MEMO

TO:	Benjamin Brazell
FROM:	Isaac Old
CC:	Cosimo Pagano
DATE:	April 26, 2023
SUBJECT:	Construction Noise Analysis for District East Redevelopment

This technical memorandum reports the findings of an assessment of potential construction noise associated with the proposed District East Redevelopment ("Project"). It includes:

- A description of the Project;
- Discussion of relevant noise standards and policy;
- Background sound level measurement methodology and results;
- Sound propagation modeling methodology and results of potential construction noise;
- Discussion of the monitor and model results in the context of the identified noise standards and policy.

This memo is an update of a RSG memo titled *Construction Noise Analysis for District East Redevelopment* and dated June 20, 2022, and revised January 12, 2023 and March 10, 2023.

Project Description

The Project is a proposed redevelopment of the Shoppingtown Mall area on Erie Boulevard in DeWitt, New York into a multi-use area that will include residential, hospitality, retail, entertainment, and office/medical uses. The plan also includes green spaces and pedestrian and bicycle paths. The Project will be built out over a period of approximately 12 years:

- Year 1 & 2: Demolition and building infrastructure including roads, walkways, and green spaces and park
- Year 3 through 12 (vertical phases): Mixed use, medical offices, residential, grocery, retail, garage, institutional, theater, etc.

A map of the proposed site is provided in Figure 1.

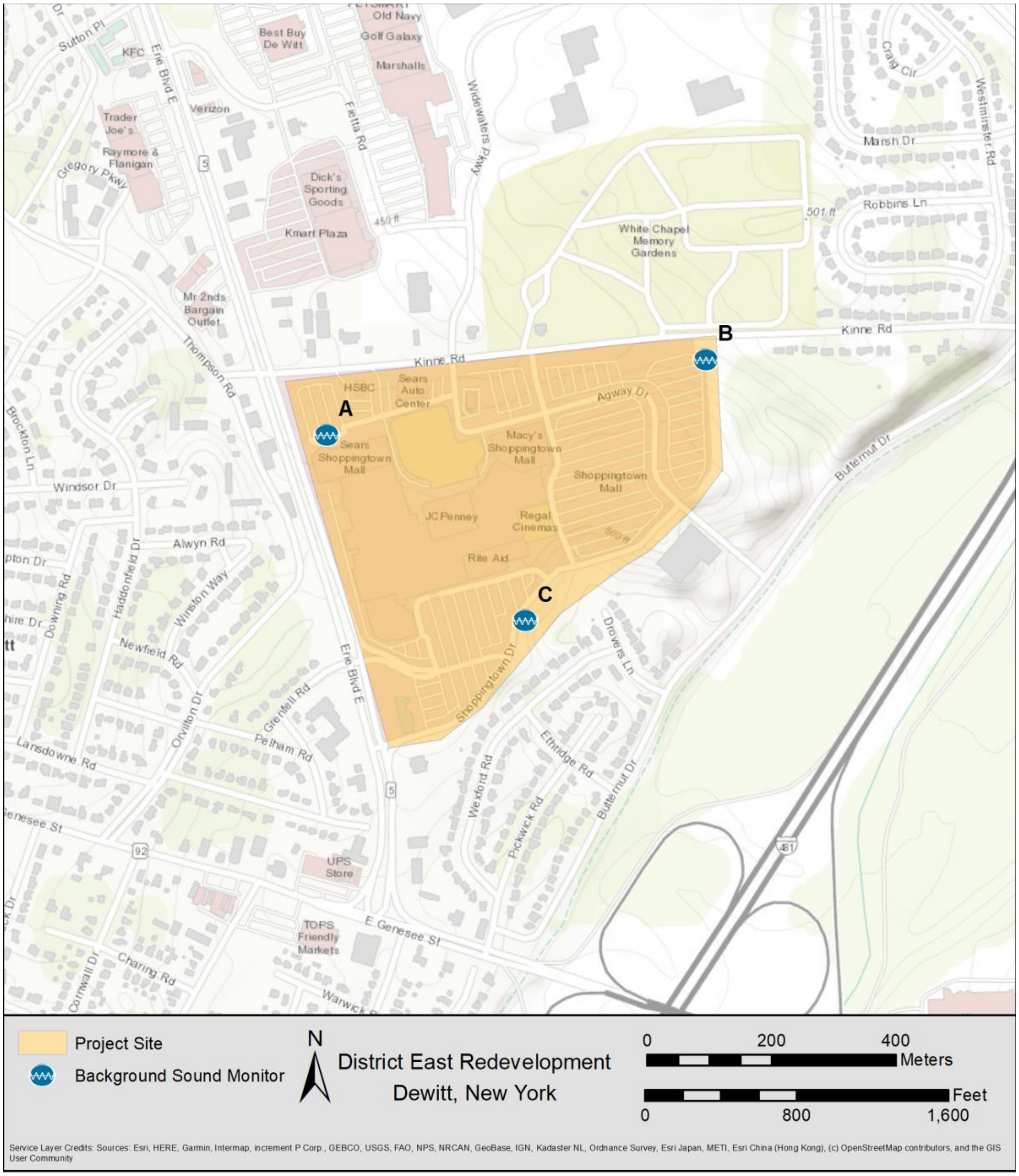

FIGURE 1: MAP OF PROJECT SITE WITH BACKGROUND SOUND MONITOR LOCATIONS

Noise Standards and Policy

Local Noise Standard

The Town of Dewitt has established a noise limit and regulations regarding noise in Chapter 126 of the town code. The noise limit contained in Section 126-4 states:

> No person shall cause, suffer, allow or permit the operation of any source of sound on a particular category of property or any public space or right-of-way in

> such a manner as to create a sound level that exceeds the particular sound level limits set forth as follows: between 7:00 a.m. and 10:00 p.m., seventy (70) dBA and between 10:00 p.m. and 7:00 a.m., fifty (50) dBA when measured at the adjoining property line.

The regulation goes on to list a number of prohibited noises, the portions of which are relative to an assessment of construction noise, are reproduced below:

> (4) Exhaust of engines: the discharge into the open air of the exhaust of any stationary internal-combustion engine or motor vehicle engine, except through a muffler or other device which will effectively prevent loud or explosive noises therefrom.
>
> (5) Construction work: the erection, including excavation, demolition, alteration or repair, of any building other than between 7:00 a.m. and 7:30 p.m., except in the case of urgent necessity in the interest of public safety as determined by the building inspector or other applicable laws in the Town of DeWitt.
>
> (7) Loading and unloading vehicles: the creation of a loud and excessive noise in connection with loading or unloading any vehicle or the opening and destruction of bales, boxes, crates and containers.

State Policy

The New York State Department of Environmental Conservation (NYSDEC) Program Policy, entitled *Assessing and Mitigating Noise Impacts* (October 2000, revised February 2, 2001), includes information about background sound level measurements, jurisdiction limits of the NYSDEC, and a review of guidelines from the other sources. The purpose of the Policy is as follows:

> “This policy is intended to provide direction to the staff of the Department of Environmental Conservation for the evaluation of sound levels and characteristics (such as pitch and duration) generated from proposed or existing facilities. This guidance also serves to identify when noise levels may cause a significant environmental impact and gives methods for noise impact assessment, avoidance, and reduction measures….”

The sound level guidelines are found in Section V.B.1.c of the Policy. Two types of thresholds are mentioned – one that is relative to existing background sound levels, and the other that is fixed.

> “The goal for any permitted operation should be to minimize increases in sound pressure level above ambient levels at the chosen point of sound reception. Increases ranging from 0-3 dB should have no appreciable effect on receptors. Increases from 3-6 dB may have potential for adverse noise impact only in cases where the most sensitive of receptors are present. Sound pressure increases of more than 6 dB may require a closer analysis of impact potential depending on

existing SPLs and the character of surrounding land use and receptors. SPL increases approaching 10 dB result in a perceived doubling of SPL. The perceived doubling of the SPL results from the fact that SPLs are measured on a logarithmic scale. An increase of 10 dB(A) deserves consideration of avoidance and mitigation measures in most cases. The above thresholds as indicators of impact potential should be viewed as guidelines subject to adjustment as appropriate for the specific circumstances one encounters.

"Establishing a maximum SPL at the point of reception can be an appropriate approach to addressing potential adverse noise impacts. Noise thresholds are established for solid waste management facilities in the Department's Solid Waste regulations, 6 NYCRR Part 360. Most humans find a sound level of 60 - 70 dB(A) as beginning to create a condition of significant noise effect (EPA 550/9-79-100, November 1978). In general, the EPA's "Protective Noise Levels" guidance found that ambient noise levels of 55 dBA $L_{(dn)}$ was sufficient to protect public health and welfare and, in most cases, did not create an annoyance (EPA 550/9-79-100, November 1978). In non-industrial settings the SPL should probably not exceed ambient noise by more than 6 dB(A) at the receptor. An increase of 6 dB(A) may cause complaints. There may be occasions where an increase in SPLs of greater than 6 dB(A) might be acceptable. The addition of any noise source, in a nonindustrial setting, should not raise the ambient noise level above a maximum of 65 dB(A). This would be considered the "upper end" limit since 65 dB(A) allows for undisturbed speech at a distance of approximately three feet. Some outdoor activities can be conducted at a SPL of 65 dB(A). Still lower ambient noise levels may be necessary if there are sensitive receptors nearby. These goals can be attained by using the mitigative techniques outlined in this guidance."

Precedents of applying the policy calls for the use of the equivalent average sound level (L_{eq}) for both the existing and build sound levels.

The guidelines state that they do "not supersede any local noise ordinances or regulations."

Assessment Criteria

Based on the local noise standard and State policy, the criteria against which construction noise is assessed in this assessment are:

- A maximum sound level[1] of 70 dBA at the property line from Project sound sources, and

[1] The sound level limit for the Town of Dewitt does not specify a sound level metric (e.g. L_{max}, L_{eq}, L_{50}, etc.). The limits may be a maximum level, average level, or some other metric, but for this assessment based on the ordinance language, "to create a sound level that exceeds the particular sound level limits," it has been applied as an L_{max} limit. For the purposes of this memo,

- Existing equivalent continuous background sound level plus 6 dB at area receptors. With the measured background sound levels discussed in the following section, this would set the daytime limit to 60 dBA (L_{eq}) at nearby receptors.

Background Sound Levels

Methodology

Background sound levels were measured at three locations around the Project site for a period of nine days (April 15 to April 24, 2022). The monitor locations are shown in Figure 1. As shown in the figure, the monitors represent the three extents of the Project site: Monitor A to the northwest near Erie Boulevard, Monitor B to the northeast adjacent to Kinne Road, and Monitor C to the south along Shoppingtown Drive and adjacent to the residences along Wexford Road.

Sound levels were measured using ANSI/IEC Class 1 sound level meters that logged A-weighted and 1/3 octave band equivalent sound levels once each second continuously throughout the monitoring period. Audio recordings were also made at each location to aid in source identification and soundscape characterization. Each sound level meter microphone was mounted on a wooden stake at a height of approximately 1.2 meters (4 feet) and covered with a seven-inch weather-resistant windscreen. The windscreen reduces the influence of wind-induced self-noise on the measurements. The sound level meters were field calibrated before and after the measurement period.

Wind data was logged at each site using ONSET anemometers which recorded average wind speed and wind gust speed data once per minute and was installed at microphone height (1.2 meters or 4 feet).

Sound level data from each monitor were averaged into 10-minute periods and summarized over the entire monitoring period. Statistical levels were calculated from the one-second L_{eq}. Data were excluded from the averaging under the following conditions:

- Wind gust speeds above 5 m/s (11 mph);
- Precipitation which occurred primarily on April 16th, and the evening of April 18th into the early morning of April 20th;
- Anomalous sounds that were out of character for the area being monitored, such as sirens and people in close proximity to the monitor; and
- During microphone calibration and maintenance.

Monitor Results

The data from each monitor exhibited a diurnal pattern typical of suburban and urban areas with higher traffic noise during the day and lower background sound levels at

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we are considering the "L_{max}" to be the slow-response max or $L_{As,max}$ consistent with FHWA data on construction noise sources.

night. The highest sound levels were at Monitor A which was closest to Erie Boulevard. Generally overall sound levels were 4 to 5 dB less at Monitors B and C which were further from the primary road through the area. A summary of the overall monitor results by daytime and nighttime periods is provided in Table 1.

