APPENDIX Q

KEMPER COUNTY IGCC PROJECT
NOISE IMPACT STUDY

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NOISE STUDY FOR THE MISSISSIPPI POWER COMPANY IGCC POWER PLANT AND COAL MINING PROJECT

KEMPER COUNTY, MISSISSIPPI

January 2009

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NOISE STUDY FOR THE MISSISSIPPI POWER COMPANY IGCC POWER PLANT AND COAL MINING PROJECT KEMPER COUNTY, MISSISSIPPI

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1.0 INTRODUCTION AND SUMMARY

Mississippi Power Company is proposing to build and operate a 550 MW Integrated Gasification Combined-Cycle (IGCC) power plant and coal mine in Kemper County, Mississippi. The site is located to the west of State Route 493 near the town of Liberty. The closest noise-sensitive receivers are Liberty Church and residences along Route 493. The major sound sources at the IGCC project site would be Process Air Compressors (PAC), PAC intercoolers, a GE 7FB combustion turbine, steam turbine, HRSG, generators, transformers and auxiliary equipment. The major sound sources for the coal mining operations would include the electric-powered dragline, hydraulic-powered shovel, large dozers, backhoes, dump trucks and graders. Both the IGCC power plant and coal mining operations would normally operate 24 hours per day, seven days per week. This report discusses project sound sources and the potential effects on the surrounding area.

The IGCC power plant and coal mining maximum sound levels at nearby sensitive receivers were calculated using the Cadna-A acoustic model that implements ISO Standard 9613-2. Sound mitigation for the IGCC power plant includes standard silencers and acoustical enclosures on the combined-cycle turbine equipment plus noise barrier walls around the PAC and PAC intercoolers. Predicted maximum facility sound levels would be 43 to 51 A-weighted decibels (dBA) at the nearest noise-sensitive receivers. Day-night sound levels (L_{dn}) are 6 dBA higher due to a nighttime penalty in the definition of L_{dn}. Predicted day-night sound levels (L_{dn}) from the facility are below the EPA residential noise guideline (55 dBA) at Liberty Church and all nearby residences except one. At that one residence, the predicted L_{dn} sound level would be 57 dBA and, though higher than the EPA guideline, it is below the HUD residential noise guideline of 65 dBA L_{dn} for acceptable residential noise exposure.

Because the coal mining operations' closest proximity to the nearest noise-sensitive receivers to the IGCC power plant is more than 2.3 miles away, the sound level contribution from coal mining operations would cause no impact. Furthermore, the cumulative impact form the IGCC power plant and coal mine operating simultaneously would not generate sound levels any higher than those generated from the IGCC power plant by itself.

This report is organized as follows. Section 2.0 discusses the concepts used in community noise analysis and provides examples so the reader can understand the decibel scale. Section 3.0 presents the State, County, and EPA guidelines that apply to the Project. Section 4.0 presents background measurements that were made in the study area. Section 5.0 presents the IGCC plant operational noise impact analysis along with a summary of proposed noise mitigation measures. Section 6.0 presents the coal mining operations and cumulative impacts. Finally, Section 7.0 discusses IGCC plant construction noise and mitigation measures.

2.0 NOISE CONCEPTS

Noise is defined as "unwanted sound", which implies sound pressure levels that are annoying or disrupt activities people are engaged in. The human sense of hearing is subjective and highly variable between individuals. Noise regulations and guidelines set quantitative limits to the sound pressure level (measured with sound analyzers and predicted with computer models) in order to protect people from sound exposures that most would judge to be annoying or disruptive.

The loudness of a sound is dependent on the radiated energy of the sound source and the propagation and attenuation characteristics of the air. The standard unit of sound pressure level (L_p) is the decibel (dB), a logarithmic scale formed by taking 20 times the $\log_{10}$ of a ratio of two pressures: the measured sound pressure divided by a reference sound pressure. The decibel level scale conveniently compresses the range of audible sound pressures, which span 12 orders of magnitude, into an easy to use scale spanning 0 to 120 dB. Airborne sound is referenced to 20 micro-Pascals[1] (20 µPa), which corresponds to 0 dB and the threshold of hearing. A property of the decibel scale is that the sound pressure levels of two separate sounds are not directly additive. For example, if a sound of 70 dB is added to another sound of 70 dB, the total is only a 3-decibel increase (or 73 dB), not a doubling to 140 dB. For broadband sounds, a 3 dB change is the minimum change perceptible to the human ear.

The acoustic energy level of a source is its sound power level (L_w), and L_w is also measured on a decibel scale, where the reference power is 10^{-12} Watts. The sound power level (e.g., L_w of 110 dBA re 10^{-12} W) is the same at any distance since it represents the energy intensity of a source. Thus, L_w values do not have reference distances. By contrast, a sound pressure level (e.g., L_p of 81 dBA re 20 µPa at 50 feet) must have a reference distance. Sound power levels are typically greater than 100 dBA in value and the large L_w numbers should not be confused with the sound pressure levels we hear.

Sound metrics are used to quantify sound pressure levels and to describe a sound's loudness, duration, and tonal character. A commonly used descriptor is the A-weighted decibel (dBA). The A-weighting scale attempts to approximate the human ear's sensitivity to certain frequencies by emphasizing the middle frequencies and de-emphasizing the lower and higher frequency sounds. The decibel is a

[1] A micro-Pascal is 10^{-6} Newton/meter^2.

logarithmic unit of measure of sound, meaning that a 10-decibel change in the sound level roughly corresponds to a doubling or halving of perceived loudness. A 3-dBA change in the noise level is generally defined as being just perceptible to the human ear. Table 1 provides the subjective effect of different changes in sound levels.

TABLE 1

SUBJECTIVE EFFECT OF CHANGES IN SOUND PRESSURE LEVELS

Change in Sound Level	Apparent Change in Loudness
3 dB	Just perceptible
5 dB	Noticeable
10 dB	Twice (or half) as loud

Reference: American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), 1989 ASHRAE Handbook—Fundamentals, Atlanta, Georgia, 1989.

The following measures of sound pressure level are based on the A-weighted decibel and are typically used when evaluating sound measurement data.

L_{eq}, or Equivalent Level, is the steady-state sound level during a given amount of time that has the same acoustic energy as the fluctuating noise levels during that same period.

L_{max}, or Maximum Level, represents the maximum sound level during a given time period.

L_n, or "n" Percentile Level, is the statistical representation of time-varying sound levels. This metric indicates that over a given time period, the fluctuating noise level was equal to or greater than the stated level for "n" percent of the time. Commonly used percentiles include the L_{10} and the L_{90}.

The $\mathbf{L_{90}}$, or background level, is the sound level exceeded 90 percent of the time and represents sound levels heard during the quietest 10 percent of the time. The $\mathbf{L_{10}}$ defines the peaks of the intermittent noise sources and is commonly referred to as the intrusive sound level.

