Illinois Environmental Protection Agency
Bureau of Air, Permit Section
1021 N. Grand Avenue East
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Project Summary for a Construction Permit Application from Robbins Community Power, LLC for a Power Plant in Robbins, Illinois

Site Identification No.: 031270AAB
Application No.: 07060081
Date Received: August 17, 2007

Schedule

Public Comment Period Begins:	February 23, 2008
Public Hearing Date:	April 8, 2008
Public Comment Period Closes:	May 8, 2008

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I. INTRODUCTION

Robbins Community Power LLC (RCP) has proposed to re-activate the former Robbins Resource Recovery facility as a wood (biomass) fired power plant. The two existing boilers at the site would burn wood fuel to provide up to 55 MW of electricity to the grid. The project requires a permit from the Illinois EPA because of its emissions.

The Illinois EPA has reviewed RCP's application and made a preliminary determination that the application for the proposed project meets applicable requirements. Accordingly, the Illinois EPA has prepared a draft of the construction permit that it would propose to issue for the proposed construction and modifications to the plant. However, before issuing the permit, the Illinois EPA is holding a public comment period with a public hearing to receive comments on the proposed issuance of the permit and the terms and conditions of the draft permit.

II. PROJECT DESCRIPTION

The boilers would generate steam which would power a steam turbine generator. The boilers are of fluidized bed design, each with a nominal heat input capacity of 390 million Btu per hour. The combustors would be equipped with low-NOx combustion, a selective non-catalytic reduction (SNCR) system, an oxidation catalyst system (for CO control) and a baghouse for control of emissions.

Fluidized bed boilers are well suited for firing of wood fuel. The wood fuel must meet detailed specifications before entry onto the RCP property. Such specifications include, but are not limited to, prescriptive screening protocols and land inspection programs. Section V provides further details on wood fuel supply for the plant.

This project also includes fuel and bulk material storage and handling equipment. Control of particulate matter (PM) will be by baghouses. Fugitive dust and particulate matter emissions are generated by vehicle traffic and wind blown dust on roadways, parking lots and other open areas at the plant. These emissions would be minimized with a fugitive dust control program as well as pavement of new roadways areas at the plant.

RCP indicated that it is pursuing this project because of its ability to utilize the existing infrastructure (e.g., the boilers) in close proximity to the biomass generated in the Chicago area. In addition, the incentives to generate renewable energy, be they financial or environmental, allow the project to be viable.

III. FUEL SUPPLY

RCP has provided a Wood Fuel Quality Control Plan. This Plan, which can be found as Attachment 3 of the permit, provides the detailed requirements that RCP must meet for wood fuel. The suppliers of wood to RCP, known as Plan Participants, would be required to provide clean wood fuel to RCP. Treated and painted wood and foreign material would not be part of the fuel stream. Employees of Plan Participants handling mixed material streams containing wood suitable for fuel would be trained in proper selection and processing of clean wood for use as fuel. The fuel plan also establishes the specifications the Illinois EPA is approving as described in Section 3.330 of Illinois' Environmental Protection Act. Therefore the plant is not a pollution control

facility and will not require local siting approval pursuant to Section 39.2 of the Illinois Environmental Protection Act.

IV. PROJECT EMISSIONS

The potential emissions of the proposed plant are listed below. The principal emission units at the proposed plant are the two boilers. Potential emissions are calculated based on continuous operation at the maximum load of the boiler. Actual emissions will be less to the extent that the plant does not operate at its maximum capacity.

Potential Emissions From the Plant

Pollutant	Potential Emission (Tons Per Year)
Particulate Matter (PM)	61.7
Particulate Matter (PM_{10}) - total	43.3
Sulfur Dioxide (SO_2)	39.4
Nitrogen Oxides (NO_x)	241.3
Carbon Monoxide (CO)	236.3
Volatile Organic Material (VOM)	17.4
Lead	0.20

IV. APPLICABLE EMISSION STANDARDS

The application shows that the proposed project will readily comply with applicable state and federal emission standards, including the emission standards and regulations of the State of Illinois (35 Ill. Adm. Code: Subtitle B, Subchapter c) and applicable federal emission standards adopted by the United States EPA (40 CFR Part 60).

