Hudson River PCBs Superfund Site

Phase 1 Final Design Report
Attachment J - Noise Impact Assessment

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1.0 INTRODUCTION

This report describes the noise impact assessment used to predict sound levels as part of the design of Phase 1 of the remedy for the Hudson River PCBs Superfund Site, located in New York State. This report lists the major equipment expected to be deployed for each facet of the operation and the basis of the reference sound level data for each piece of equipment; describes the modeling methodology used to calculate an estimate of sound levels associated with dredging and barging operations, processing facility operations, processing facility construction activities; presents the modeling results; and discusses mitigative measures where necessary. This assessment was done in accordance with the Noise Modeling Protocol submitted to the United States Environmental Protection Agency (EPA) [Epsilon, 2006].

The noise modeling was conducted for the expected noise sources in the absence of any mitigation directed specifically to noise impacts. This noise report includes the noise level predictions around areas of dredging and around the processing facility during construction and operations. The predictions focus, in particular, on estimated noise levels at pertinent assessment points, including: near-by shorelines, process facility site fence lines, property lines, and receptors. If the modeling indicates that noise levels exceed an applicable standard or criterion (listed in Section 3 of this Noise Impact Assessment) at a receptor, this report as well as the *Phase 1 Final Design Report* (Phase 1 FDR) (Blasland, Bouck & Lee, Inc. [BBL], 2006) discusses potential mitigation measures to address such impacts.

2.0 NOISE METRICS

Sound (noise) levels can be measured and quantified in several ways. All of them use the logarithmic decibel (dB) scale. The dB scale is logarithmic to accommodate the wide range of sound intensities found in the environment. The following information defines the noise measurement terminology used in this analysis.

Sound pressure levels of two separate sounds are not directly additive. For example, if a sound of 50 dB is added to another sound of 50 dB, the total is only a 3 dB increase (to 53 dB), not a doubling to 100 dB. Thus, every 3 dB change in sound levels represents a doubling (or halving) of sound energy. Related to this is the fact that a change in sound levels of less than 3 dB is imperceptible to the human ear.

Another property of sound is that if one source of noise is 10 dB (or more) louder than another source, then the total sound level is simply the sound level of the louder source. For example, impact of one source of sound at 60 dB combined with a second source of sound at 47 dB is 60 dB. The sound level analysis, therefore, focuses on the loudest sound sources; these dictate the sound level at a given receptor (receiver).

The sound level meter used to measure noise is a standardized instrument (American National Standards Institute [ANSI], 1983). It contains "weighting scales" to adjust the frequency response of the instrument to approximate that of the human ear under various circumstances. The weighting scale used for community noise surveys is the A-weighted scale (dBA). Sounds are reported as detected with the dBA of the sound level meter. A-weighted sound levels emphasize the middle frequency (i.e., middle pitched – around 1,000 Hertz sounds) and de-emphasize lower and higher frequency sounds. The dBA most closely approximates how the human ear responds to sound at various frequencies.

Because the sounds in the environment vary with time, they cannot simply be described with a single number. Several sound level metrics commonly reported in community noise monitoring are described below.

- The equivalent level is the level of a hypothetical steady sound that would have the same energy (i.e., the same time-averaged mean square sound pressure) as the actual fluctuating sound observed. The equivalent level is designated L_{eq} and is also A-weighted. The equivalent level represents the time average of the fluctuating sound pressure and is close to the maximum level observed during the measurement period.

- The maximum sound level (designated L_{max}) is the greatest sound level measured within a stated time interval.

- Day-night average sound level, abbreviated as DNL and symbolized as L_{dn}, is the 24-hour average sound level, in dBs, obtained after addition of 10 dBs to sound levels during the night (from 10:00 pm to 7:00 am). The hourly L_{eq} sound level metric is used to calculate the L_{dn}.

In the design of noise control, it is important to know the frequency spectrum of the noise of interest. Noise control materials do not function like the human ear, so simple A-weighted levels need to be supplemented with additional information. The spectra of noises are usually stated in terms of octave band sound pressure levels, in dB, with the octave frequency bands being those established by accepted standards (ANSI, 1986). The noise control is applied on an octave band frequency basis to the noise source of interest. The resultant octave band frequency levels are combined using the standardized dBA to calculate a new A-weighted sound level at the receptor(s) of interest.

3.0 RELEVANT NOISE CRITERIA

The numeric noise criteria applicable to the project are specified in the *Hudson River Quality of Life Performance Standards* (Hudson QoLPS) (EPA, 2004) and consist of the following:

Short-term – these criteria apply to processing facility construction, sheet pile installation, dredging, and backfilling activities:

- Residential Control Level (maximum hourly average)
  - Daytime = 75 dBA

- Residential Standard (maximum hourly average)
  - Daytime = 80 dBA
  - Nighttime = 65 dBA (10:00 pm to 7:00 am)

- Commercial/Industrial Standard (maximum hourly average)
  - Daytime and nighttime = 80 dBA

Long-term – these criteria apply to processing facility operations:

- Residential Standard (24-hour average)
  - Day-night average = 65 dBA (after addition of 10 dBA to noise levels measured during nighttime hours)

- Commercial/Industrial Standard (maximum hourly average)
  - Daytime and nighttime = 72 dBA

The sound level metric used for the maximum hourly averages is the equivalent sound level designated L_{eq}(h). The day-night average of 65 dBA is designated L_{dn} and consists of the 24 L_{eq}(h) values with 10 dBA added to the nine L_{eq}(h) values measured between 10:00 pm and 7:00 am.