TABLE 1: SUMMARY OF BACKGROUND SOUND LEVELS BY MONITOR

Monitor	Daytime Leq (dBA)	Nighttime Leq (dBA)
A	57	49
B	53	46
C	53	48
Average (dBA)	54	48
+ 6 dB	60	54

As shown in Table 1, the average daytime sound level for the site was 54 dBA during the day. With construction occurring during the day (7 am to 7:30 pm, based on the Town of DeWitt ordinance), this would set the assessment criteria at 60 dBA per State policy.

Time-history plots of the 10-minute sound level data is available for each monitor upon request.

The primary sound source at all locations was road traffic. This was particularly the case for Monitor A which was located near the intersection of Kinne Road and Erie Boulevard East. At Monitor A, other sound sources included mechanical equipment from nearby buildings, trains, aircraft, and some biogenic sound such as birds.

Monitor B is generally similar, with less road traffic and mechanical equipment noise, and a higher prominence of other sources, such as aircraft and dogs.

Monitor C also has road traffic noise, but instead of discrete car passbys being audible, it's a more consistent sound caused by the steady flow of traffic on Interstate 481, located to the east. Passbys on closer secondary and tertiary road are still apparent though. More discrete aircraft flyovers are more noticeable as a result, and this is the site with the least mechanical equipment sound. Train passbys are least apparent here relative to other sites.

Although all monitoring sites were on the property of the mall, results do inform us on the soundscapes of surrounding areas with sensitive receptors. Sensitive receptors to the east of the mall will have as much if not more influence from traffic relative to Monitor C. Receptors west of the mall will have traffic noise from Erie Boulevard East, though some of the more densely residential areas should have less traffic noise overall. Receptors to the north will have traffic noise from Kinne Road, Interstates 481 and 690, and the railroad and rail yard, similar to Monitor B.

Sound Propagation Modeling of Construction Noise

Methodology

Modeling for this assessment was in accordance with the standard ISO 9613-2, "Acoustics – Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation." The ISO standard states,

> This part of ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level … under meteorological conditions favorable to propagation from sources of known sound emissions. These conditions are for downwind propagation … or, equivalently, propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs at night.

The model takes into account source sound power levels, surface reflection and absorption, atmospheric absorption, geometric divergence, meteorological conditions, walls, barriers, berms, and terrain. The acoustical modeling software used here was CadnaA, from Datakustik GmbH. CadnaA is a widely accepted acoustical propagation modeling tool, used by many noise control professionals in the United States and internationally. ISO 9613-2 assumes downwind sound propagation between every source and every receptor, consequently, all wind directions, including the prevailing wind directions, are taken into account.

Modeling does not include existing ambient sound levels in the results. It is common practice to model noise impacts from construction activities in isolation. Addition of ambient sound levels to the model would only hide the influence of construction sound sources, particularly at distant receptors. Ambient sound levels will also vary throughout the area, making determination of a level for the entire area imprecise.

Equipment

During demolition, construction equipment would operate primarily near the existing mall structure. The primary equipment used during demolition includes approximately six excavators, three dozers, three loaders, dump trucks (~20 trips/day), and a concrete crusher.

Construction of infrastructure will occur throughout the Project site. While infrastructure is being constructed, the primary equipment that will be used include approximately four excavators, four dozers, three loaders, triaxle trucks delivering materials, and during a portion of the phase, a paver and concrete trucks. Blasting is not anticipated at this time.

Applicable use factors for long-term average sound levels were selected based on typical equipment used for construction of similar type, size, and scope. Given the general scope of the development site, these include trucks, excavators, loaders, cranes, etc. The use factor was implemented according to RCNM (Roadway

Construction Noise Manual). The purpose of use factor is to take into account that construction equipment will not be used every minute of every day, so it weights sound emissions by an estimated typical operating time. As an example, the use factor of a Dozer is 40%. Since the construction day is about 12 hours (720 minutes), it would be assumed to operate for 4.8 hours or 288 minutes per day. Use factors are relevant when calculating longer term L_{eq} sound levels, such as are shown in Figure 2 tthrough 13, but is not used for short term maximum sound levels, such as is found in Table 3. For assessing the Town of Dewitt sound level limit, the L_{max} sound level modeling results should be used. For assessing the NYSDEC limit of ambient + 6 dB, L_{eq} modeling results should be used.

The vertical phases (years 3 through 12) will occur within confined areas at different locations around Project site as different buildings are being constructed. During the vertical phases (years 3 through 12), the primary equipment includes an excavator, dozer, loader, crane, and delivery trucks.

Modeling was completed for all 12 phases of construction including all the equipment listed above. Since proposed construction equipment is mobile and will work throughout each phase area, each phase area was modeled as an area source containing the average sound emissions[2] of all equipment that would operate within that area during each phase. In addition, since all equipment will not typically operate simultaneously for an entire day, each piece of equipment was assigned a use factor[3] to account for the amount of time each piece of equipment would operate.

Only approximate location and number of construction equipment is known at the current time. Meaning that use of more exact sound source locations by way of line and point sources would be a guess, at best. To address this, area sources were used in the approximate locations of expected construction. Expected construction noise sources for these locations were logarithmically summed (logarithmic summation) together and then weighted by the expected time they would be used over a day (logarithmic averaging).

Exact locations of the area sources could be provided, however given the variety of construction noise source areas used for each phase and the number of phases, this will be a large list and include complicated geometries. Area sources were generally quite large, including the area of buildings, parking lots, streets, etc. Area source heights were between 1.5 meters and 2 meters depending on the phase and type of construction. These heights were taken from the FHWA (Federal Highway Administration) RCNM

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[2] The equipment sound emissions that were used are primarily from the National Cooperative Highway Research Program (NCHRP) Project No. 25-49, “Development of a Highway Construction Noise Model” which published average and maximum sound emissions on variety of common construction equipment. Some source emission data was supplemented by RSG’s noise source library, as needed.

[3] The use factors that were used for each equipment are from the Federal Highway Administration’s (FHWA) Roadway Construction Noise Model (RCNM) User’s Guide, January 2006.

(Roadway Construction Noise Model) dataset and are based on the average of sound sources modeled for a construction area.

A noise assessment during the "operation" phase is not typically provided at this point since it does not accurately reflect finished phases of the project. Mechanical equipment and other noise sources have not been selected at this time and over the next 10 years, the required equipment could change notably. We do know what the expected primary sound source types will be, mechanical equipment and vehicle traffic. The current use of the site also includes mechanical equipment and vehicle traffic as primary sound sources. Expected primary Project sound sources are similar to existing primary sound sources.

Model Results

The average daytime sound level modeled for each phase of construction is provided in the maps in Figures 2 through 13 at the end of this memorandum. As shown in the maps, 60 dBA which is represented by the orange isoline largely remains on the Project property for each phase, although there are some locations during some phases where the 60 dBA isoline extends over neighboring properties. A summary of the model results across all 550 modeled receptors is provided in Table 2. Over the course of the 12-year build-out, there will be a total of 33 modeled receptors that exceed 60 dBA, and the most for any single phase is 15 receptors above 60 dBA during the 2028 phase. The highest modeled sound level at a receptor is 66 dBA which occurs in the 2031 phase at the cemetery north of the Project site. All modeled receptors that exceed 60 dBA are either commercial properties or the post office and cemetery north of the Project site. For 6 of the 12 years there are no receptors above 60 dBA. Model results are shown without mitigation measures implemented. Potential mitigation measures are identified in Table 4.

Although some receptors do exceed 60 dBA, all but one of the receptors (the cemetery) is a commercial use. Commercial use will be less sensitive to sound than residential uses. Due to the layout of the site, receptors with the highest modeled sound levels are also those that are currently most exposed to vehicle traffic sound and were most exposed to sound from the mall that currently occupies the site. Construction sound will also not be permanent. Although it may have an impact on the same area in multiple years, the highest sound levels will not be experienced by the same receptors during every phase. Nevertheless, mitigation measures (as provided in Table 4) should be applied in areas closest to sensitive receptors during phases where sound levels are modeled to exceed 60 dBA. The level of mitigation achievable from Project fencing, berms, or portable noise barriers (at least 7 dB) should be adequate for most phases.

TABLE 2: SUMMARY OF MODELED DAYTIME SOUND LEVELS FROM CONSTRUCTION BY PHASE

PHASE	DAYTIME MODELED SOUND PRESSURE LEVEL (dBA)		# OF RECEPTORS OVER 60 DBA
	AVERAGE ACROSS MODELED RECEPTORS	MAXIMUM	
Demolition	49	60	0
Infrastructure	50	62	4
2024	44	53	0
2025	45	59	0
2026	44	57	0
2027	44	61	1
2028	45	65	15
2029	44	56	0
2030	45	61	3
2031	43	66	7
2032	39	64	3
2033	36	59	0

Maximum Sound Levels from Construction Equipment

Results in the previous section represent the average sound emissions from each phase of construction. At any given moment in time, some construction equipment may produce sound levels that are above its typical sound emissions. These maximum sound levels are usually short in duration while the equipment conducts a specific activity or function. It is also unlikely that all equipment for a phase will be co-located and producing maximum sound emissions at the same time, making the application of maximal sound emissions to the modeling performed above unrealistically conservative. Table 3 provides the maximum sound levels from individual pieces of proposed equipment at:

- a reference distance of 15 meters (50 feet);
- 387 meters (1,270 feet) the average distance from closest residences in all directions to the center of the Project site; and
- 33 meters (108 feet) the shortest distance between a construction area and a nearby residence (between Shoppingtown Drive and a residence on Wexford Road.

Also provided in Table 3, is the distance for each equipment that results in a projected sound level of 70 dBA, the daytime property line sound level limit for the Town of Dewitt (a L_{max} based limit). Table 4 shows sound levels at the closest expected setback for that type of equipment, along with possible mitigation measures their efficacy. The crusher generally does not need to be at a fixed location at the site, so could be located about 200 meters from all receptors, reducing sound levels. Positioning of earthen berms, could provide additional sound level reduction. Other sound sources can use lower noise use practices, such as reducing tailgate bangs for dump trucks, and bucket shaking for excavators. Dump trucks can also be equipped to vibrate the bed to loosen material without using tailgate bangs. Using one or more of these mitigation measures should be able to reduce sound levels to 70 dBA or below in most situations.

TABLE 3: MAXIMUM SOUND LEVELS FROM CONSTRUCTION EQUIPMENT & DISTANCE TO 70 dBA

SOURCE	REFERENCE L_{max} (dBA) AT 15 m (50 ft)	L_{max} (dBA) AT 387 m (1,270 ft)	L_{max} (dBA) AT 33 m (108 ft)	DISTANCE TO 70 dBA	
				METERS	FEET
Asphalt Paving	83	56	76	65	213
Excavator	87	60	81	110	361
Dump Truck	92	64	85	200	656
Dozer	86	59	79	90	295
Concrete Truck	82	55	75	60	197
Crane	79	52	72	42	138
Loader	81	54	75	55	180
Concrete Crusher	94	67	88	274	899

TABLE 4: EQUIPMENT SOUND LEVELS AND MITIGATION MEASURES[4]

Sound Source	Closest Distance to Property Line		Sound Level at Minimum Setback (dBA)	Possible Mitigation Measures	Potential Sound Level Reduction (dB)			
	meters	feet			Fencing[5]	[6]Setback	Portable Barrier[7]	Berm
Asphalt Paving	33	108	76	Site fencing, mobile barrier, berm	7-9	-	7-9	10-12[7]
Excavator	33	108	81	Site fencing, mobile barrier, berm, activity modification	7-9	-	7-9	10-12[7]
Dump Truck	33	108	85	Site fencing, mobile barrier, berm, activity modification, low noise equipment	7-9	-	7-9	10-12[8]
Dozer	33	108	79	Site fencing, mobile barrier, berm	7-9	-	7-9	10-12[7]
Concrete Truck	33	108	75	Site fencing, mobile barrier, berm,	7-9	-	7-9	10-12[7]
Crane	33	108	72	Site fencing, mobile barrier, berm	7-9	-	7-9	10-12[7]
Loader	33	108	75	Site fencing, mobile barrier, berm, activity modification	7-9	-	7-9	10-12[7]
Concrete Crusher	70	230	81	Increased setbacks, berms, fencing	7-9	8	-	10[9]

[4] Mitigation effectiveness is specific to the context it was used. Any mitigation measure can be made more or less effect depending on how it is used.
[5] Tow-meter tall perimeter fence with sound barrier material at 33 meter setback.
[6] Shift from 70 meter minimum setback to 200 meter minimum setback.
[7] Two-meter tall mobile barrier, located 3 meters from the unit.
[8] Three-meter tall berm located 10 meters from the unit at a 33 meter receptor setback.
[9] Three-meter tall berm located 10-meters from the unit at a 200 meter receptor setback.