The boilers would be subject to the federal New Source Performance Standards (NSPS) for Industrial-Commercial-Institutional Steam Generating Units, 40 CFR 60, Subpart Db. This NSPS sets emission limits for nitrogen oxides, sulfur dioxide, and particulate matter, as well as opacity, from the boilers. The NSPS for Electric Utility Steam Generating Units For Which Construction is Commenced After September 18, 1978, at 40 CFR Part 60, Subpart Da will not apply. This is because neither combustor will have the capability of combusting more than 250 mmBtu/hour of natural gas or other fossil fuel, which would be used as an auxiliary fuel. (Refer to 40 CFR 60.40Da(a)(1).)

Because the potential annual emissions of the proposed plant are less than 10 tons for any individual hazardous air pollutant (HAP) and 25 tons of HAP in aggregate, the project does not trigger a requirement for case-by-case determination of MACT under Section 112(g) of the Clean Air Act (CAA).

VI. ADDITIONAL REGULATORY REQUIREMENTS FOR THE PLANT

A. Nonattainment New Source Review

This project is in an area classified as nonattainment for ozone so that NOx and VOM emissions are regulated as ozone precursors. This project is subject to rules governing Major Stationary Sources Construction and Modification (MSSCAM) for NOx as its emissions are greater than 100 ton/yr. The area is also classified as nonattainment

for $PM_{2.5}$, but emissions of particulate matter, in terms of PM_{10}, which currently serves as a surrogate for $PM_{2.5}$ for MSSCAM will not exceed the major source threshold of 100 tons per year, so that MSSCAM will not be applicable for emissions of particulate matter.

For a major project, the rules for Major Stationary Sources Construction and Modification (MSSCAM), 35 IAC Part 203 require: 1) an "emission limit" which represents the Lowest Achievable Emission Rate (LAER), 2) compensating emission reductions from other sources, commonly called offsets, 3) an analysis of alternatives to the project, and 4) information confirming that other existing major sources owned by the applicant within Illinois are in compliance with applicable air pollution regulations or on a program to come into compliance. A discussion of these requirements for NOx emissions follows.

i. Lowest Achievable Emission Rate (LAER)

The determination of LAER for the plant's emissions of NOx is discussed in Section VII.

ii. Emission Offsets

The emissions associated with a major project in a nonattainment area must not interfere with the state plan to achieve attainment of the national air quality standards. This plan consists of new programs and regulations designed to achieve the national standards and are based on a detailed analysis of current and projected emission and air quality levels. In order to account for the emissions increase from a major project proposed in a nonattainment area, the applicant must provide compensating emission reductions from other sources that have not been relied on in the attainment plan. These emission reductions are commonly referred to as "emission offsets".

Because the Chicago Area is a severe ozone nonattainment area, emission offsets at a ratio of 1.15:1.0, i.e., for each ton of NOx emissions from a project, 1.15 ton of offsets must be provided. Because the plant is permitted for potential NOx emissions of 241.3 tons per year, an offset of 278 tons NOx/year must be secured prior to construction of the plant. RCP plans to obtain creditable emission offsets, or decreases, from Corn Products International. In the event that Corn Products International cannot supply offsets to this project, RCP, will be required to obtain offsets from another source prior to construction.

iii. Existing Source Compliance

RCP currently does not have any source in Illinois. Thus, compliance at existing major sources does not need to be conducted.

iv. Analysis of Alternatives to the Proposed Project

RCP has demonstrated that the benefits of this new plant significantly outweighs the environmental and social costs imposed as a result of its location, construction, based upon an analysis of alternative sites, sizes, production processes, and

environmental control techniques for the proposed plant, as required by 35 IAC 203.306.

B. Prevention of Significant Deterioration (PSD)

The proposed plant is not a major new source subject to the federal rules for PSD. This is because the major source threshold under PSD for this project is 250 tons per year (tpy) and the potential annual emissions for each PSD pollutant is less than 250 tons per year. This plant is not one of the 28 listed source categories for which the PSD threshold is 100 tpy, most notably, fossil-fuel fired steam electric plants of more than 250 mmBtu/hour heat input. Wood is not a fossil fuel. While natural gas is a fossil fuel, the physical capacity of all the natural gas fired burners at the plant will be less than 250 mmBtu/hr. Accordingly, the plant will not be a fossil fuel steam electric power plant, as addressed at 40 CFR 52.21(b).