The day-night sound level $\mathbf{L_{dn}}$ is equal to the 24-hour L_{eq} level with a 10-dBA penalty added for the nighttime hours of 10 p.m. to 7 a.m.

Sound pressure level measurements typically include the analysis and breakdown of the sound spectrum into its various frequency components to determine tonal characteristics. The unit of measure of frequency is the Hertz (Hz), a measure of the cycles per second of sound waves. A total of eleven octave bands are used to define the frequency spectrum from 16 Hz to 16,000 Hz that approximates the range of audible sound.

The noise environment in an industrial area such as the site in Kemper County results from traffic on Route 493, and jet over flights. Natural sounds (wind noise, insects) predominate in areas located away from the existing highway. Typical sound levels associated with various activities and environments are presented in Table 2.

TABLE 2

COMMON SOUND LEVELS

Activity	dBA
Threshold of pain	130
Chipping on metal	120
Loud rock band	110
Jack hammer	100
Jet airliner ½ mile away	95
Threshold of hearing damage	90
Freeway traffic - downtown streets	80
Urban residential area	70
Normal conversation	60
Normal Suburban Area	50
Quiet suburban area	40
Rural area	30
Wilderness area	25
Threshold of audibility	0

3.0 NOISE REGULATIONS AND GUIDELINES

3.1 State and Local Noise Regulations

There are no State or local noise regulations that apply to this project. Kemper County has no ordinances pertaining to noise beyond the prohibition of creating a nuisance.

3.2 U.S. EPA Residential Noise Guidelines

The U.S. Environmental Protection Agency (EPA) has published residential guidelines[2] on environmental sound levels to protect public health and welfare. Because noise is usually associated with annoyance, criteria levels are based on community surveys of people's tolerance to noise. Different types of land uses also exhibit different sensitivities to noise. The EPA sound level guidelines do not provide an absolute measure of noise impact, but rather a consensus on potential community interference. It should also be noted that in any noise environment, some people may always be annoyed regardless of the sound level. The EPA residential guidelines are designed to protect against:

- Hearing Loss – 70 dBA 24-hour L_{eq}
- Outdoor Activity Interference and Annoyance – 55 dBA L_{dn}

The EPA suggests 55 dBA L_{dn} as an overall design goal for residential development. As a goal, the 55 L_{dn} is not enforceable, and does not consider economic considerations or engineering feasibility. EPA observes that maintenance of an outdoor L_{dn} not exceeding 55 dBA will permit normal speech communication and protect against sleep interference.[3] 55 dBA L_{dn} is equivalent to a 24-hour average L_{eq} level of 48.6 dBA. The EPA guidelines are proposed for use as one benchmark in evaluating sounds from the IGCC plant, and are summarized in Table 3.

[2] U.S. EPA, Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety, Publication EPA-550/9-74-004, March, 1974.
[3] Ibid., page 21.

TABLE 3

U.S. EPA NOISE GUIDELINES TO PROTECT PUBLIC HEALTH AND WELFARE WITH AN ADEQUATE MARGIN OF SAFETY FROM UNDUE EFFECTS

For Protection Against	Outdoor Guideline (dBA)
Activity interference, annoyance and sleep disturbance on residential property	55 L_{dn} (Equivalent to 48.6 L_{eq})
Hearing damage	70 L_{eq} (24-hours)

3.3 HUD Guidelines

The Department of Housing and Urban Development (HUD) has also established guidelines[4] for evaluating noise impacts on residential land uses. The guidelines summarized in Table 4 suggest what are acceptable noise levels at residential locations. According to the HUD regulations, sites where the L_{dn} does not exceed 65 dBA are acceptable for housing. Sites where the L_{dn} is between 65 and 75 dBA are classified by HUD as “normally unacceptable” but may be approved if additional sound attenuation is designed into new housing, and sites where the L_{dn} exceeds 75 dBA are classified by HUD as “unacceptable”. The L_{dn} 65 dBA HUD guideline is proposed for use as one benchmark in evaluating the IGCC plant. L_{dn} 65 dBA is equivalent to a 24-hour L_{eq} level of 58.6 dBA.

In the absence of State and local noise regulations, the EPA and HUD residential noise guidelines, L_{dn} 55 dBA and L_{dn} 65 dBA, respectively, will be used to evaluate sound impacts from the IGCC plant.

[4] U.S. HUD, Environmental Criteria and Standards, 44 Federal Register 40860, July 12, 1979.

TABLE 4

U.S. HUD GUIDELINES FOR EVALUATING SOUND EFFECTS ON RESIDENTIAL PROPERTIES

Acceptability for Residential Use	**Outdoor Guideline Levels (dBA)**
Acceptable	65 L_{dn} (Equivalent to 58.6 L_{eq})
Acceptable With Design Attenuation	65-75 L_{dn}
Unacceptable	Greater than 75 L_{dn}

4.0 EXISTING CONDITIONS

Sound measurements were made by ECT, Inc. in the project area on September 17 and 18, 2008 between the hours of 11:00 a.m. and 9:00 p.m. for periods of slightly greater than 20 minutes at each location. These measurements were made in front of various residences located along Route 493. Average sound levels varied according to the distance from the highway and levels of existing traffic; average sound levels (L_{eq}) varied from 35 to 53 dBA. Maximum sound levels from roadway traffic ranged from 72 to 81 dBA. For one measurement without roadway traffic, an L_{eq} of 35 dBA was recorded. This is a typical sound level for a rural area. The existing residences and Liberty Church on Route 493 often experience higher average sound levels than 35 dBA due to motor vehicle traffic.

5.0 IGCC PLANT OPERATIONAL NOISE IMPACT AND MITIGATION

Maximum sound levels at nearby sensitive receivers (residences and Liberty Church) were calculated using the Cadna-A acoustic model assuming simultaneous operation of all IGCC plant equipment at maximum operating conditions. Figure 1 shows the location of noise sensitive receivers in relation to the project site and its property boundaries. Cadna-A is a sophisticated 3-D model for sound propagation and attenuation based on International Standard ISO 9613-2.[5] Atmospheric absorption is the process by which sound energy is absorbed by the air and was calculated using ANSI S1.26-1995.[6] Air absorption of sound assumed standard day conditions and is significant at large distances and at high frequencies. ISO 9613-2 was used to calculate propagation and attenuation of sound energy by hemispherical divergence with distance, surface and building reflection, and shielding effects by barriers, buildings, and ground topography. The predicted maximum sound levels are conservative because: (1) the acoustic model assumes a ground-based temperature inversion, such as may occur on a calm, clear night when sound propagation is most favorable; (2) the model was instructed to ignore foliage sound absorption; and (3) no ground absorption (i.e., 100% sound wave reflection) was assumed for the plant equipment area.