Discussion of Results & Conclusion

Based on the noise ordinance for the Town of Dewitt, construction noise would be limited to 7 AM to 7:30 PM. The limits evaluated in this assessment are an L_{max} daytime property line limit of 70 dBA per the Town of Dewitt noise ordinance and an L_{eq} daytime receptor limit of 60 dBA (background plus 6 dB) per the NYSDEC noise policy.

Receptors near the site are relatively diverse. There is a combination of residential areas to the northeast across Kinne Road, south between Interstate 481 and the site, and west on the other side of Erie Boulevard East. There are commercial areas to the west directly along Erie Boulevard East. There are several stores and shopping centers located to the north and west of the site, north of Kinne Road and along Erie Boulevard East, north of the intersection with Kinne Road. A cemetery is located to the northeast of the site on Kinne Road. Of the two general receptor types (commercial and residential), residential areas will be more sensitive to sound than commercial areas, as they are used for recreation and restoration. The cemetery, though it is not used in the same way as residences, is likely used for memorial services, requiring speech communication.

The maximum sound levels presented in the previous section show that there will be times when construction equipment may cause exceedences of the 70 dBA property line limit, depending on where the equipment is operated at the Project site. When construction equipment is operating within the distances shown in Table 3 to a property line, mitigation may be needed to reduce the potential impact. This mitigation may include:

- mobile noise barriers;
- construction site fencing with noise barrier material attached to the fencing;
- earthen or aggregate berms;
- lower noise construction methods or equipment;
- relocating equipment further from receptors if feasible; and/or
- limiting the duration of the construction within those distances to the property line.

Noise mitigation specifications will be provided later in the design process when project phasing is finalized. Specifications will be kept on-site during construction and included as an appendix of future subcontractor agreements. The effectiveness of mitigation measures are location and equipment specific. For example, depending on the barrier size and the relative locations of the sound source and receptors, sound level reduction could be between 0 and 15 dB. Specific noise mitigation measures will be implemented throughout construction as outlined in the noise assessment. Typically an un-manned noise monitor is provided by the contractor which notifies a designated representative when noise levels exceed the desired setting. The representative then investigates and initiates additional mitigation measures based on field conditions. Noise management procedures will be included as part of agreements with construction contractors. A noise mitigation plan that includes potential noise mitigation options, along with when they should be implemented will be developed and provided to any contractors. In addition to specific mitigation measures outlined above, general construction noise mitigation measures include:

- properly maintaining construction equipment;
- planning circular haul vehicle routes to minimize backup alarm use;
- ensuring that all equipment is equipped with appropriate mufflers; and
- using broadband backup alarms where possible.

Based on the average daytime model results, projected sound levels are below 60 dBA at receptors throughout the area for half of the construction phases. During six construction phases there will be up to 33 receptors that exceed 60 dBA with the most receptors in a given year of 15 and the highest projected sound level of 66 dBA. All 33 of the modeled receptors that are above 60 dBA are either commercial properties or the post office and cemetery north of the Project site. If mitigation is necessary to reduce the impact on these northerly properties, construction site fencing with noise barrier material attached to the fencing could be used along the northern edge of the property to reduce the sound propagating northward during the phases that involve construction along the northern edge of the Project site.

In the context of SEQRA, this assessment provides the following responses to the noise-related questions on the Environmental Assessment Forms (EAF):

- Will the proposed action produce noise that will exceed existing ambient noise levels during construction, operation, or both? If yes provide details including sources, time of day, and duration.

  Response: Only construction noise has been quantitatively assessed at this time. Per the noise ordinance for the Town of Dewitt, construction noise is limited to 7 AM to 7:30 PM. During construction, sound levels from construction will exceed existing ambient sound levels in the area. The average daytime sound level in the area is 54 dBA. The average and maximum sound levels produced by standard construction equipment that will be used at the site, such as loaders, dozers, excavators, concrete crushers, asphalt paving, cranes, concrete trucks, and dump trucks, will exceed this ambient sound level. Some of this equipment will operate at the site more regularly such as excavators, loaders, and trucks, while other equipment such as pavers and concrete crushers will operate only for a couple phases or portions of a phase. There will be up to 13 non-residential properties between 60 and 65 dBA during four years of the construction. There are no residences that are projected to have average daytime sound levels from construction over 60 dBA. For construction phases with modeled sound levels over 60 dBA at non-residential receptors, various mitigation measures can be used. These measures can include increasing setback for equipment that does not require specific placement (i.e. crushers), earthen berms, use of project fencing equipped with barrier material, and use of mobile barriers. The Project developer will work with the Town of Dewitt to address any noise complaints, should they arise.

Equipment for Project operation has not been selected at this time, so precise operational sound level modeling cannot be performed. It is expected that primary Project sound sources will include mechanical equipment and vehicle traffic. The current use also includes primary sound sources of mechanical equipment and vehicle traffic. Proposed project sound emissions will be of a similar type to the existing use.

- Will the proposed action remove existing natural barriers that could act as a noise barrier or screen?

  Response: There are no natural noise barriers at the site currently, but the existing mall structure does reduce sound that is propagating across the Project site from any direction. However, this structure will be replaced over the course of the Project build-out with other buildings which will then serve as structures that reduce sound that is propagating across the Project site.

- Will the proposed action produce sound above noise levels established by local regulations?

  Response: The Town of Dewitt has a daytime property line limit of 70 dBA. There will be times when construction equipment may cause exceedences of the 70 dBA limit, depending on where the equipment is operated at the Project site. When construction equipment is operating within the distances shown in Table 3 to a property line, mitigation may be needed to reduce the potential impact. Source specific mitigation options are shown in Table 4 and should be implemented for construction phases as needed. With some of these measures implemented, the Town of Dewitt limit should be able to be met during all phases. Noise management procedures will be included as part of agreements with construction contractors. A noise mitigation plan that includes potential noise mitigation options, along with when they should be implemented will be developed and provided to any contractors. If construction noise complaints do occur, the Project developer will work with the Town of Dewitt to address the complaints.