C. Emission Allowance Programs for SO_2 and NOx

The boilers will be an affected source for purposes of Title IV of the Clean Air Act (Acid Deposition), and the regulations promulgated thereunder because the biomass boilers will generate over 25 MW of electricity that can be sent to the grid.

Likewise, the boilers will be subject to the NO_x Trading Program for Illinois' version of the Clean Air Interstate Rule (which will take the place of the NO_x Trading Program).

D. Emissions Reduction Market System (ERMS)

The plant's seasonal emissions of VOM will be less than 10 tons, so that it will not be subject to the ERMS. Should seasonal emissions ever exceed 10 tons, RCP would be required to obtain allotment trading units (ATU) in an amount equivalent to its VOM emissions each season to comply with the ERMS.

VII. CASE-BY-CASE CONTROL TECHNOLOGY DETERMINATION

A. Lowest Achievable Emission Rate (LAER)

RCP submitted a control technology demonstration in its application reflecting its judgment as to the emission control technology and associated emission limits that should be considered LAER, as required under MSSCAM, for NOx emissions for units at the plant.

LAER is the more stringent rate of emissions based on either the most stringent emission standard, which is contained in the implementation plan of any state for the class of unit, unless it is demonstrated that such limitation is not achievable, or the most stringent emission limitation which is achieved in practice or is achievable for the class of unit.

LAER Discussion for the Boilers

RCP's LAER demonstration included information from many sources, including other recently issued permits for wood-fired boilers. Most notably, RCP identified the permit for the 50 MW boiler at the Schiller

Station in Portsmouth, New Hampshire. The emission rates for NOx established in that permit served as the basis to set LAER for RCP's boilers. The above demonstrated that low-NO_x combustion technology (staged combustion and advanced combustion controls, overfire air and flue gas recirculation) and a selective non-catalytic reduction (SNCR) system will constitute LAER for RCP's fluidized bed boilers.

NOx - To control NOx emissions, many techniques and technologies were evaluated. In addition to the basic NOx control techniques, such as low-NOx burners and overfire air which are now normally present on new boilers, the following additional technologies were among those available and technically feasible: rotating opposed fire air, natural gas reburning, fuel lean gas reburning, advanced gas reburning, amine enhanced gas injection, flue gas recirculation, selective catalytic reduction (SCR), selective non-catalytic reduction (SNCR), and hybrid selective reduction.

In general, the most effective add-on technology to reduce NOx emissions is typically SCR. SCR involves the injection of ammonia or urea into the flue gases of a boiler at an appropriate location downstream of the combustion zone within the appropriate temperature profile, whereby the ammonia reacts with NOx in the presence of a catalyst, to produce nitrogen and water. SCR is now routinely applied to new, pulverized coal, utility boilers. SCR could only be fitted on RCP's boilers after complete restructuring of the boilers, most notably through the insertion of flue gas reheating and associated equipment. To retrofit this equipment into the ductwork would render the project economically cost-prohibitive, and thus, infeasible. On the other hand, SNCR, the chosen LAER technology, is a technology that, when combined with fluidized bed combustion, can reduce NOx emissions equally as well as SCR. The implementation of SNCR will also have the added benefit of reducing ammonia slip. This will help in limiting formation of sulfates on downstream equipment and lowering the potential for added condensable particulate. Further review of lesser-performing alternatives was unnecessary.

The proposed NOx LAER limit is established at 0.070 lb/mmBtu (24-hour average), consistent with the NOx limit set for Schiller Station Unit 5 (0.075 lb/mmBtu).

The RACT/BACT/LAER Clearinghouse was also reviewed for similar operations to determine required control technologies across the United States. The Clearinghouse indicated that the NOx LAER determination for RCP is the best rate relative to all types of wood fired boilers, including the only other CFB boiler found on the RACT/BACT/LAER clearinghouse (i.e., the Schiller Station unit in New Hampshire).

LAER Discussion for Engines

For the emergency engines, natural gas is identified as the sole fuel and operation is limited to 500 hours per year. These engines will have to meet the 40 CFR 60, Subpart IIII New Source Performance Standards for stationary compression ignition internal combustion engines. Thus, for the fuel combusted in each engine, there will be both minimal tons/year emissions and lb/mmBtu emission rates subsequently generated for NOx from the engines.