The potential future sources of sound at the site are the coal gasification process equipment, including process air compressors (PAC) and PAC intercoolers, a GE 7FB combustion turbine (CT) and generator, a steam turbine (ST) and generator, CT air inlet, heat recovery steam generator (HRSG), HRSG exhaust stack, cooling towers, transformers and auxiliary equipment. The design assumes standard silencers on the HRSG air inlet and exhaust and standard acoustical enclosures for the CT and ST. An added noise mitigation element in the design is noise barrier walls around the PAC and PAC intercoolers on the north, east, and south sides assumed to be 18 meters high. These sound sources have the highest sound power at the facility and the barrier walls are necessary to prevent offsite noise impacts.

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[5] International Standard, ISO 9613-2, Acoustics – Attenuation of Sound During Propagation Outdoors, -- Part 2 General Method of Calculation.

[6] American National Standards Institute, ANSI S1.26-1995, American National Standard Method for the Calculation of the Absorption of Sound by the Atmosphere, 1995.

Future sound levels (L_{eq}) at the sensitive receiver locations are summarized in Table 3. These are maximum sound levels that assume all facility equipment is in operation and atmospheric conditions produce minimum sound attenuation. Predicted maximum facility sound levels are 43 to 51 dBA at the nearest receivers. Figure 2 presents a color contour plot of the facility sound levels and predicted levels at the sensitive receivers.

Table 3 also provides the day-night sound levels (L_{dn}) computed for noise from the project. Whereas the facility would operate 24 hours per day, the L_{dn} level is equal to the predicted L_{eq} level plus 6.4 dBA. These results show that the day-night (L_{dn}) operational sound levels at Liberty Church and at all but one of the nearest residences will comply with the EPA residential noise guideline of 55 dBA L_{dn}. The predicted level at Residence 6 will be slightly above the EPA guideline but below the HUD residential guideline of 65 dBA L_{dn}.

TABLE 5

MAXIMUM SOUND LEVELS FROM THE KEMPER COUNTY IGCC PLANT (dBA)

Receiver Location	Sound Facility (L_{eq})	Sound Facility (L_{dn})
Residence 1	46.2	52.6
Residence 2	47.4	53.8
Liberty Church	43.4	49.8
Residence 3	44.7	51.1
Residence 4	47.9	54.3
Residence 5	45.6	52.0
Residence 6	50.9	57.3

It is expected that the sound from the Kemper County IGCC plant will be more audible at night when there is less roadway traffic or human activity. Much of the time, depending upon weather conditions, actual sound levels would be less than predicted here, because this analysis does not include additional attenuation from wind gradients and atmospheric turbulence, effects that, at times, can reduce sound levels 10 to 20 dBA.