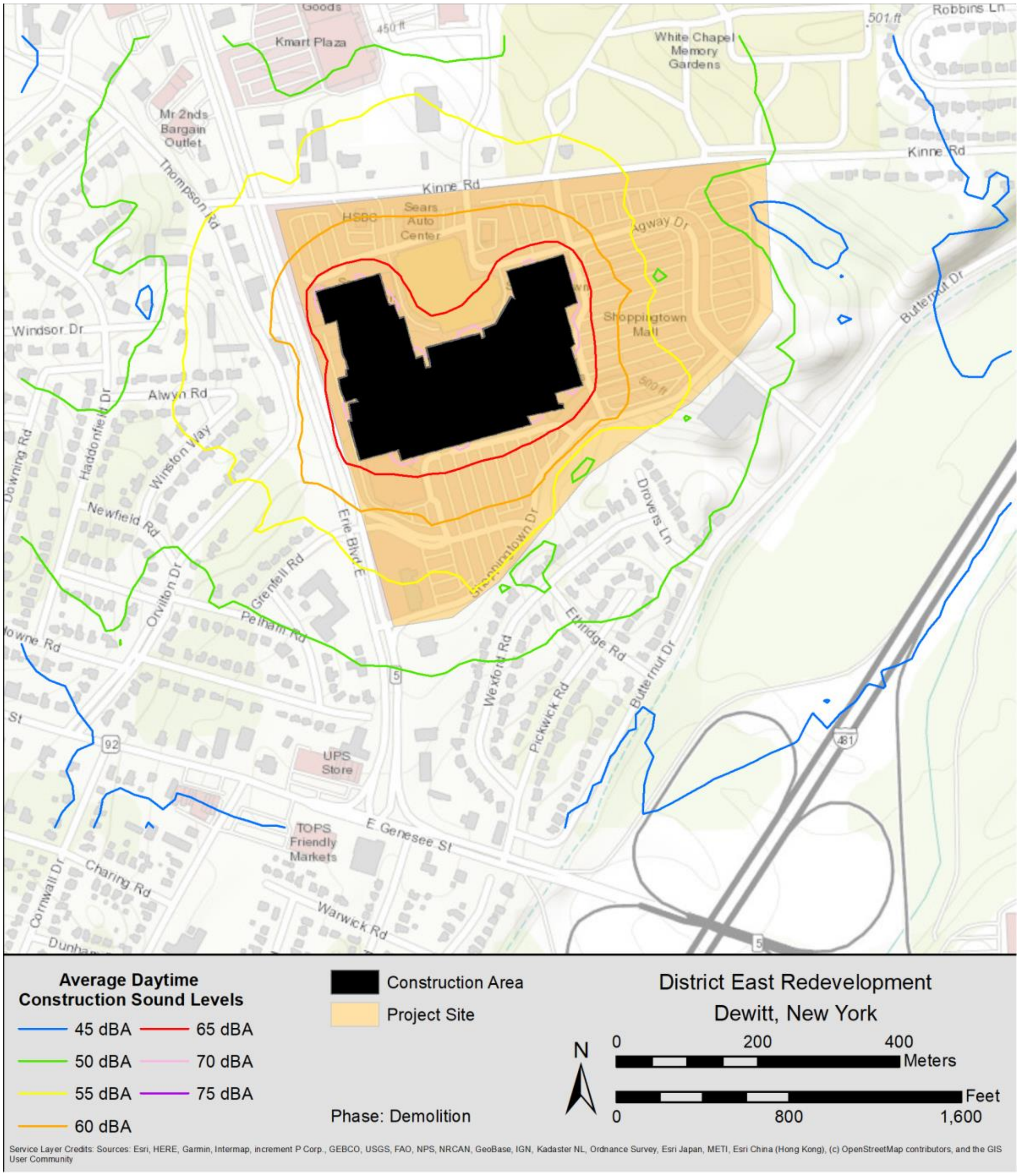

FIGURE 2: SOUND PROPAGATION MODEL RESULTS – DEMOLITION

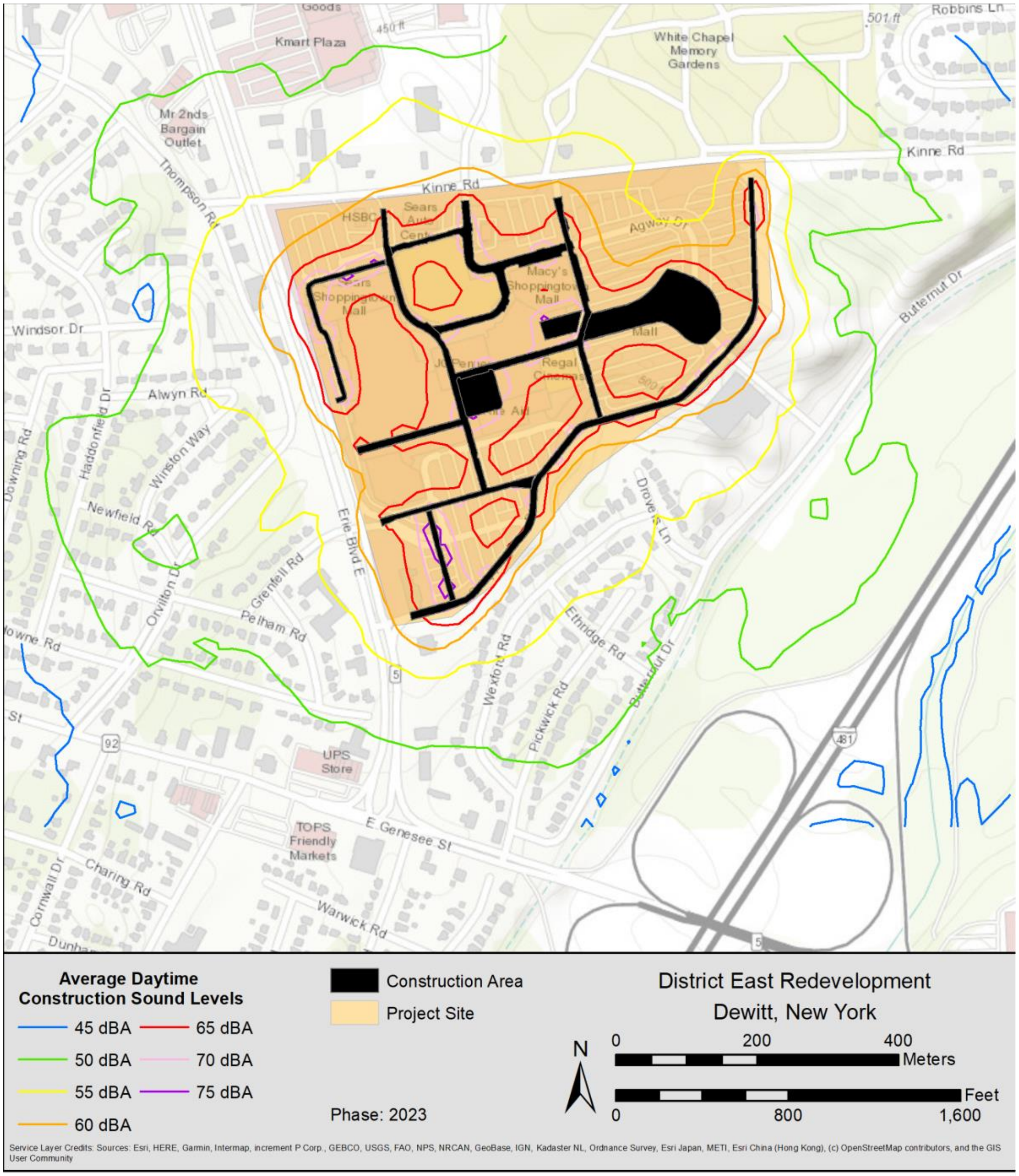

FIGURE 3: SOUND PROPAGATION MODEL RESULTS – INFRASTRUCTURE

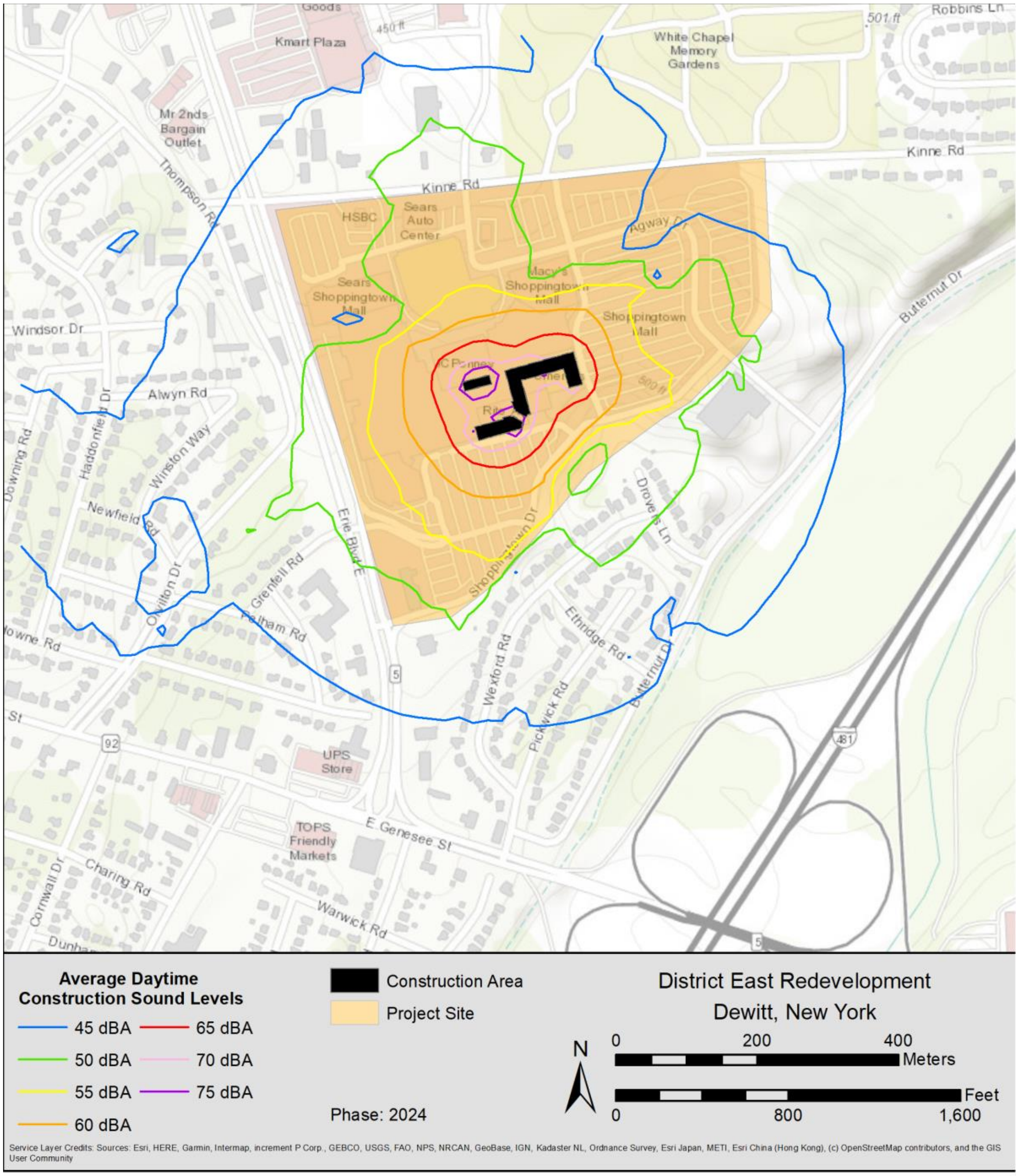

FIGURE 4: SOUND PROPAGATION MODEL RESULTS – 2024

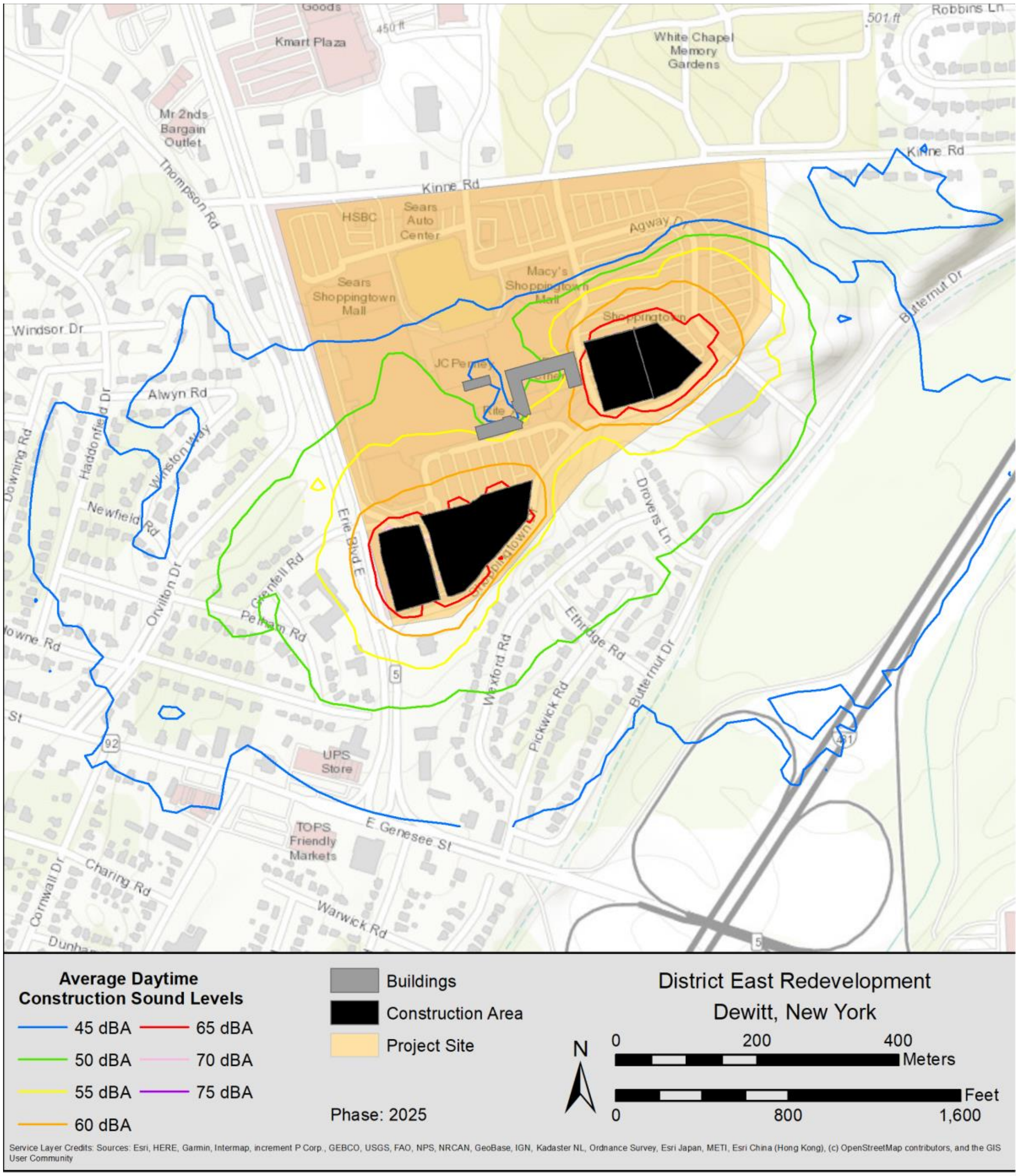

FIGURE 5: SOUND PROPAGATION MODEL RESULTS – 2025

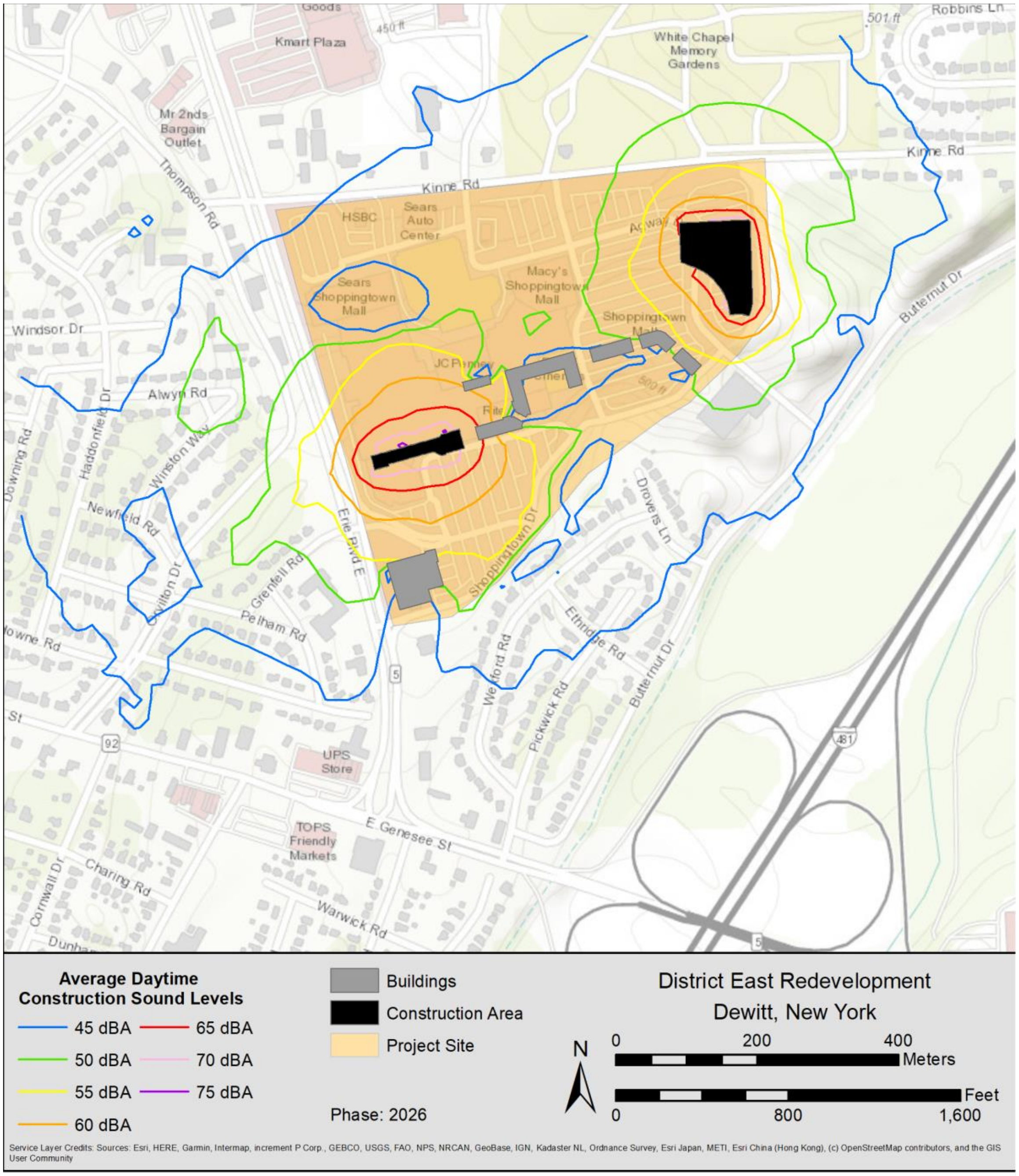

FIGURE 6: SOUND PROPAGATION MODEL RESULTS – 2026

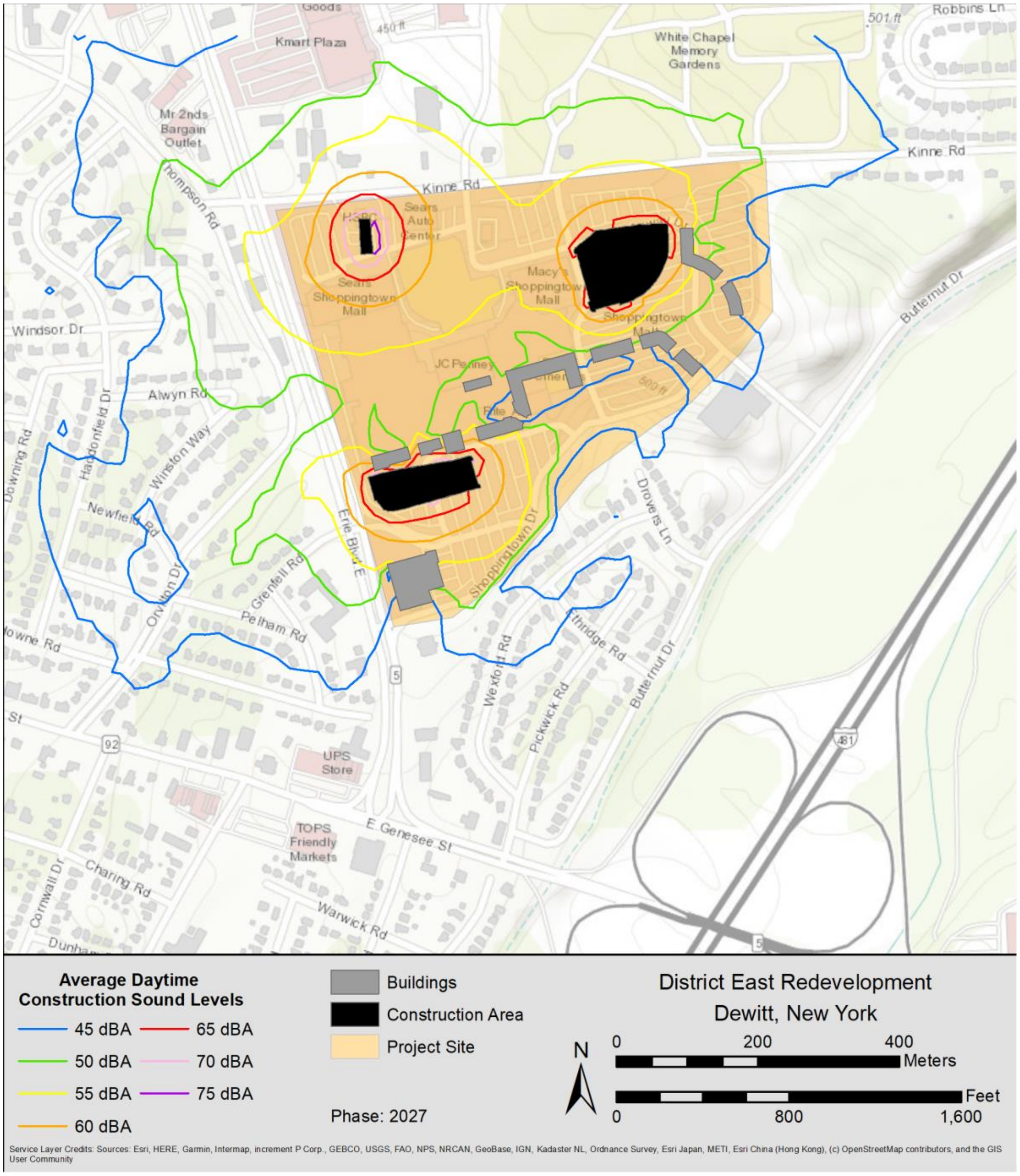

FIGURE 7: SOUND PROPAGATION MODEL RESULTS – 2027

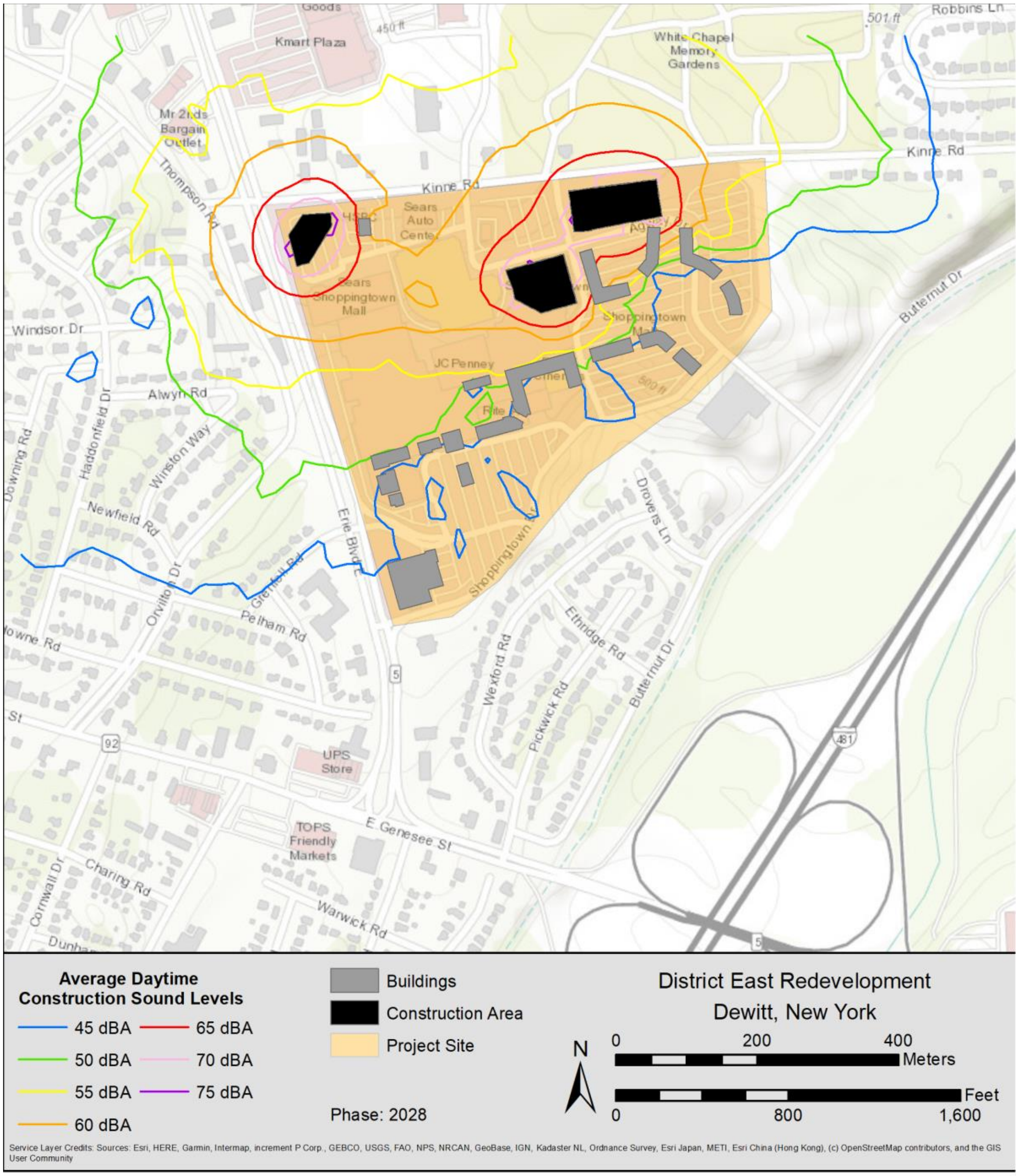

FIGURE 8: SOUND PROPAGATION MODEL RESULTS – 2028

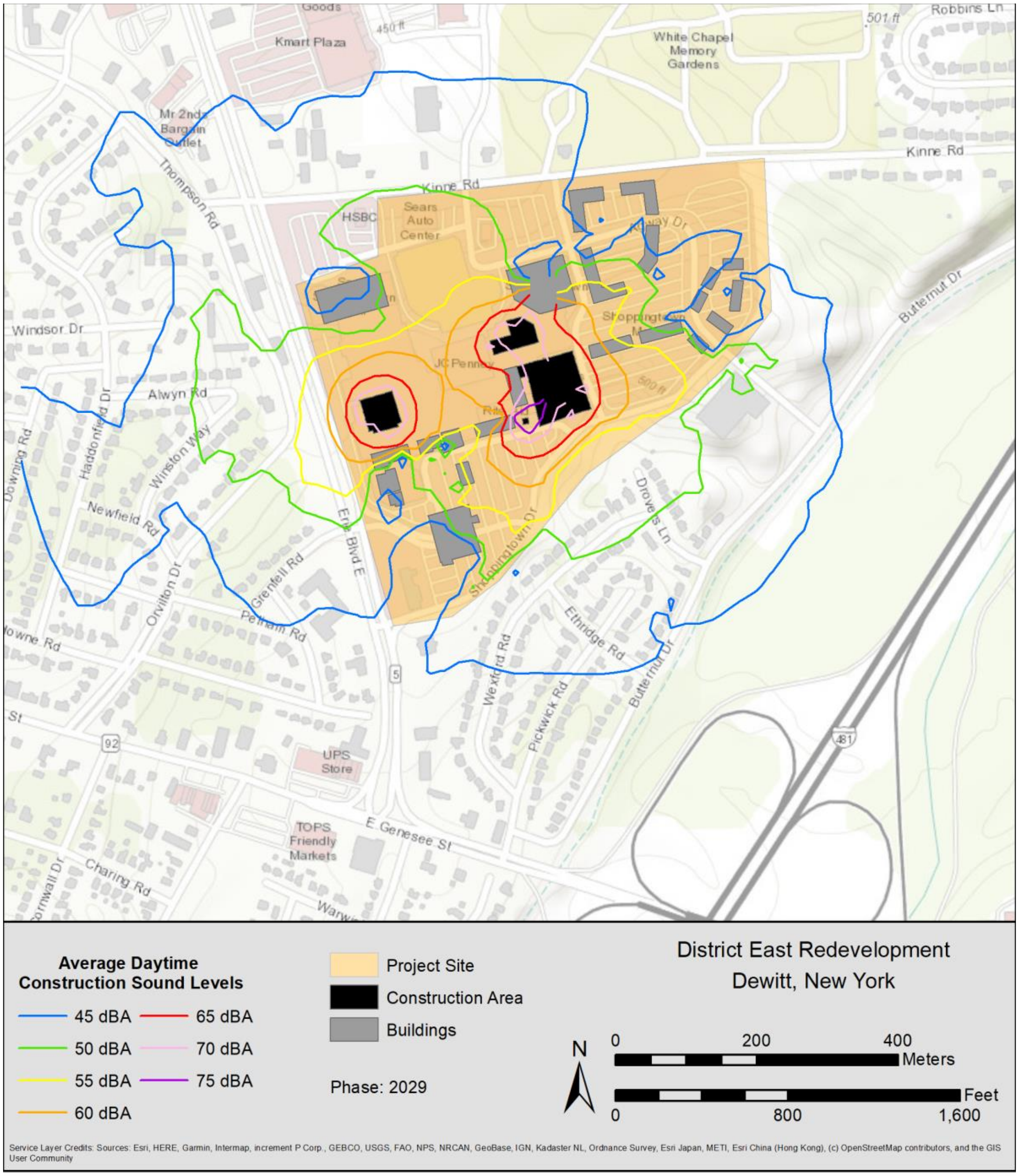

FIGURE 9: SOUND PROPAGATION MODEL RESULTS – 2029

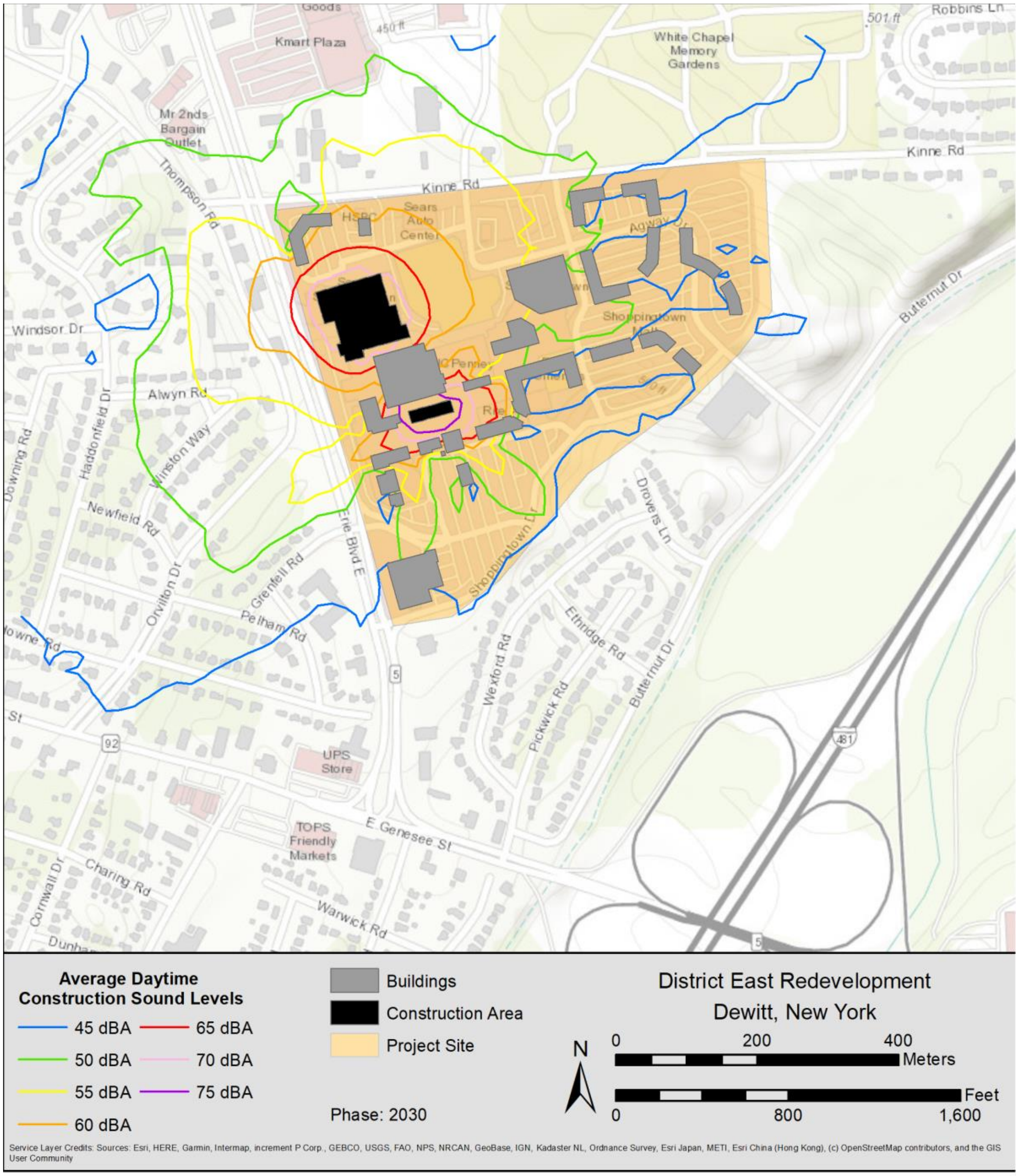

FIGURE 10: SOUND PROPAGATION MODEL RESULTS – 2030

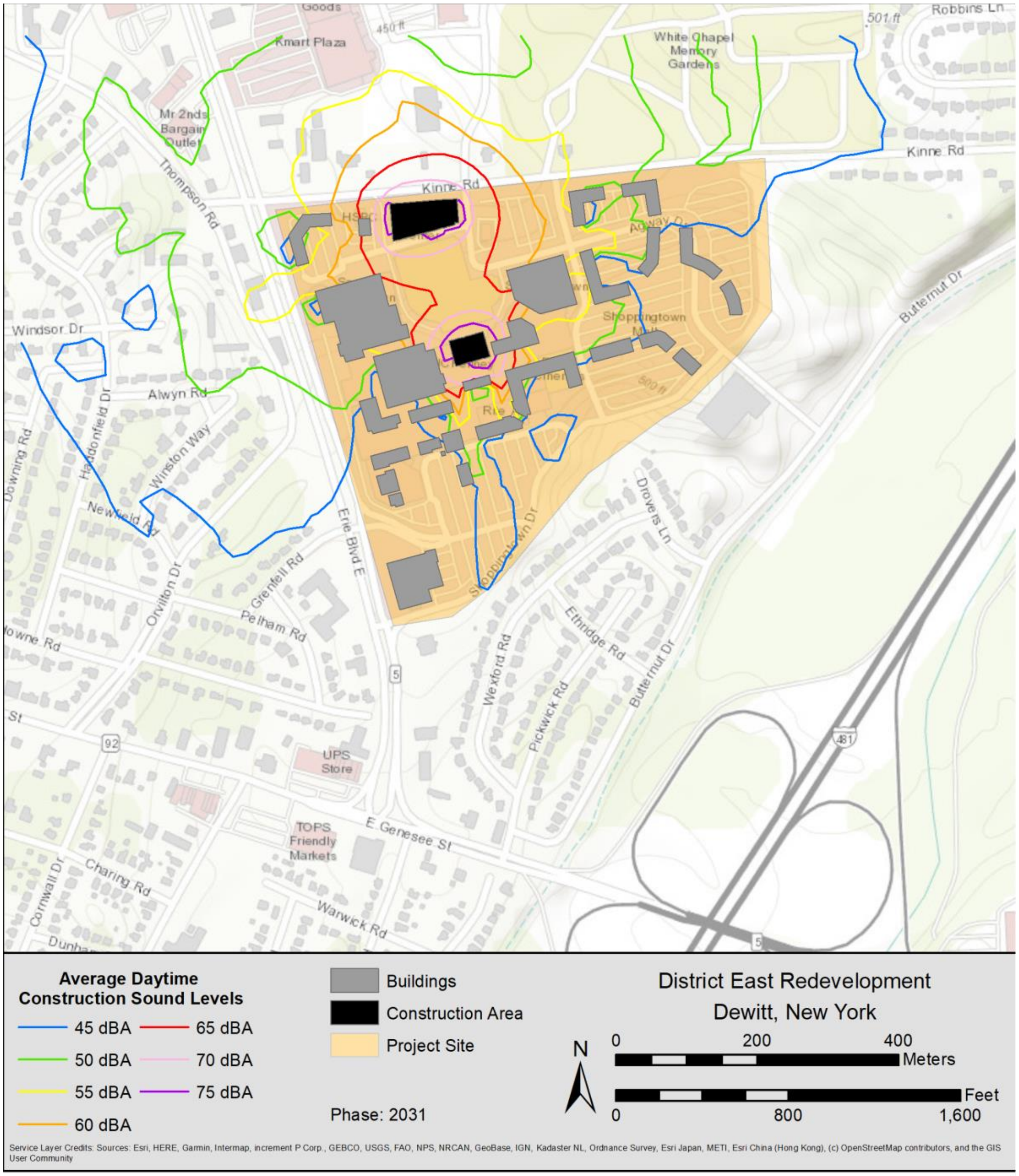

FIGURE 11: SOUND PROPAGATION MODEL RESULTS – 2031

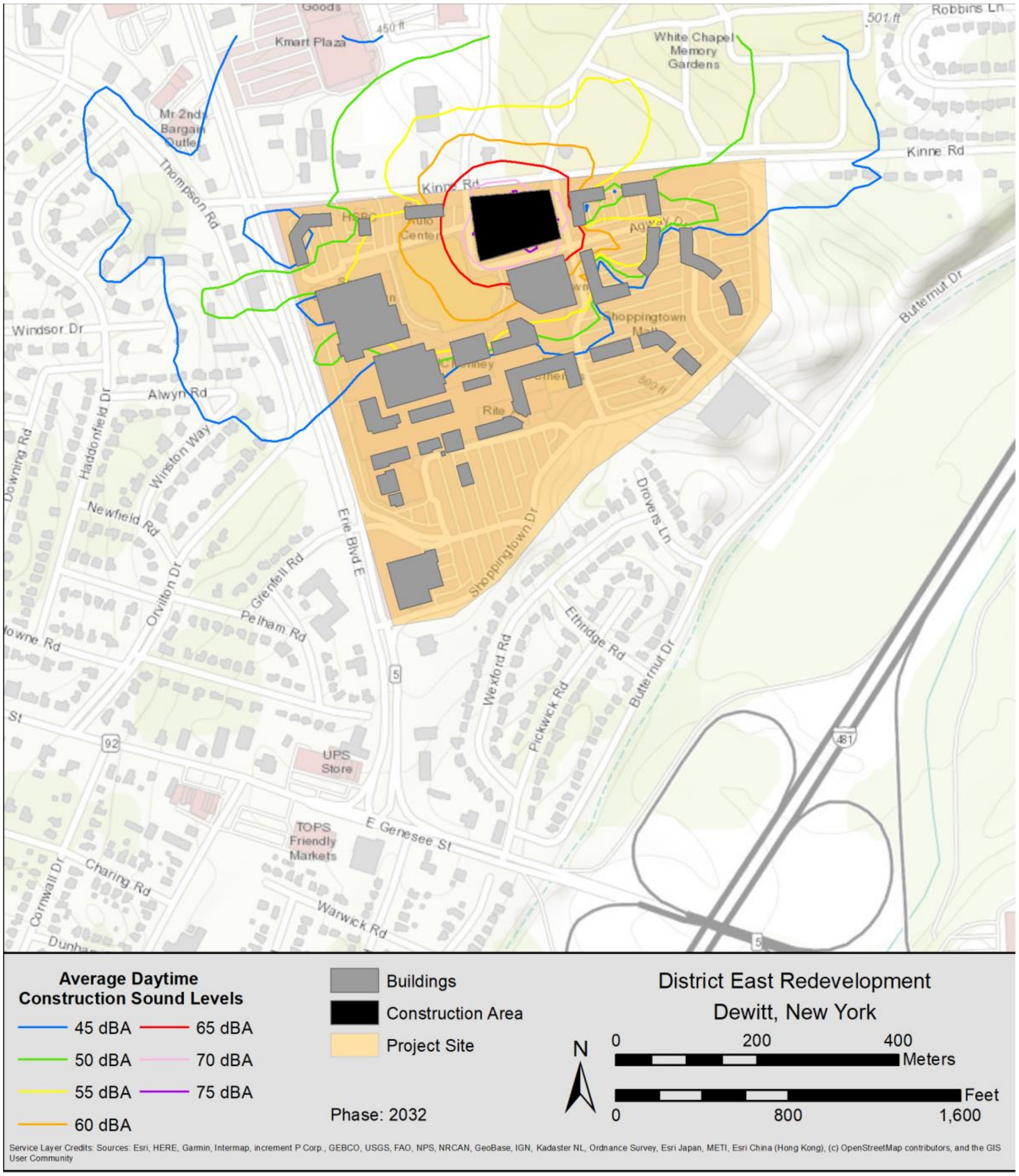

FIGURE 12: SOUND PROPAGATION MODEL RESULTS – 2032

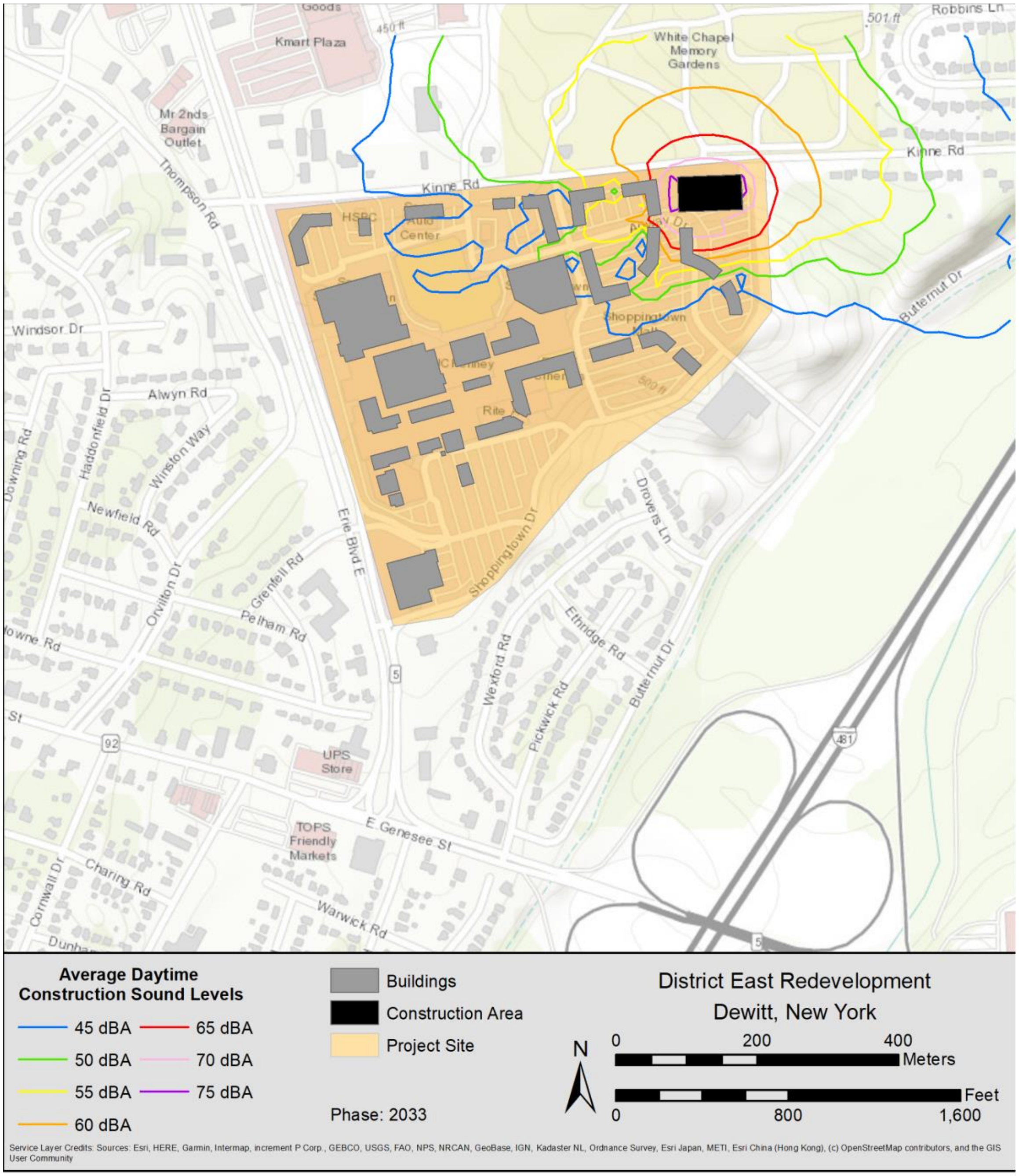

FIGURE 13: SOUND PROPAGATION MODEL RESULTS – 2033

APPENDIX A. ACOUSTICS PRIMER

Expressing Sound in Decibel Levels

The varying air pressure that constitutes sound can be characterized in many different ways. The human ear is the basis for the metrics that are used in acoustics. Normal human hearing is sensitive to sound fluctuations over an enormous range of pressures, from about 20 micropascals (the “threshold of audibility”) to about 20 pascals (the “threshold of pain”).