B. Best Available Control technology (BACT)

As the plant will not be a major source for purposes of PSD, the plant is not subject to PSD under the PSD rules. However, the boilers were originally subject to BACT when they were used for combustion of municipal waste. The Illinois EPA has made a determination of BACT for emissions of PM, SO_2, acid gases, heavy metals and organic materials from the boilers as if BACT were to apply. In addition to the material submitted by RCP, the Illinois EPA's determination of BACT relies upon its general knowledge of the types of operations of the proposed project and specific information about existing industrial wood-fired boilers that are located throughout the country. As explained below, the Illinois EPA concurred with RCP's selection of control technologies as it reflected technologies that are in common use on wood-fired boilers and effectively control emissions. However, the Illinois EPA's determination of BACT for the boilers, as set forth in the draft permit, would establish performance requirements for the control technology on the boilers that are more stringent than those initially proposed by RCP in its application.

BACT Discussion for the Boilers

PM - For particulate matter, emissions occur as a result of carryover of fly ash and lime. Theoretical candidates for control of PM include baghouses, electrostatic precipitators, wet electrostatic precipitators, wet scrubber, venturi scrubber, cyclone and electro-catalytic oxidation. Given the nature of the fuel and its ash characteristics, the baghouse will achieve the equivalent (or better) emission control of PM/PM_{10} as an ESP (and better than the other alternatives considered), while providing a more workable overall control strategy when combined with SNCR and a spray dryer absorber. The baghouse technology represents the top control technology. An appropriate limit, given the fuel, for PM is 0.0120 lb/mmBtu (3-hour block average).

The RACT/BACT/LAER Clearinghouse was reviewed to determine typical BACT PM emission rates for wood-fired boilers. The Clearinghouse indicated that the PM rate above for RCP is the best rate relative to all types of wood fired boilers.

SO_2 – RCP started by looking at accepted, technically available and feasible control technologies for reducing SO_2 from the flue gases of wood-fired boilers ("flue gas desulfurization"). These were: use of low sulfur fuels, limestone injection, wet scrubbing and a spray dryer absorber (SDA, or dry scrubber).

The technologies deemed to be feasible were: limestone injection, wet scrubbing and a spray dryer absorber.

The design fuel supply for the boiler is wood which generally is a low sulfur content fuel. In an SDA system, a significant part of the acidic components within the flue gas are rapidly absorbed into the alkaline droplets. In this case, SO_2 adsorbs to the surface of lime and reacts to form compounds that can be collected in conjunction with PM, usually in a baghouse. For RCP, the spray dryer absorber is selected as the preferred control method based on its technological, environmental and economic advantages. The proposed spray dry absorber system represents the top control technology for low-sulfur wood fuel, much higher than other considered alternatives. The proposed SO_2 BACT limit is established at 0.0114 lb/mmBtu (24-hour daily average).

The RACT/BACT/LAER Clearinghouse was reviewed to determine typical SO_2 BACT emission rates for wood-fired boilers. Based on data in the Clearinghouse, the SO_2 rate above for RCP is the best rate relative to all types of wood fired boilers.

Acid gases – Wood contains trace quantities of chlorine and fluorine so that combustion of wood will result in acid gas emissions (e.g., hydrogen chloride, hydrogen fluoride) that will also, post-controls, be emitted in very small quantities.

Heavy metals – The combined control of pollutants from the SNCR system, SDA and baghouse will be sufficient to control emissions of heavy metals, including condensable PM.

Organic compounds – The temperature in the boilers' flue gas, at the entrance to the baghouse, will be at a low enough temperature, insuring that post-combustion formation of the organic compounds of greatest concern (e.g., polychlorinated dibenzo-p-dioxins) will be minimized.

It is worth noting that carbon monoxide emissions will be well-controlled by the use of an oxidation catalyst system, although this pollutant will not required to meet LAER or BACT.

VIII. AIR QUALITY IMPACT ANALYSIS

A. Introduction

The previous discussions addressed emissions and emission standards. Emissions are the quantity of pollutants emitted by a source, as they are released to the atmosphere from various emission units. Standards are set limiting the amount of these emissions as a means to address the presence of contaminants in the air. The quality of air that people breathe is known as ambient air quality. Ambient air quality considers the emissions from a particular source after they have dispersed following release from a stack or other emission point, in combination with pollutants emitted from other nearby sources and background pollutant levels. The level of pollutants in ambient air is typically expressed in terms of the concentration of the pollutant in the air. One form of this expression is parts per million. A more common scientific form is in micrograms per cubic meter, which are millionths of a gram by weight of a pollutant contained in a cubic meter of air.