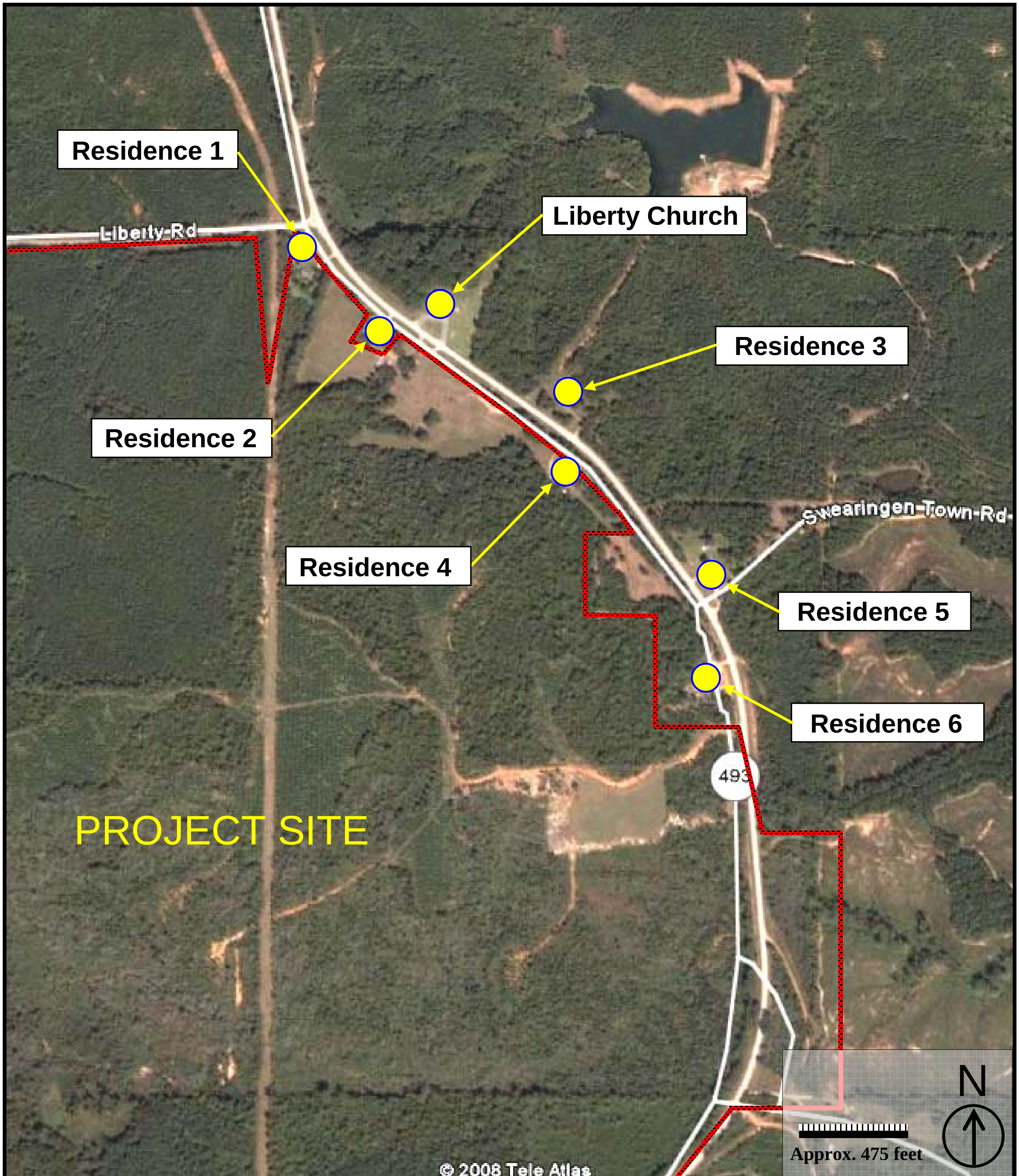

Figure 1

Sensitive Receiver Locations
Near Kemper County IGCC Plant

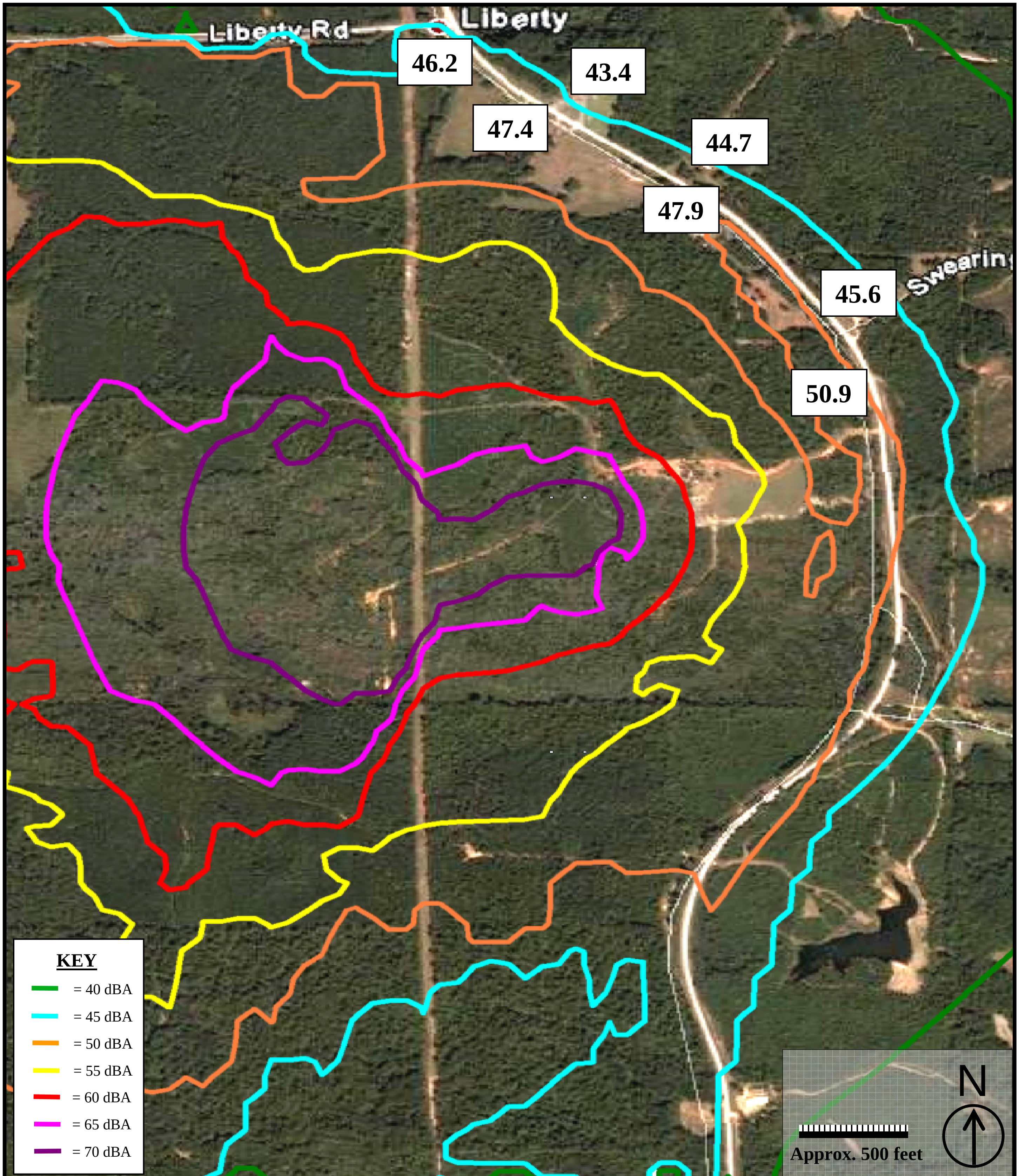

Figure 2

Maximum Sound Levels (dBA)
Kemper County IGCC Plant

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6.0 COAL MINING OPERATIONS AND CUMULATIVE IMPACTS

This section of the report presents the potential sound impacts from coal mining operations and the potential cumulative sound impact of coal mining and the IGCC power plant operations occurring simultaneously. Both operations would normally occur 24 hours per day and 7 days per week. The coal mining operation would consist of three major activities: 1) removal of overburden; 2) surface mining of coal, and 3) reclamation of the open pit. Each of these activities is described below.

Surface mining would first consist of removing the overburden and then the exposed coal seam with excavating equipment. This sequence would be repeated for each of coal seam to be mined. The removal of the overburden for the first 5 to 20-foot depths would be conducted using a hydraulic-powered shovel to excavate the overburden and load into large dump trucks, which would then remove the overburden from the area. At depths below 20 feet, the electric-powered dragline would be used to remove overburden material. The dragline would operate from a bench within the pit mine. Once the overburden is removed from the pit, surface mining operations would occur.

Equipment used during surface mining activities would consist of electric-powered dragline, cable tractor, loaders, large dump trucks, dozers, graders and backhoes. Surface mining would commence in the northeast corner of the “life of mine area” closest to the IGCC power plant. Each mining pit would be approximately 140 feet and 7,000 feet long and would be constructed from north to south with mining operations occurring from east to west within each pit.

As required by federal and state surface mining regulations, reclamation of mined areas would occur concurrently with other mining operations. Following removal of the final coal seam from a mine pit, the pit would be filled with the remaining overburden material from the adjacent active mine pit. The same equipment used to remove the overburden would be used during reclamation activities. If necessary, top soil would be brought on to the site and large dozers would be used to spread the final cover. The final cover would be mulched, seeded and planted to reduced run-off and dust impacts.

North American Coal Corporation (NAC) provided a list of equipment anticipated to be operation during coal mining. Noise emissions from mining operations were based on sound level measurements taken by NAC of some of the louder pieces of equipment and from Federal Highway Administration (FHWA) documentation[7]. Table 6 presents the equipment and sound power levels used to represent surface coal mining operations. Usage factors were applied to the sound power levels for each piece of equipment. A usage factor is the percentage of time during a one-hour period that the equipment is actually being used at its maximum power and not shutdown or at idles. For example, during mining operations, the dragline would have a high usage factor of 90 percent, whereas a large dozer would have usage factor of 40 percent[7].

The Cadna-A model was used to model the surface coal mining operations. The overburden removal phase would generate the highest sound levels during coal mining operations because much of the equipment would be working at the shallowest depth of the coal mining activities compared to those inside the pit, which would provide shielding for the dragline other mining equipment. These highest sound levels were used to assess potential noise impacts at the seven noise-sensitive receivers. Sound modeling was conducted for two worst-case scenarios: 1) coal mining operations at its closest point to the noise sensitive receivers and 2) coal mining and IGCC power plant operating simultaneously. Because the coal mining operations' closest proximity to the nearest noise-sensitive receivers to the IGCC power plant is more than 2.3 miles away, the sound level contribution from coal mining operations would cause no impact at the noise-sensitive receivers; therefore, background sound levels would not increase. Similarly, the cumulative modeling results showed that the IGCC power plant and coal mine operating simultaneously would not generate sound levels higher than those presented in Table 5 for IGCC power plant operating by itself. Figures 3 and 4 show the maximum sound level contours for coal mining operations only and coal mining and IGCC power plant operating simultaneously. Appendix A presents the Cadna-A model outputs.

[7] U.S. Department of Transportation, FHWA Roadway Construction Noise Model User's Guide, January 2006.