[10] This factor of one million in sound pressure difference is challenging to convey in engineering units. Instead, sound pressure is converted to sound “levels” in units of “decibels” (dB, named after Alexander Graham Bell). Once a measured sound is converted to dB, it is denoted as a level with the letter “L”.

The conversion from sound pressure in pascals to sound level in dB is a four-step process. First, the sound wave’s measured amplitude is squared and the mean is taken. Second, a ratio is taken between the mean square sound pressure and the square of the threshold of audibility (20 micropascals). Third, using the logarithm function, the ratio is converted to factors of 10. The final result is multiplied by 10 to give the decibel level. By this decibel scale, sound levels range from 0 dB at the threshold of audibility to 120 dB at the threshold of pain.

Typical sound sources, and their sound pressure levels, are listed on the scale in Figure 14.

Human Response to Sound Levels: Apparent Loudness

For every 20 dB increase in sound level, the sound pressure increases by a *factor* of 10; the sound *level* range from 0 dB to 120 dB covers 6 factors of 10, or one million, in sound *pressure*. However, for an increase of 10 dB in sound *level* as measured by a meter, humans perceive an approximate doubling of apparent loudness: to the human ear, a sound level of 70 dB sounds about “twice as loud” as a sound level of 60 dB. Smaller changes in sound level, less than 3 dB up or down, are generally not perceptible.

