, cooking off the UCO moisture is less energy intensive. These statements imply that the two raw feed materials, UCO and animal by-products, are either processed together or that rendering plants processing both UCO and animal by-products use cookers to eliminate the moisture from UCO. In the rendering industry, UCO is seldom added to the cooking process used for rendering animal byproducts unless it is used in place of Tallow to charge the cooker at the beginning of a production cycle. Rather, UCO is processed separately from the animal by-products by using a decanting process, which requires much less energy.

3. In the second paragraph on page 15, CARB states that the data collected and reported in Table 1.05 on page 16 is from inquiries conducted with seven U.S. rendering plants. The results of those inquiries show that for those seven plants the energy used for processing varies by an order of magnitude. In addition, CARB states that the difference in energy requirements may be due to the way UCO is processed and the moisture content of the unprocessed UCO. In the third paragraph CARB states that it takes a lot less energy to decant the UCO than it does to cook the UCO. In the fourth paragraph on page 15, CARB provides a rational for using a thermal input number that is estimated by the Fats and Proteins Research Foundation (FPRF). The selection and use of that thermal number for processing UCO is troubling because of the rational provided by CARB in the paragraph. There is no explanation as to how the FPRF arrived at its estimated thermal input number and the reference to the material used to determine the energy requirement is very vague. CARB chose the number because "it is close to the weighted average of Plants 1-7 in Table 1.05 and the data provided by an industry source." The data collected for Plants 1-7 do not appear to have been

collected using a statistically significant methodology. "It differs by an order of magnitude." CARB should conduct a statistically significant sample of data using a third party source to protect the proprietary nature of the data. CARB should collect data that provides specific information concerning the method used by renderers to process UCO, and data concerning estimates of the energy used to process UCO as well as energy estimates for processing animal by-products. For example, data such as this could be collected through the Pacific Coast Renderers Association. Darling would participate in such a survey, provided Darling can be assured, to its satisfaction, that its anonymity and the confidential nature of its data can be protected and such data will only be used to develop industry averages.

4. In the fourth paragraph on page 15, CARB states "it is estimated that currently 60-80 percent of UCO is processed using the technology employed representative of the data provided by an industry source, while the remainder is processed in cookers at rendering plants, such as those represented by Plants 1-7." The statement indicates that the "industry source" is not included with the other 7 rendering plants surveyed. It is not clear how data from all sources were handled. CARB should clearly indicate how data from the 7 survey rendering plants, the industry source, and the literature were used and weighted in deriving its carbon intensity values. Darling encourages CARB to develop the pathways for UCO based on the predominant process technology used by the rendering industry. Data from the seven plants surveyed should be ignored or properly weighted based on data obtained from a more inclusive survey of the rendering industry.

5. In the first paragraph on page 21, CARB discusses the assumption that half the UCO in the U.S. is processed via acid esterification and the other half is processed using a continuous, non-acid esterification. On what basis was this assumption made? Darling knows of little to any acid esterification. The only reason to use acid esterification is to treat free fatty acids in UCO in a two step biodiesel production process. Almost all biodiesel produced in the United States is produced using traditional transesterification (non-acid esterification), with free fatty acids, if any, removed prior to processing.

6. If there are two different processes (transesterification alone or esterification followed by transesterification) used to produce biodiesel, one that uses more than twice the amount of energy than the other as stated by CARB in the first paragraph on page 21, then there should be two separate calculations for the energy and GHG emissions for the two different processes, rather than using an average of the energy required in the two different processes. Or CARB could determine which process is used in California, or develop a ratio based on the amount of biodiesel produced using each of the processes that could be used to determine an average energy usage. The importance of appropriately characterizing the process to be used to make biodiesel for California is supported by the fact that the energy required during biodiesel

production is 18.45% of the energy required and represents 38.61% of the GHG emissions contributed to the Well to Tank calculation (Table A on page 4.)

7. In the first paragraph on page 25, CARB states "California marginal electricity mix is used to calculate emissions from electricity generation." The marginal mix of electricity refers to the mix of electric generators used to meet the last kilowatt of electricity demanded by users, electricity on the margin. In most cases the electric generation that will be on the margin in California is electric generation using natural gas as its fuel source. It would seem that rather than using marginal electric generation, it would be more representative to use the average emission rate for the most recent annual mix of electricity used in the state of California. The annual generation mix of electric generation in California will include generating sources that utilize natural gas, geothermal, hydro, nuclear, coal, and renewables. According to the U.S. Energy Information Administration, the average CO_2 emission rate for the state of California is 350 g/kwh and the CO2 emission rate for a natural gas combined cycle electricity generating unit is 440 g/kwh.