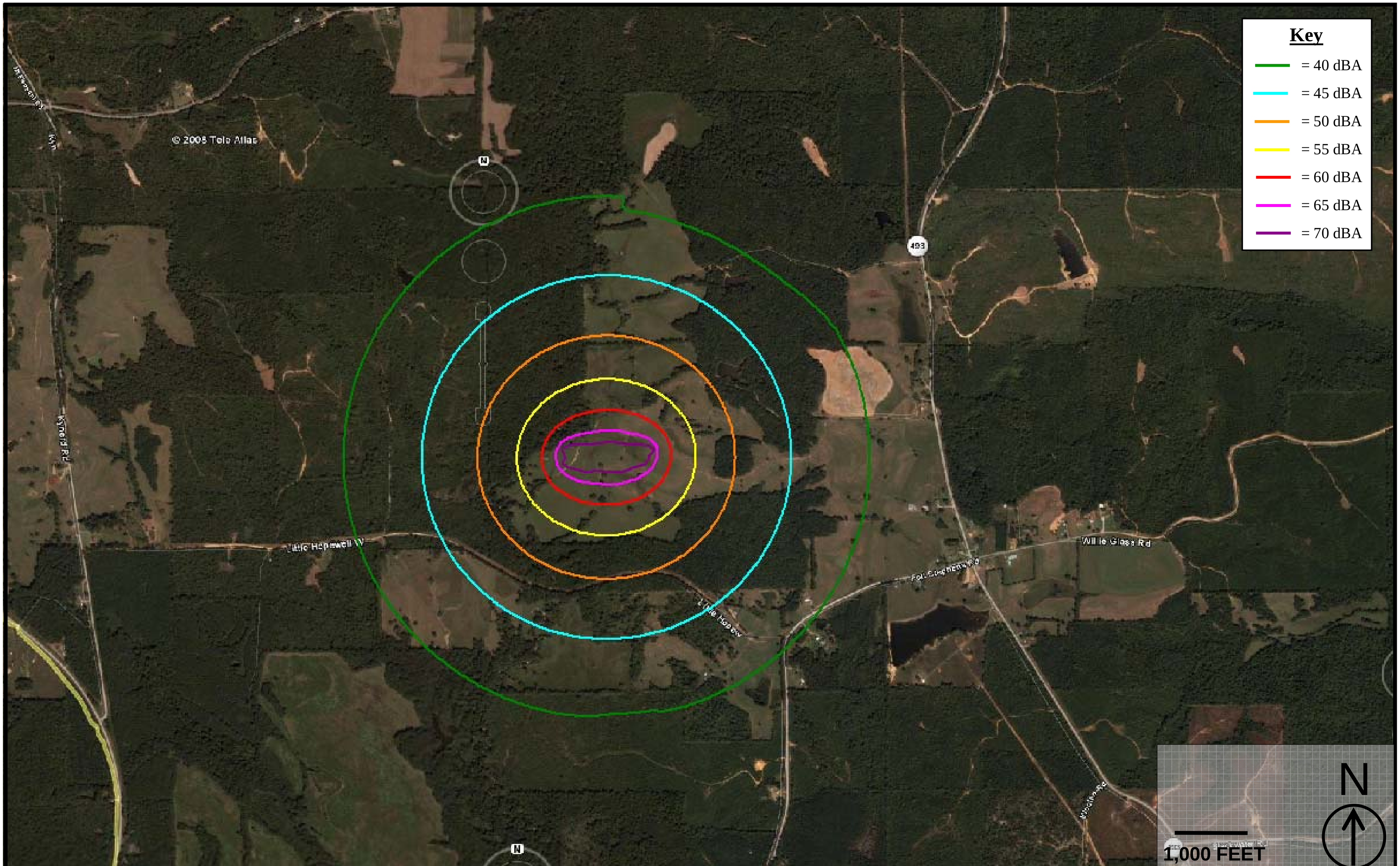

FIGURE 3.

Maximum Sound Levels
From Surface Mining Operations
With No IGCC Power Plant Noise (dBA)

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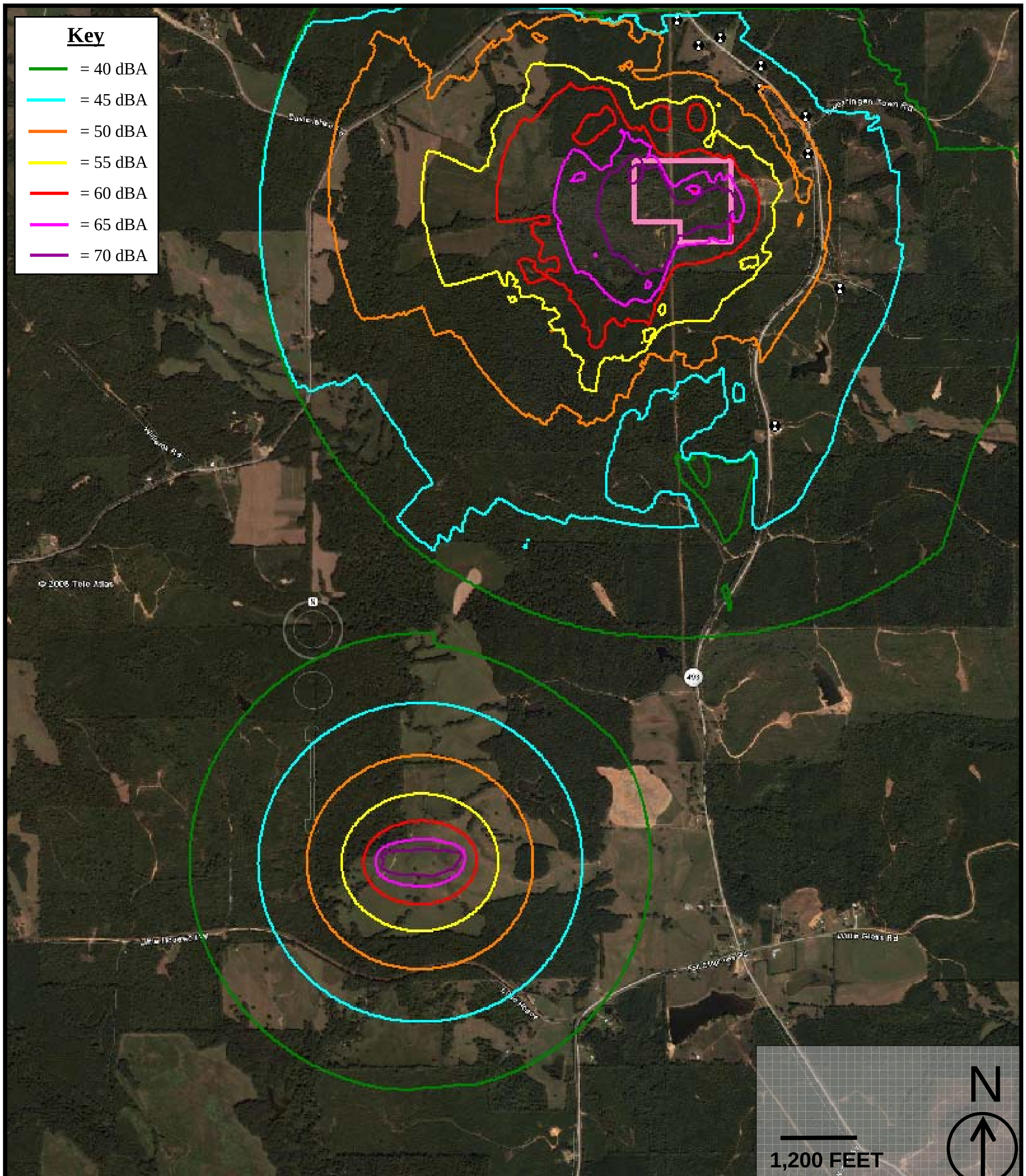

Figure 4.