[10] The pascal is a measure of pressure in the metric system. In Imperial units, they are themselves very small: one pascal is only 145 millionths of a pound per square inch (psi). The sound pressure at the threshold of audibility is only 3 one-billionths of one psi: at the threshold of pain, it is about 3 one-thousandths of one psi.

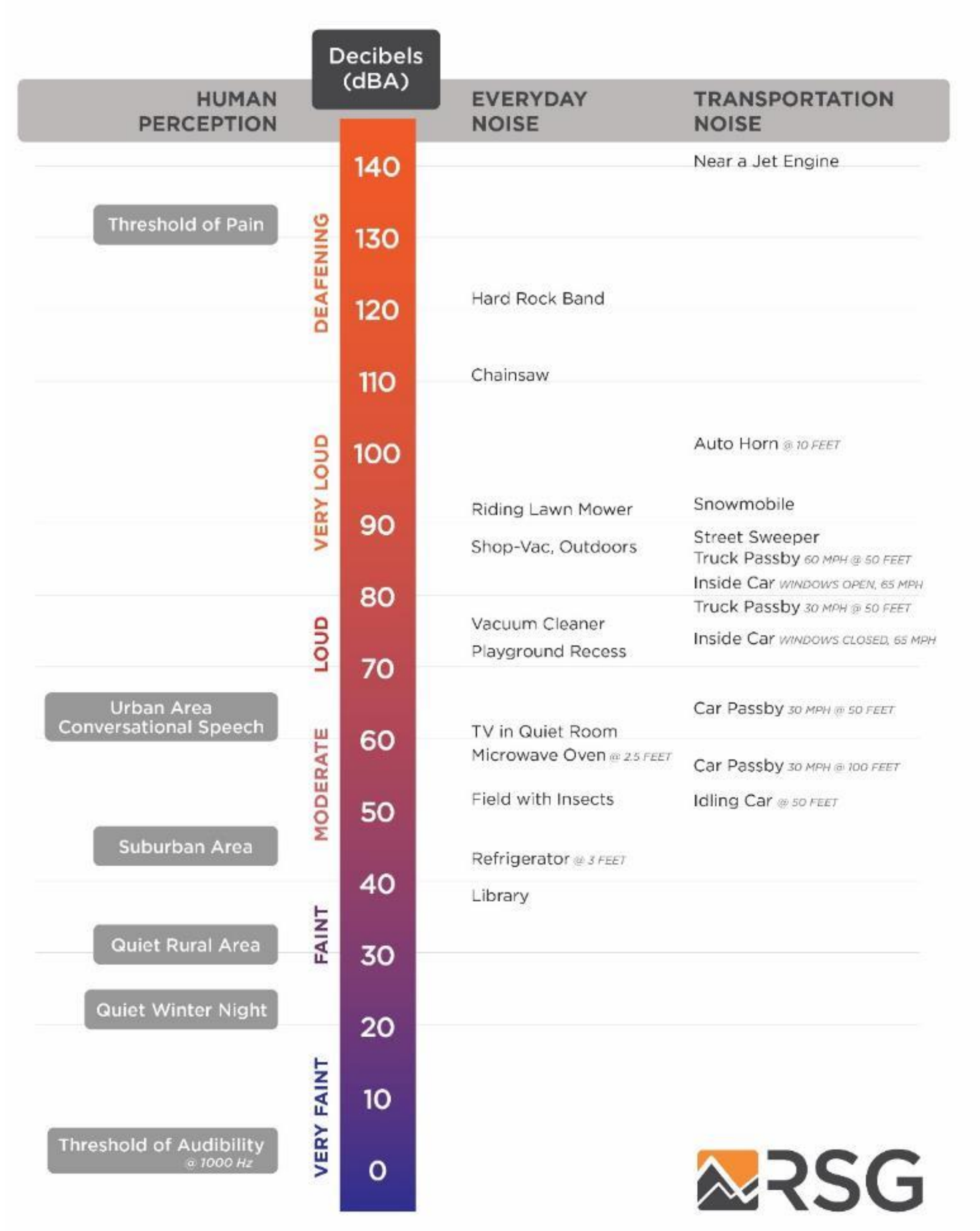

FIGURE 14: A SCALE OF SOUND PRESSURE LEVELS FOR TYPICAL SOUND SOURCES

Frequency Spectrum of Sound

The "frequency" of a sound is the rate at which it fluctuates in time, expressed in Hertz (Hz), or cycles per second. Very few sounds occur at only one frequency: most sound contains energy at many different frequencies, and it can be broken down into different frequency divisions, or bands. These bands are similar to musical pitches, from low tones to high tones. The most common division is the standard octave band. An octave is the range of frequencies whose upper frequency limit is twice its lower frequency limit, exactly like an octave in music. An octave band is identified by its center frequency: each successive band's center frequency is twice as high (one octave) as the previous band. For example, the 500 Hz octave band includes all sound whose frequencies range between 354 Hz (Hertz, or cycles per second) and 707 Hz. The next band is centered at 1,000 Hz with a range between 707 Hz and 1,414 