The United States EPA has established standards for the level of various pollutants in the ambient air. These ambient air quality standards are based on a broad collection of scientific data to define levels of ambient air quality where adverse human health impacts and welfare impacts may occur. As part of the process of adopting air quality standards, the USEPA compiles scientific information on the potential impacts of the pollutant into a "criteria" document. Hence the pollutants for which air quality standards exist are known as criteria pollutants. Based upon the nature and effects of a pollutant, appropriate numerical standards(s) and associated averaging times are set to protect against adverse impacts. For some pollutants several standards are set, for others only a single standard has been established.

Areas can be designated as attainment or nonattainment for criteria pollutants, based on the existing air quality. In an attainment area, the goal is to generally preserve the existing clean air resource and prevent increases in emissions which would result in nonattainment. In a nonattainment area efforts must be taken to reduce emissions to come into attainment. An area can be attainment for one pollutant and nonattainment for another.

Compliance with air quality standards is determined by two techniques, monitoring and modeling. In monitoring one actually samples the levels of pollutants in the air on a routine basis. This is particularly valuable as monitoring provides data on actual air quality, considering actual weather and source operation. The Illinois EPA operates a network of ambient air monitoring stations across the state.

Monitoring is limited because one cannot operate monitors at all locations. One also cannot monitor to predict the effect of a future source, which has not yet been built, or to evaluate the effect of possible regulatory programs to reduce emissions. Modeling is used for these purposes. Modeling uses mathematical equations to predict ambient concentrations based on various factors, including the height of a stack, the velocity and temperature of exhaust gases, and weather data (speed, direction and atmospheric mixing). Modeling is performed by computer, allowing detailed estimates to be made of air quality impacts over a range of weather data. Modeling techniques are well developed for essentially stable pollutants like particulate matter, NOx, and CO, and can readily address the impact of individual sources. Modeling techniques for reactive pollutants, e.g., ozone, are more complex and have generally been developed for analysis of entire urban areas. They are not applicable to a single source with small amounts of emissions.

Air quality analysis is the process of predicting ambient concentrations in an area or as a result of a project and comparing the concentration to the air quality standard or other reference level. Air quality analysis uses a combination of monitoring data and modeling as appropriate.

B. Air Quality Analysis for NO_2, SO_2, PM_{10} and CO

An ambient air quality analysis was conducted by the consulting firm, Mostardi-Platt Environmental, on behalf of RCP to assess the impact of the emissions of the proposed project. This analysis must determine whether the proposed project will cause or contribute to a violation of any applicable air quality standard.

The starting point for determining the extent of the modeling necessary for this proposed plant was evaluating whether the plant would have a “significant impact”. The PSD rules identify Significant Impact Levels, which represent thresholds triggering a need for more detailed modeling. These thresholds are specified for all criteria pollutants, except ozone and lead. The significant impact levels do not correlate with health or welfare thresholds for humans, nor do they correspond to a threshold for effects on flora or fauna. For pollutants for which impacts are above the significant impact level, modeling would be performed by incorporating proposed new emissions units at the proposed plant and significant stationary sources in the surrounding area.

However, the ambient air quality impact analysis demonstrates that the project would not cause or contribute to a violation of the National Ambient Air Quality Standard(s) (NAAQS) or applicable PSD increment(s) for NOx, PM_{10}, SO_2 and CO for either normal operation or during periods of startup or malfunction. Table 1 shows that the maximum predicted impact of each pollutant will be below all significant impact levels.

Table 1 – Maximum Plant Impacts (ug/m^3)[1]

Pollutant	**Averaging Period**	**Maximum Predicted Impact**	**Significant Impact Level**
NO_2	Annual	0.27	1
PM_{10}	24-hour	2.13	5
PM_{10}	Annual	0.73	1
SO_2	3-hour	1.76	25
SO_2	24-hour	0.77	5
SO_2	Annual	0.07	1
CO	1-hour	8.78	2,000
CO	8-hour	5.84	500

The results demonstrate that all impacts are insignificant and no refined (full impact) analysis is required.