Maximum Sound Levels From Surface Mining Operations and IGCC Power Plant Noise (dBA)

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TABLE 6

COAL MINING EQUIPMENT SOUND POWER LEVELS

Equipment	Sound Power Level (L_w) (dBA)
P&H 757 Dragline*	119
Cable Tractor	113
Cat 966 F.E.L.	108
Cat 345 Backhoe	108
Cat 365 Backhoe	108
Cat 789C End Dump Truck*	112
Cat 785C End Dump Truck	111
Cat 844 Wheel Dozer	110
Cat 994F Wheel Loader	112
Cat D11R Track Dozer	109
Cat D10R Track Dozer	110
Cat D10R D.L. Dozer	116
Cat D6LGP/D8LPG Track Dozer	110
Cat 24H *and 16 H Graders	115
Cat D400 Dump Truck	110
O&K Hydraulic Shovel	116
O&K RH120C Backhoe	108
Cat 436 Backhoe/Loader	114
Cat 825C Compactor	109
Cat Water Truck	107

*NAC provided sound data for these pieces of equipment.

7.0 IGCC PLANT CONSTRUCTION NOISE IMPACT AND MITIGATION

The construction of the Kemper County IGCC Project will require the use of equipment that may be audible from off-site locations. Facility construction will consist of site clearance, excavation, foundation work, steel erection and installation of facility equipment, and finishing work. These activities will overlap. Pile driving, generally considered the noisiest construction activity, may be required.

The noise levels resulting from construction activities vary greatly depending on factors such as the type of equipment, the specific equipment model, the operations being performed, and the overall condition of the equipment. Variations in the energy expended by the equipment and changes in construction phases and equipment mix make the prediction of potential noise impacts even more challenging.

EPA[8] has published data on the average sound levels for typical construction phases of industrial facilities. These average levels were projected from the edge of the facility footprint to the closest residential receiver, located at a distance of approximately 900 feet. This calculation conservatively assumes all equipment operating concurrently onsite for the specified construction phase. The results of these calculations are presented in Table 7 and show estimated construction sound levels at the nearest residence will be between 53 and 64 dBA for all activities except pile driving, which if necessary would produce a sound level of about 68 dBA at the nearest residence. If pile driving were required for the project's foundations, that activity would be limited to daytime hours. The construction sound at more distant locations will be less since sound level decreases with distance from the sound source. Construction noise impacts will be temporarily and the highest levels experienced by residents will be no louder than maximum levels from passby traffic on Route 493.

[8] EPA PB 206 717, Noise From Construction Equipment and Operations, Building Equipment, and Home Appliances, February, 1971.

TABLE 7

ESTIMATED SOUND LEVELS AT THE CLOSEST RESIDENTIAL RECEPTOR BY CONSTRUCTION PHASE

Construction Phase	50 Feet from Source (L_{eq})	At Closest Residential Receptor, (L_{eq})
Site Clearance	90	64
Excavation	89	63
Pile Driving	95	68
Foundations	78	53
Erection	85	60
Finishing	89	63

Reasonable effort will be made to minimize the impact of noise resulting from construction activities. The mitigation measures outlined below will be incorporated into the construction management guidelines:

- Construction activities that produce significant noise will generally be limited to daytime hours.
- Properly designed engine enclosures and intake silencers will be required.
- Regular equipment maintenance and lubrication will be required.
- All exhaust systems will be in good working order.

As the design of the Project progresses and construction scheduling has been finalized, the mitigation plan will be reviewed to minimize the effects of construction noise.

APPENDIX A

CADNA MODEL OUTPUT

Dragline P&H 757

<u>1/1 Octave Band Sound Power</u>

	16Hz	114.16
50% usage	**31.5Hz**	114.16
3dB	**63Hz**	113.16
	125Hz	113.16
	250Hz	113.16
	500Hz	112.16
	1KHz	113.16
	2KHz	111.16
	4KHz	111.16
	8KHz	110.16
	16KHz	108.16
<u>L-Weighted</u>		
	Broadband	**122.9**
<u>A-Weighted</u>		
	Broadband	**118.7**

Cable Tractor

<u>1/1 Octave Band Sound Power</u>

	16Hz	103.60
50% usage	**31.5Hz**	101.60
3dB	**63Hz**	109.60
	125Hz	109.60
	250Hz	106.60
	500Hz	106.60
	1KHz	104.60
	2KHz	105.60
	4KHz	105.60
	8KHz	104.60
	16KHz	103.60
<u>L-Weighted</u>		
	Broadband	**116.70**
<u>A-Weighted</u>		
	Broadband	**112.60**

Cat 966 F.E.L

<u>1/1 Octave Band Sound Power</u>

	16Hz	98.60
40% usage	**31.5Hz**	96.60
4dB	**63Hz**	104.60
	125Hz	104.60
	250Hz	101.60
	500Hz	101.60
	1KHz	99.60
	2KHz	100.60
	4KHz	100.60
	8KHz	99.60
	16KHz	98.60
<u>L-Weighted</u>		
	Broadband	**111.70**
<u>A-Weighted</u>		
	Broadband	**107.50**

Cat 345 Backhoe

<u>1/1 Octave Band Sound Power</u>

	16Hz	98.60
40% usage	**31.5Hz**	96.60
4dB	**63Hz**	104.60
	125Hz	104.60
	250Hz	101.60
	500Hz	101.60
	1KHz	99.60
	2KHz	100.60
	4KHz	100.60
	8KHz	99.60
	16KHz	98.60
<u>L-Weighted</u>		
	Broadband	**111.70**
<u>A-Weighted</u>		
	Broadband	**107.50**

Cat 789C End Dump		
1/1 Octave Band Sound Power		
	16Hz	114.16
40% usage	**31.5Hz**	114.16
4dB	**63Hz**	106.16
	125Hz	108.16
	250Hz	111.16
	500Hz	106.16
	1KHz	104.16
	2KHz	93.16
	4KHz	95.16
	8KHz	109.16
	16KHz	88.16
L-Weighted		
	Broadband	**119.62**
A-Weighted		
	Broadband	**111.38**