Hz. The range of human hearing is divided into 10 standard octave bands: 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1,000 Hz, 2,000 Hz, 4,000 Hz, 8,000 Hz, and 16,000 Hz. For analyses that require finer frequency detail, each octave-band can be subdivided. A commonly-used subdivision creates three smaller bands within each octave band, or so-called 1/3-octave bands.

Human Response to Frequency: Weighting of Sound Levels

The human ear is not equally sensitive to sounds of all frequencies. Sounds at some frequencies seem louder than others, despite having the same decibel level as measured by a sound level meter. In particular, human hearing is much more sensitive to medium pitches (from about 500 Hz to about 4,000 Hz) than to very low or very high pitches. For example, a tone measuring 80 dB at 500 Hz (a medium pitch) sounds quite a bit louder than a tone measuring 80 dB at 60 Hz (a very low pitch). The frequency response of normal human hearing ranges from 20 Hz to 20,000 Hz. Below 20 Hz, sound pressure fluctuations are not "heard", but sometimes can be "felt". This is known as "infrasound". Likewise, above 20,000 Hz, sound can no longer be heard by humans; this is known as "ultrasound". As humans age, they tend to lose the ability to hear higher frequencies first; many adults do not hear very well above about 16,000 Hz. Most natural and man-made sound occurs in the range from about 40 Hz to about 4,000 Hz. Some insects and birdsongs reach to about 8,000 Hz.