Corrections and Clarifications:

1. CARB has made the assumption that the UCO is only originating in California and is being processed into biodiesel in California. This same assumption should also be made for Tallow. Darling is providing additional discussion on the availability of California origin Tallow in a subsequent comment under the renewable diesel section.

2. In Table 1.02 on page 11, CARB assumes that UCO is transported 50 miles from its place of origin to the rendering facility. Darling disagrees with including any calculations in the UCO pathway for direct energy use or upstream energy use associated with transporting UCO from its place of origin to the rendering plant for processing. Darling believes it would be inappropriate to include such energy calculations in this pathway. Fuel use and greenhouse gas production associated with transporting the raw UCO would not be avoided if these materials are not processed by a renderer or other UCO processor. In most metropolitan areas, disposal of UCO on-site, such as pouring UCO down the drain, is prohibited. Therefore, if UCO is not collected and transported to a renderer, the restaurant would still find it necessary to have its UCO transported to a landfill or other disposal site.

3. The calculations for Direct Energy and Upstream Energy on page 12 are very confusing. It would seem that the same calculation can be arrived at by simply multiplying the number of miles traveled by the truck times the Energy Intensity (Btu/ton-mi) factor found in Table 1.02 on page 11. However, the results of those two calculations are slightly different; 102,762 Btu/ton wet UCO, compared to 100 miles times 1,028 Btu/ton-mi equals 102,800 Btu/ton wet UCO. It would seem that the results should be the same since both approaches are calculating the amount of energy that it takes to move one ton of anything over a given distance.

4. The Upstream Energy calculation should be the same as multiplying the Upstream Diesel Energy Factor (Btu/Btu) of 0.216 from Table 1.02 times the Direct Energy factor calculation of 102,726. However, the result of the formula presented in page 12 for Upstream Energy is 22,149, which is slightly different than 22,197 Btu/ton wet UCO obtained by multiplying the Upstream Energy Factor of 0.216 times 102,762.

5. In both the Direct Energy formula and the Upstream Energy calculation, the energy and mileage for collecting UCO are repeated in the formula which has the effect of doubling the energy used for transporting the UCO. There is no explanation provided for why the calculation is included in the formula. In the Direct CO2 Emissions calculation on page 13 it is noted that the g/mmBtu is a factor used in the formula twice for travel by the heavy duty trucks "both ways." This same note should be included for the formulas on page 12. The calculation or at least the rational for the calculation may be based on a faulty assumption. Trucks used to collect UCO from restaurants typically stop at a number of different restaurants along preplanned circuitous routes. Unlike other industries where trucks may drive some distance empty before picking up a load and returning, UCO collection trucks are only empty prior to the first stop and load additional UCO with each subsequent stop going away from and returning to the plant. When asked distance traveled, UCO collection drivers usually report the distance for the entire route, leaving from and returning to the plant. As a result, doubling the energy, mileage and emissions data in this pathway may be inappropriate and unnecessarily inflate direct and upstream energy calculations.

6. References are not given for the origins of the GHG emission rates used in the calculations for GHG emissions from the Direct Emissions and Upstream Emissions shown in Table 1.4 on page 18.

7. CARB does not identify how it arrived at the assumption for the transport parameters presented in Table 1.08 on page 19.

8. In the first paragraph on page 23, CARB states that it assumes the esterification input parameters used for soybean oil esterification are the same for biodiesel produced from UCO esterification. Is esterification frequently used to convert soybean oil into biodiesel? Did CARB research this assumption? If so a reference should to be cited.

Darling has reviewed the "Detailed California-GREET Pathway for Renewable Diesel Produced in California from Tallow (U.S. Sourced)" document and we have the following comments and questions:

Major Points:

1. In the fourth paragraph on page 2, CARB states that it has developed the pathway for a specific case of inedible Tallow sourced from rendering operations in the Mid-

Western United States where the rendered product is then transported to California via rail. The assumption that only Tallow in the Midwest will be rendered and then shipped to California ignores the Tallow that is produced and rendered in California. According to the Pacific Coast Renders Association fiscal year July 1, 2007 to June 30, 2008 census of raw materials handled in California, there are billions of pounds of animal by-product rendered in the State of California. CARB does note later in the paragraph that for other feedstocks or processing techniques, appropriate modifications to this pathway will be required. Since this pathway is being created at the direction of the Low Carbon Fuel Standard rule, CARB should develop a specific pathway for Tallow and UCO that is rendered in California, and appropriate modifications to the pathway be developed for Midwest renderers at a later date. If there is not a California pathway, the California renderers will be penalized by the assumption that the direct and upstream energy usage to ship rendered product to refineries in California is assumed to be 1,400 miles by rail.