C. Vegetation and Soils Analysis

Robbins Community Power provided an analysis of the impacts of the proposed plant on vegetation and soils. The first stage of this analysis focused on the use of modeled air concentrations and published screening values for evaluating exposure to flora from selected criteria pollutants (SO_2, NOx, CO, ozone and PM_{10}). These screening values or threshold ambient concentrations (which may indicate levels of potential adverse impacts) are provided for “sensitive”, “intermediate”, and “resistant” species. The applicant has conservatively compared maximum modeled concentrations against “sensitive” species threshold concentrations, and in all instances, modeled impacts are below the “sensitive” value thresholds.

Potential adverse impacts to soil and vegetation from deposition of hazardous air pollutants (trace elements including hazardous metals) are the focus of the methodology. In this stepwise process, soil (depositional) loadings calculated from annual average air concentrations (modeling results) are combined with published endogenous soil concentration data and compared against threshold impact information. Dispersion modeling results were obtained for short- and long-term averaging periods for arsenic, cadmium, cobalt, selenium, chromium, fluoride, lead, manganese, mercury, and nickel. Annual average concentrations were converted to deposited soil concentrations and plant tissue concentrations and compared against screening levels for soil and plants. In all cases, the pollutant levels were less than the screening levels.

The proposed plant’s emissions are not expected to result in harmful effects to the soils and vegetation in the area. Maximum modeled impacts for SO_2, NOx, CO and PM_{10} do not exceed the secondary NAAQS level set forth by USEPA. Maximum modeled 3-hour average SO_2 impacts do not exceed the significant impact level for the secondary standard.

Discussions between the Illinois EPA and the Illinois Department of Natural Resources, as required under Illinois' Endangered Species Act, are ongoing, to review the above conclusions with respect to species of vegetation that are endangered. These discussions also address endangered species of animals that may be present in the area.

D. Construction and Growth Analysis

Robbins Community Power provided a discussion of the emissions impacts resulting from residential and commercial growth associated with construction of the proposed plant. Anticipated emissions resulting from residential, commercial, and industrial growth associated with construction and operation of the proposed plant are expected to be low. Despite the large number of workers required during the construction phase and a significant number of permanent employees for operation of the plant, emissions associated with new residential construction, commercial services, and supporting secondary industrial services are not expected to be significant. To the extent that the plant draws from the existing work force and is supported by the existing infrastructure, impacts would be minimal and distributed throughout the region.

E. Environmental Assessment

Illinois law does not provide for performance of other environmental impact assessments in conjunction with the issuance of this permit for the proposed plant. Likewise, the issuance of this permit is not a federal action for which an Environmental Impact Assessment would be required under the National Environmental Policy Act.

IX. DRAFT PERMIT AND CONDITIONS

The Illinois EPA has prepared a draft of the construction permit that it would propose to issue for this plant. The conditions of the permit set forth the specifications for the wood fuel used at the plant, the emissions of the plant and the air pollution control requirements that the plant must meet. These requirements include the applicable emission standards that apply to the various units at the plant. They also include the measures that must be used and the emission limits that must be met for emissions of different regulated pollutants from the plant.

Limitations are set for NOx, i.e., the pollutant for which the project is major under MSSCAM, and for pollutants for which the project is not major. In addition to annual limitations on emissions, the permit includes short-term emission limitations and operational limitations, as needed to provide practical enforceability of the annual emission limitations. As previously noted, actual emissions associated with the plant would be less than the permitted emissions to the extent that the boilers operate at less than capacity and control equipment normally operates to achieve emission rates that are lower than the applicable standards and limitations.

The permit also establishes appropriate compliance procedures for the project, including requirements for emission testing, required work practices, operational monitoring, recordkeeping, and reporting. These measures are imposed to assure that the operation and emissions of the plant are appropriately tracked to confirm compliance with the various limitations and requirements established for individual emission units.

X. REQUEST FOR COMMENTS

It is the Illinois EPA's preliminary determination that the permit for the proposed project meets applicable state and federal air pollution control requirements. The Illinois EPA is therefore proposing to issue a construction permit for the project. Comments are requested on this proposed action by the Illinois EPA and the conditions of the draft permit.