To adjust measured sound pressure levels so that they mimic human hearing response, sound level meters apply filters, known as "frequency weightings", to the signals. There are several defined weighting scales, including "A", "B", "C", "D", "G", and "Z". The most common weighting scale used in environmental noise analysis and regulation is A-weighting. This weighting represents the sensitivity of the human ear to sounds of low to moderate level. It attenuates sounds with frequencies below 1000 Hz and above 4000 Hz; it amplifies very slightly sounds between 1000 Hz and 4000 Hz, where the human ear is particularly sensitive. The C-weighting scale is sometimes used to describe louder sounds. The B- and D- scales are seldom used. All of these frequency weighting scales are normalized to the average human hearing response at 1000 Hz: at this frequency, the filters neither attenuate nor amplify. When a reported sound level has been filtered using a frequency weighting, the letter is appended to “dB”. For example, sound with A-weighting is usually denoted “dBA”. When no filtering is applied, the level is denoted “dB” or “dBZ”. The letter is also appended as a subscript to the level indicator “L”, for example “L_A” for A-weighted levels.

Time Response of Sound Level Meters

Because sound levels can vary greatly from one moment to the next, the time over which sound is measured can influence the value of the levels reported. Often, sound is measured in real time, as it fluctuates. In this case, acousticians apply a so-called “time response” to the sound level meter, and this time response is often part of regulations for measuring sound. If the sound level is varying slowly, over a few seconds, “Slow” time response is applied, with a time constant of one second. If the sound level is varying quickly (for example, if brief events are mixed into the overall sound), “Fast” time response can be applied, with a time constant of one-eighth of a second.[11] The time response setting for a sound level measurement is indicated with the subscript “S” for Slow and “F” for Fast: L_S or L_F. A sound level meter set to Fast time response will indicate higher sound levels than one set to Slow time response when brief events are mixed into the overall sound, because it can respond more quickly.

In some cases, the maximum sound level that can be generated by a source is of concern. Likewise, the minimum sound level occurring during a monitoring period may be required. To measure these, the sound level meter can be set to capture and hold the highest and lowest levels measured during a given monitoring period. This is represented by the subscript “max”, denoted as “L_{max}”. One can define a “max” level with Fast response L_{Fmax} (1/8-second time constant), Slow time response L_{Smax} (1-second time constant), or Continuous Equivalent level over a specified time period L_{EQmax}.

Accounting for Changes in Sound Over Time

A sound level meter’s time response settings are useful for continuous monitoring. However, they are less useful in summarizing sound levels over longer periods. To do so, acousticians apply simple statistics to the measured sound levels, resulting in a set of defined types of sound level related to averages over time. An example is shown in Figure 15. The sound level at each instant of time is the grey trace going from left to right. Over the total time it was measured (1 hour in the figure), the sound energy spends certain fractions of time near various levels, ranging from the minimum (about 27 dB in the figure) to the maximum (about 65 dB in the figure). The simplest descriptor is the average sound level, known as the Equivalent Continuous Sound Level. Statistical levels are used to determine for what percentage of time the sound is louder than any given level. These levels are described in the following sections.

[11] There is a third time response defined by standards, the “Impulse” response. This response was defined to enable use of older, analog meters when measuring very brief sounds; it is no longer in common use.

Equivalent Continuous Sound Level - L_{eq}

One straightforward, common way of describing sound levels is in terms of the Continuous Equivalent Sound Level, or L_{EQ}. The L_{EQ} is the average sound pressure level over a defined period of time, such as one hour or one day. L_{EQ} is the most commonly used descriptor in noise standards and regulations. L_{EQ} is representative of the overall sound to which a person is exposed. Because of the logarithmic calculation of decibels, L_{EQ} tends to favor higher sound levels: loud and infrequent sources have a larger impact on the resulting average sound level than quieter but more frequent sounds. For example, in Figure 15, even though the sound levels spends most of the time near about 34 dBA, the L_{EQ} is 41 dBA, having been "inflated" by the maximum level of 65 dBA and other occasional spikes over the course of the hour.

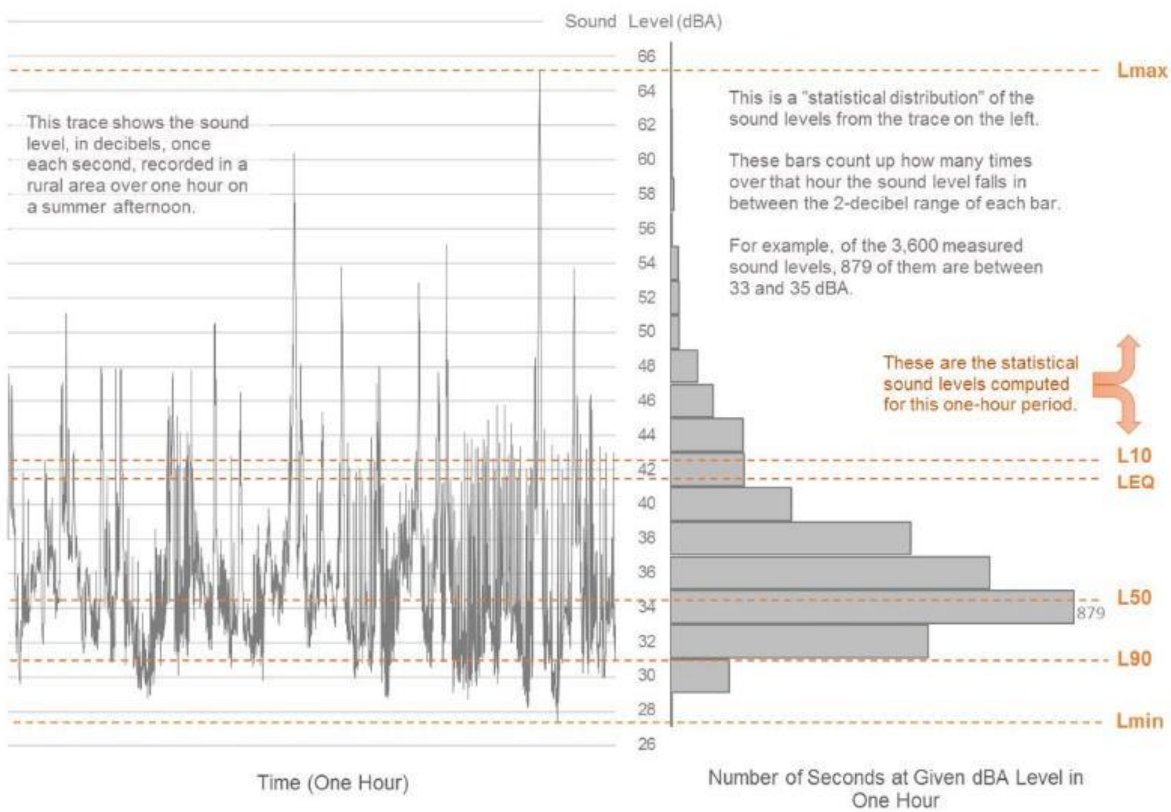

FIGURE 15: EXAMPLE OF DESCRIPTIVE TERMS OF SOUND MEASUREMENT OVER TIME

Percentile Sound Levels – L_n

Percentile sound levels describe the statistical distribution of sound levels over time. "L_N" is the level above which the sound spends "N" percent of the time. For example, L_{90} (sometimes called the "residual base level") is the sound level exceeded 90% of the time: the sound is louder than L_{90} most of the time. L_{10} is the sound level that is exceeded only 10% of the time. L_{50} (the "median level") is exceeded 50% of the time: half of the time the sound is louder than L_{50}, and half the time it is quieter than L_{50}. Note that L_{50} (median) and L_{EQ} (mean) are not always the same, for reasons described in the previous section.

L_{90} is often a good representation of the “ambient sound” in an area. This is the sound that persists for longer periods, and below which the overall sound level seldom falls. It tends to filter out other short-term environmental sounds that aren’t part of the source being investigated. L_{10} represents the higher, but less frequent, sound levels. These could include such events as barking dogs, vehicles driving by and aircraft flying overhead, gusts of wind, and work operations. L_{90} represents the background sound that is present when these event sounds are excluded.

Note that if one sound source is very constant and dominates the soundscape in an area, all of the descriptive sound levels mentioned here tend toward the same value. It is when the sound is varying widely from one moment to the next that the statistical descriptors are useful.

APPENDIX B. SOURCE INFORMATION

TABLE 5: SOUND PROPAGATION MODELING PARAMETERS

Parameter	Setting
Ground Absorption	Spectral for all sources, Mixed Ground (G=0.5)
Atmospheric Absorption	Based on 10 Degrees Celsius, and 70 percent relative humidity
Reflections	None
Receiver Height	1.5 meters for residences and grid
Search Distance	2,000 meters

TABLE 6: SOUND SOURCES BY PHASE

Phase	Equipment	Count	Use (minutes per day)	Modeled Sound Power (dBA)	Info Source
Demolition	Excavator	6	288	111	RCNM
	Loader	3	288	107	RCNM
	Dozer	3	288	115	RCNM
	Dump Truck	1	288	116	RCNM
	Jaw Crusher	1	288	118	RSG Measurement
2023	Asphalt Paving	1	360	115	RCNM
	Concrete Mix Truck	1	288	116	RCNM
	Dozer	4	288	115	RCNM
	Dump Truck	1	288	116	RCNM
	Excavator	4	288	111	RCNM
	Loader	3	288	107	RCNM
2024	Crane	1	115	112	RCNM
	Excavator	1	288	111	RCNM
	Dozer	1	288	115	RCNM
	Loader	1	288	107	RCNM
	Dump Truck	1	288	116	RCNM
2025	Crane	1	115	112	RCNM
	Excavator	1	288	111	RCNM
	Dozer	1	288	115	RCNM
	Loader	1	288	107	RCNM
	Dump Truck	1	288	116	RCNM
2026	Crane	1	115	112	RCNM
	Excavator	1	288	111	RCNM
	Dozer	1	288	115	RCNM

Phase	Equipment	Count	Use (minutes per day)	Modeled Sound Power (dBA)	Info Source
	Loader	1	288	107	RCNM
	Dump Truck	1	288	116	RCNM
2027	Crane	1	115	112	RCNM
	Excavator	1	288	111	RCNM
	Dozer	1	288	115	RCNM
	Loader	1	288	107	RCNM
	Dump Truck	1	288	116	RCNM
2028	Crane	2	115	112	RCNM
	Excavator	2	288	111	RCNM
	Dozer	2	288	115	RCNM
	Loader	2	288	107	RCNM
	Dump Truck	2	288	116	RCNM
2029	Crane	1	115	112	RCNM
	Excavator	1	288	111	RCNM
	Dozer	1	288	115	RCNM
	Loader	1	288	107	RCNM
	Dump Truck	1	288	116	RCNM
2030	Crane	2	115	112	RCNM
	Excavator	2	288	111	RCNM
	Dozer	2	288	115	RCNM
	Loader	2	288	107	RCNM
	Dump Truck	2	288	116	RCNM
2031	Crane	2	115	112	RCNM
	Excavator	2	288	111	RCNM
	Dozer	2	288	115	RCNM
	Loader	2	288	107	RCNM
	Dump Truck	2	288	116	RCNM
2032	Crane	1	115	112	RCNM
	Excavator	1	288	111	RCNM
	Dozer	1	288	115	RCNM
	Loader	1	288	107	RCNM
	Dump Truck	1	288	116	RCNM
2033	Crane	1	115	112	RCNM
	Excavator	1	288	111	RCNM
	Dozer	1	288	115	RCNM
	Loader	1	288	107	RCNM
	Dump Truck	1	288	116	RCNM

TABLE 7: EQUIPMENT SOUND POWER DATA

Sound Source	1/1 Octave Band Sound Power (dBZ)									Sum (dBA)	Sum (dBZ)
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
Front End Loader	98	104	108	116	112	111	106	98	93	115	119
Dump Truck	114	111	112	114	117	109	106	101	95	116	122
Crane	103	112	108	111	113	106	101	96	90	112	118
Excavator	103	106	113	112	112	103	101	97	89	111	118
Concrete Mixing Truck	103	105	112	113	115	108	108	104	100	116	119
Front End Loader	100	104	101	107	105	100	98	99	98	107	112
Asphalt Paving	107	103	111	114	117	106	102	96	88	115	120
Jaw Crusher	106	120	122	119	115	113	110	103	94	118	126