Cat 785C End Dump		
1/1 Octave Band Sound Power		
	16Hz	114.16
40% usage	**31.5Hz**	114.16
4dB	**63Hz**	106.16
	125Hz	108.16
	250Hz	111.16
	500Hz	106.16
	1KHz	104.16
	2KHz	93.16
	4KHz	95.16
	8KHz	109.16
	16KHz	88.16
L-Weighted		
	Broadband	**119.62**
A-Weighted		
	Broadband	**111.38**

O&K RH120C Backhoe		
1/1 Octave Band Sound Power		
	16Hz	98.60
40% usage	**31.5Hz**	96.60
4dB	**63Hz**	104.60
	125Hz	104.60
	250Hz	101.60
	500Hz	101.60
	1KHz	99.60
	2KHz	100.60
	4KHz	100.60
	8KHz	99.60
	16KHz	98.60
L-Weighted		
	Broadband	**111.70**
A-Weighted		
	Broadband	**107.50**

Cat 994F Wheel Loader		
1/1 Octave Band Sound Power		
	16Hz	109.60
40% usage	**31.5Hz**	109.60
4dB	**63Hz**	108.60
	125Hz	106.60
	250Hz	110.60
	500Hz	111.60
	1KHz	107.60
	2KHz	98.60
	4KHz	98.60
	8KHz	97.60
	16KHz	92.60
L-Weighted		
	Broadband	**118.10**
A-Weighted		
	Broadband	**112.30**

Cat D11R Track Dozer

1/1 Octave Band Sound Power		
	16Hz	110.26
40% usage	**31.5Hz**	109.26
4dB	**63Hz**	106.26
	125Hz	106.26
	250Hz	102.26
	500Hz	105.26
	1KHz	105.26
	2KHz	101.26
	4KHz	99.26
	8KHz	96.26
	16KHz	90.26
L-Weighted		
	Broadband	**115.87**
A-Weighted		
	Broadband	**109.28**

Cat D10R D.L Dozer

1/1 Octave Band Sound Power		
	16Hz	116.60
40% usage	**31.5Hz**	115.60
4dB	**63Hz**	112.60
	125Hz	112.60
	250Hz	108.60
	500Hz	111.60
	1KHz	111.60
	2KHz	107.60
	4KHz	105.60
	8KHz	102.60
	16KHz	96.60
L-Weighted		
	Broadband	**122.20**
A-Weighted		
	Broadband	**115.60**

Cat D10R Track Dozer

1/1 Octave Band Sound Power		
	16Hz	111.00
40% usage	**31.5Hz**	110.00
4dB	**63Hz**	107.00
	125Hz	107.00
	250Hz	103.00
	500Hz	106.00
	1KHz	106.00
	2KHz	102.00
	4KHz	100.00
	8KHz	97.00
	16KHz	91.00
L-Weighted		
	Broadband	**117.00**
A-Weighted		
	Broadband	**110.00**

Cat D8LPG Track Dozer

1/1 Octave Band Sound Power		
	16Hz	111.00
40% usage	**31.5Hz**	110.00
4dB	**63Hz**	107.00
	125Hz	107.00
	250Hz	103.00
	500Hz	106.00
	1KHz	106.00
	2KHz	102.00
	4KHz	100.00
	8KHz	97.00
	16KHz	91.00
L-Weighted		
	Broadband	**117.00**
A-Weighted		
	Broadband	**110.00**

Cat D6LGP Track Dozer		
1/1 Octave Band Sound Power		
	16Hz	111.00
40% usage	**31.5Hz**	110.00
4dB	**63Hz**	107.00
	125Hz	107.00
	250Hz	103.00
	500Hz	106.00
	1KHz	106.00
	2KHz	102.00
	4KHz	100.00
	8KHz	97.00
	16KHz	91.00
L-Weighted		
	Broadband	**117.00**
A-Weighted		
	Broadband	**110.00**

Cat 24H Motor Grader		
1/1 Octave Band Sound Power		
	16Hz	114.60
40% usage	**31.5Hz**	114.60
4dB	**63Hz**	113.60
	125Hz	107.60
	250Hz	112.60
	500Hz	108.60
	1KHz	107.60
	2KHz	109.60
	4KHz	106.60
	8KHz	102.60
	16KHz	96.60
L-Weighted		
	Broadband	**121.30**
A-Weighted		
	Broadband	**114.90**

Cat 16H Motor Grader		
1/1 Octave Band Sound Power		
	16Hz	114.60
40% usage	**31.5Hz**	114.60
4dB	**63Hz**	113.60
	125Hz	107.60
	250Hz	112.60
	500Hz	108.60
	1KHz	107.60
	2KHz	109.60
	4KHz	106.60
	8KHz	102.60
	16KHz	96.60
L-Weighted		
	Broadband	**121.30**
A-Weighted		
	Broadband	**114.90**

Cat 12,000 gal. Water Truck		
1/1 Octave Band Sound Power		
	16Hz	109.00
40% usage	**31.5Hz**	109.00
4dB	**63Hz**	107.00
	125Hz	100.00
	250Hz	100.00
	500Hz	103.00
	1KHz	102.00
	2KHz	99.00
	4KHz	97.00
	8KHz	95.00
	16KHz	92.00
L-Weighted		
	Broadband	**115.00**
A-Weighted		
	Broadband	**107.00**

Cat 365 Backhoe		
1/1 Octave Band Sound Power		
	16Hz	98.60
40% usage	**31.5Hz**	96.60
4dB	**63Hz**	104.60
	125Hz	104.60
	250Hz	101.60
	500Hz	101.60
	1KHz	99.60
	2KHz	100.60
	4KHz	100.60
	8KHz	99.60
	16KHz	98.60
L-Weighted		
	Broadband	**111.70**
A-Weighted		
	Broadband	**107.50**

Cat 844 Wheel Dozer		
1/1 Octave Band Sound Power		
	16Hz	111.00
40% usage	**31.5Hz**	110.00
4dB	**63Hz**	107.00
	125Hz	107.00
	250Hz	103.00
	500Hz	106.00
	1KHz	106.00
	2KHz	102.00
	4KHz	100.00
	8KHz	97.00
	16KHz	91.00
L-Weighted		
	Broadband	**117.00**
A-Weighted		
	Broadband	**110.00**

Cat D400 Artic. Dump Truck		
1/1 Octave Band Sound Power		
	16Hz	112.60
40% usage	**31.5Hz**	112.60
4dB	**63Hz**	110.60
	125Hz	103.60
	250Hz	103.60
	500Hz	106.60
	1KHz	105.60
	2KHz	102.60
	4KHz	100.60
	8KHz	98.60
	16KHz	95.60
L-Weighted		
	Broadband	**118.15**
A-Weighted		
	Broadband	**110.30**