2. The pathway paper is written assuming that only Tallow will be used to produce renewable diesel. However, both Tallow and UCO can be used to produce renewable diesel. The document should recognize that renewable diesel can be made from either waste product. CARB may need to use two different pathways since the amount of energy required to process UCO prior to producing renewable diesel is lower than the energy requirements to render Tallow before producing renewable diesel from the rendered product. CARB will also need to develop a method for allowing blended UCO and Tallow processed together in a renewable diesel plant.

3. Table 1.01 on page 13 provides rendering energy for production of Tallow. The data depicted is from 7 rendering plants, two of which CARB declares are located in California, and also from published thermal and electrical energy of a number of associations and research foundations. In the last paragraph on page 12, CARB states that "the average thermal and electrical energy use of the 7 plants was used as average direct energy use for the rendering process modeled in the pathway. This is inconsistent with the approach CARB used in the UCO pathway. Assuming that the source of data in the UCO pathway was the same as in the Tallow pathway, the use of the data should be consistent within the two pathways.

4. The survey data in Table 1.01 represents only seven plants and does not appear to be collected using a statistically significant methodology. The data from the lowest energy user to the highest energy user is almost double what is reported by the lowest plant. The energy used during the rendering process is heavily influenced by the type and quality of the raw material being processed. Energy used to produce a pound of tallow from the offal derived from the slaughtering process will typically be lower than for tallow derived from rendering animal mortalities. Some rendering operations process a mixture of these materials in addition to meat market waste. The energy required to produce a pound of tallow in such facilities will be intermediate to plants processing offal and those that primarily process mortalities. CARB should conduct a

statistically significant sample of data using a third party source to protect the proprietary nature of the data to measure and address this apparent diversity in energy usage among different rendering operations in the industry. For example, data could be collected through the Pacific Coast Renderers Association to obtain data for rendering plants in California. Similarly, a national renderers association, such as the FPRF or the National Renderers Association, may be used to obtain data for United States renderers outside of California. Darling would participate in such surveys, provided Darling can be assured, to its satisfaction that its anonymity and the confidential nature of its data can be protected and such data will only be used to develop industry averages.

5. In the first paragraph of Section 2.1 on page 18, CARB states that "renewable diesel can be produced using many different methods and process configurations within a refinery," and CARB chose a "co-production" process with crude oil. Why did CARB choose this method rather than one of the many other ways and configurations? Darling disagrees with the approach of using co-processing as the first California-GREET pathway for the conversion of Tallow to renewable diesel. We recognize that prior to late 2008, co-processing was promoted as the method refiners would likely use to make renewable diesel. After extensive study of current issues and available technologies however, we have determined that this first Tallow pathway should be for methods other than co-processing. Darling does not believe that co-production with crude oil will be a viable method for the production of renewable diesel because of financial and process related issues. Fuels made when UCO and/or Tallow are co-processed with crude oil no longer qualify as renewable diesel. Thus, such fuels are ineligible for the $1.00 per gallon renewable diesel credit (but may qualify for the $0.50 per gallon alternative fuel mixture tax credit through the 2009 calendar year). According to legislation passed by the U.S Congress, renewable diesel cannot be produced from co-processing a feedstock derived from biomass, such as Tallow, with feedstocks not derived from biomass[1], such as petroleum products. In addition, UCO and Tallow contain impurities, which de-activate the catalysts commonly used by the petroleum refinery industry; also higher yields can be obtained with catalyst specifically selected for the processing of Tallow or UCO feedstocks. Further, handling of commercial quantities of fats, either virgin oil, UCO or Tallow, will require separate and dedicated facilities for receiving and pre-treatment before these fats can be processed. Finally, renewable diesel has superior properties to petroleum diesel and when produced separately, can be mixed with lower cetane blendstocks. Hence, Darling believes that most renewable diesel production will take place in facilities designed specifically to hydro-treat and isomerize virgin oils, UCO, Tallow or blends of these materials, and accommodate the oxygen and other sour gases that are released during processing. Such dedicated hydro-treating facilities may be located within, near or adjacent to an existing crude oil refinery. Further, hydro-treating

[1] These requirements apply to fuel produced, and sold or used, after December 31, 2008. Emergency Economic Stabilization Act of 2008, Pub. L. No. 110-343, Div. B, § 202(g)(1), 122 Stat. 3765, 3833.

involves exothermic reactions. CARB should verify that it has included the energy savings that result when excess heat from these reactions is recovered and re-used elsewhere in a refinery.

6. In the last paragraph on page 18, and in the first paragraph of Section 2.2 on page 20, CARB states "California marginal electricity mix is used for the production process detailed in this section." The marginal mix of electricity refers to the mix of electric generators used to meet the last kilowatt of electricity demanded by users. Electric generation on the margin is most likely generated by a natural gas generating unit. It would seem that rather than using marginal electric generation, it would be more representative to use the average emission rate for the most recent annual mix of electricity used in the state of California. The annual generation mix of electric generation in California will include generating sources that utilize natural gas, geothermal, hydro, nuclear, coal, and renewables. According to the U.S. Energy Information Administration, the average CO_2 emission rate for the state of California is 350 g/kwh and the CO2 emission rate for a natural gas combined cycle electricity generating unit is 440 g/kwh.

Corrections and Clarifications:

1. Table E on page 8 shows GHG emissions associated with Tallow transportation to the renewable diesel production plant, however, the units in the table are Btu/ton Tallow. It would seem that the emission rate should be expressed as a weight such as grams/ton Tallow or lbs/ton Tallow. The totals in the table are given in gCO_2e/mmBtu.

2. In the first paragraph of Section 1.3 on page 15, CARB states that the U.S. average regional parameters are used in CA-Greet for Tallow transport. What is the reference for the parameters?

3. In the first paragraph in Section 1.4 on page16, CARB states that the analysis assumes 10 miles for heavy-duty truck transport and 1,400 miles rail transport to the fuel production facility in CA. Does CARB assume that the Tallow is transported 10 miles to the rail transport, and the rail transport delivers the Tallow directly to the fuel production facility in CA? As previously discussed, rail transport of this distance is not necessary for Tallow produced by renderers in California and assuming all Tallow is transported this distance unjustly penalizes California renderers.

4. Darling agrees with CARB that there should not be any calculation for direct energy use or upstream energy use for transporting the animal by-products from their place of origin to the rendering plant. Fuel use and greenhouse gas production associated with transporting the raw animal by-products would not be avoided if these materials are not rendered. If not transported to a renderer, the packing pant or meat processor

would still find it necessary to transport these slaughter and trimming wastes to a landfill or other disposal site.

5. In Table 1.02 on page 14, the input for electricity is labeled as "Electricity (U.S. Average) (Btu/lb). In the UCO pathway, in Table 1.06 on page 17 the input for electricity is labeled as Electricity (CA marginal) (Btu/lb UCO). The tables are similar in that they show the direct energy, upstream energy, and total energy, but either the labeling is inconsistent or the source of the data is different.

6. What is the source of the GHG emission rates used in Table 1.06 on page 17?

7. In Table 2.01 on page 19, what are the references for the Fuel Shares used in the calculations?

8. What is the source of the assumptions used in the second paragraph of Section 3.1 to determine 80% of renewable diesel is transported 50 miles to the bulk terminal, and 20% of the renewable diesel is distributed directly from the refining plant?

9. What is the source for the assumption that renewable diesel is transported 90 miles from the bulk terminal to the refueling stations?

Summary:

Darling encourages CARB to consider new rendering industry data for natural gas and electricity used to produce a gallon of fats, particularly Tallow, but for UCO too, as such data becomes available. We expect that as the number of rendering companies become aware of these pathways and their importance, they will eagerly provide data to third party consultants and their trade association so that it can be shared with CARB. This may help to address concerns that the UCO pathway and the Tallow pathway relied on very different sources to obtain data on the energy used for processing UCO and rendering animal by-products. More consistency in the approach used in each of these pathways is appropriate because the same renderers frequently use the same site for both processes: processing UCO and rendering of animal by-products.

Darling also encourages CARB to complete the following regarding these and subsequent pathways:

1. Develop a pathway for making biodiesel from Tallow (produced in California) as soon as is practicable.

2. Address our concerns with using co-processing of Tallow with crude oil for its Tallow to renewable diesel pathway. Darling recommends using a dedicated hydro-treating facility that produces a pure renewable diesel that is suitable for use neat or for blending with petroleum diesel.

3. Remove the transportation of Tallow from the Midwest to make renewable diesel and modify the Tallow to renewable diesel pathway to apply to Tallow produced in California.

4. Develop a pathway using UCO as a feedstock for renewable diesel in a dedicated facility similar to the one recommended for Tallow.

5. Consider methodology that can be applied to determining the carbon intensity of blended feedstocks consisting of various proportions of UCO and Tallow when such blends are used as feedstock for either biodiesel or renewable diesel.

We appreciate the opportunity to comment on these important documents and are available to answer questions or provide clarification as needed.

Sincerely,

C. Ross Hamilton, Ph. D.
Vice President Government Affairs & Technology