O&K RH200 Hydraulic Shovel		
1/1 Octave Band Sound Power		
	16Hz	111.66
40% usage	**31.5Hz**	111.66
4dB	**63Hz**	110.66
	125Hz	110.66
	250Hz	109.66
	500Hz	109.66
	1KHz	110.66
	2KHz	108.66
	4KHz	108.66
	8KHz	107.66
	16KHz	105.66
L-Weighted		
	Broadband	**120.30**
A-Weighted		
	Broadband	**116.20**

Cat 436 Backhoe/Loader ITC		
1/1 Octave Band Sound Power		
	16Hz	115.00
40% usage	**31.5Hz**	114.00
4dB	**63Hz**	111.00
	125Hz	111.00
	250Hz	107.00
	500Hz	110.00
	1KHz	110.00
	2KHz	106.00
	4KHz	104.00
	8KHz	101.00
	16KHz	95.00
L-Weighted		
	Broadband	**121.00**
A-Weighted		
	Broadband	**114.00**

Cat 825C Compactor		
1/1 Octave Band Sound Power		
	16Hz	110.60
40% usage	**31.5Hz**	110.60
4dB	**63Hz**	109.60
	125Hz	105.60
	250Hz	103.60
	500Hz	101.60
	1KHz	105.60
	2KHz	98.60
	4KHz	97.60
	8KHz	95.60
	16KHz	92.60
L-Weighted		
	Broadband	**116.50**
A-Weighted		
	Broadband	**108.80**

Cadna A Output

Sound Levels from IGCC Operations only

Name	Level Lr	Limit. Value			Height		Coordinates		
	Day	Day	Night	Noise Type			X	Y	Z
	(dBA)	(dBA)	(dBA)		(m)		(m)	(m)	(m)
Residence 1	46.2			Total	1.5	r	307040.8	350329.9	135.5
Residence 2	47.4			Total	1.5	r	307144.9	350368.5	135.07
Liberty Church	43.4			Total	1.5	r	307334.8	350237.5	143.2
Residence 3	44.7			Total	1.5	r	307328.8	350126.1	146.47
Residence 4	47.9			Total	1.5	r	307559.5	349822.7	153.9
Residence 5	45.6			Total	1.5	r	307709.4	349188.8	146.07
Residence 6	50.9			Total	1.5	r	307402	348540.3	147.39

Cumulative Sound Levels from IGCC Operations and Coal Mining

Name	Level Lr	Limit. Value					Height	Coordinates	
	Day	Day	Night	Noise Type			X	Y	Z
	(dBA)	(dBA)	(dBA)		(m)		(m)	(m)	(m)
Residence 1	46.2			Total	1.5	r	307040.8	350329.9	135.5
Residence 2	47.4			Total	1.5	r	307144.9	350368.5	135.07
Liberty Church	43.4			Total	1.5	r	307334.8	350237.5	143.2
Residence 3	44.7			Total	1.5	r	307328.8	350126.1	146.47
Residence 4	47.9			Total	1.5	r	307559.5	349822.7	153.9
Residence 5	45.6			Total	1.5	r	307709.4	349188.8	146.07
Residence 6	50.9			Total	1.5	r	307402	348540.3	147.39

Cadna A Output

Name	ID	Result. PWL Day (dBA)	Type	Value	Height (m)		Coordinates X (m)	Y (m)	Z (m)
Gas Compressor	Compressor_1	129.3	Lw	GC2					
Gas Compressor	Compressor_2	129.3	Lw	GC2					
Gas Compressor	Compressor_3	129.3	Lw	GC2	9	r	306973.6	349539.3	151.01
Gas Compressor	Compressor_4	129.3	Lw	GC2	9	r	306972.2	349522	150.03
Gas Cooler	Cooler_4	122.2	Lw	GC1	9	r	306972.2	349501.7	149.2
Gas Cooler	Cooler_3	122.2	Lw	GC1	9	r	306972.9	349483.3	149.2
Gas Cooler	Cooler_2	122.2	Lw	GC1	5	r	306977.6	349486.7	145.2
Gas Cooler	Cooler_1	122.2	Lw	GC1	5	r	306978.2	349504.7	145.44
HRSG Inlet Duct	HRSG_Inlet_1	107	Lw	H2	5	r	306976.9	349524	146.38
HRSG Inlet Duct	HRSG_Inlet_2	107	Lw	H2	5	r	306976.2	349542.7	147.32
HRSG Outlet	HRSG_Outlet_2	110	Lw	H3	4	r	307118.9	349585.4	151.74
HRSG Outlet	HRSG_Outlet_3	110	Lw	H3	5	r	307166.6	349584.4	153.21
HRSG Outlet	HRSG_Outlet_1	102.8	Lw	H1	99.01	r	307115.3	349626.2	247.01
HRSG Body	HRSG_Body	102.8	Lw	H1	99.01	r	307163.8	349625.9	249.01
Dragline	Dragline	118.7	Lw	Dragline	18	r	307115.2	349607.9	166.07
Cable Tractor	Cable_Tractor	112.4	Lw	Cable_Tractor	18	r	307164.3	349607.5	167.66
Hydraulic Shovel	Hyd_Shovel	116.2	Lw	O_K_Shovel	3.5	r	305948.2	346468.6	122.4
3454 Backhoe	Backhoe_1	107.4	Lw	Cat_345	3.5	r	305924.7	346465.9	113.3
RH120 Backhoe	Backhoe_2	107.4	Lw	O_K_Backhoe	3.5	r	305912.4	346465.2	113.3
844 Dozer	Dozer_1	110	Lw	Cat_844	3	r	305889.7	346449.8	112.8
Dump Truck	Dump_Truck	110.3	Lw	Cat_D400	3	r	305924.9	346507	121.9
Compactor	Compactor	108.3	Lw	Cat_825C	3	r	305561.7	346523.5	124.95
Backhoe #1	1_Backhoe_1	114	Lw	Cat_436	3	r	305564.2	346423.1	121.9
Backhoe #2	1_Backhoe_2	107.4	Lw	Cat_365	3	r	305599.2	346478.7	131
Dump Truck #1	1_Dump_Truck_1	107.4	Lw	Cat_365	3	r	305743.3	346479.4	131
Dump Truck #2	1_Dump_Truck_2	110.3	Lw	Cat_D400	3	r	305786	346450	131

Cadna A Output

Name	ID	Result. PWL Day (dBA)	Type	Value
Gas Turbine	Turbine_2	113.5	Lw	GT1
Gas Turbine	Turbine_1	113.5	Lw	GT1
Steam Turbine	Steam_1	108.3	Lw	ST2
Truck Path #1	Truck_Path_1	111.4	Lw	Cat_789C
Truck Path #2	Truck_Path_2	106.7	Lw	Water_Truck
Grader #1	Grader_1	114.9	Lw	Cat_24H
Grader #2	Grader_2	114.9	Lw	Cat_24H

Name	ID	Result. PWL Day (dBA)	Type	Value
Cooling #1	Cooling_Tower_1	104.5	Lw	CT1
Cooling #2	Cooling_Tower_2	105	Lw	CT1