The results of the noise modeling were compared with these criteria. This comparison focused on noise level predictions at receptors near the noise sources, since the above criteria apply at the location of such receptors (residential or commercial). However, if the modeling demonstrated compliance at a location closer to the source than any receptor, predictions at the receptor were not necessary. Mitigation was considered in the design when the predicted sound levels at a receptor exceeded the relevant standard or, for daytime noise predictions at residential receptors, the residential Control Level.

4.0 DREDGING AND BARGING OPERATIONS AND SHEET PILE INSTALLATION

This section separately discusses noise levels from general dredging and barging operations, and those from installation of sheet piles where they will be installed as a resuspension control measure.

4.1 General Dredging and Barging Operations

4.1.1 Inventory of Equipment

A typical dredge equipment set-up will include the following noise-generating equipment:

1) Tug boat;
2) Work boat (tender tug);
3) Mechanical dredge;
4) Survey or support crew boats;
5) Light towers;
6) Portable generator; and
7) High solids pump.

Tugs and work boats will be used to maneuver barges, including empty barges, barges containing dredged material, barges containing backfill/cap material, and barges with equipment.

A debris crane will also be part of the dredging operation; however, the debris crane is expected to operate alone, in advance of the dredge equipment. Therefore, at a particular receptor, noise from this activity will not contribute to noise from the dredge equipment listed above. Also, noise from debris removal will be less than that for a full dredge set-up.

Backfill operations are expected to have similar source intensity and attenuation profiles as dredging operations (or lower due to the absence of the high solids pump). Therefore, the equipment inventory listed above will conservatively represent the sources of noise related to river operations that may impact a given receptor.

4.1.2 *Noise Model*

A screening model was used to predict sound levels as a function of distance from dredge operations. The screening modeling was based on sound level reduction over distance only. Given the relatively short distances between the dredge operation and receptors, this is a reasonable assumption. The New York State Department of Environmental Conversation (NYSDEC) recommends that screening-level noise analyses use this methodology (see *Assessing and Mitigating Noise Impacts,* [NYSDEC, 2001]). This methodology uses the principle of hemispherical spreading of sound waves so that every doubling of distance produces a 6 dBA reduction of sound for a point source. For example, a source equal to 80 dBA at 50 feet would have a sound level of 74 dBA at 100 feet, 68 dBA at 200 feet, and 62 dBA at 400 feet.

Dredging operation noise levels used in the calculations were based on the model described in the *Special Report Highway Construction Noise: Measurement, Prediction and Mitigation* (United States Department of Transportation, Federal Highway Administration [U.S. DOT, FHWA], 1976). Specifically, sound levels were calculated using Equation 4-1:

$$L_{eq}(h) = L_{max} + E.F. + 10 \log U.F. - 20 \log (D/D_o) \qquad (4\text{-}1)$$

Where: $L_{eq}(h)$ A-weighted, equivalent sound level at a receptor resulting from operation of a piece of equipment over a 1-hour time period;

L_{max} Maximum noise emission level of equipment based on its work cycle at distance D_o;

E.F. Equivalency Factor, which accounts for the difference between the maximum and minimum sound levels in the equipment work cycle and the percent of time spent at the maximum level. Table 2 in the U.S. DOT reference provides E.F.s based on these differences. For example, an E.F. of 0 applies to a steady-state noise source, while an E.F. of -9 applies to source that is quite variable and is at the maximum sound level for a short time during the work cycle;

U.F. Usage Factor, which accounts for the percent time that equipment is in use over the time period of interest (1 hour). For example, a U.F. of 1.0 applies for equipment in use over 1 entire hour, while a U.F. of 0.33 applies for equipment in use for 20 minutes per hour;

D Distance from the equipment to the receptor of interest; and

D_o Reference distance at which the L_{max} was measured for the piece of equipment of interest.

The modeling conservatively assumed that all sources will be operating simultaneously, and that they will be all the same distance from a given receptor (i.e., all co-located at exactly the same point). The reality is that some of the intermittent sources (tug, work boat, survey boat) will not operate concurrently and will be more disperse. This provides conservatism to the analysis. The modeling also assumed that two survey boats will be operating simultaneously, thus impacting the same given receptor.

4.1.3 Reference Sound Level Data

Reference sound level data for each significant noise source associated with the dredging and barging operations are shown in Table 4-1. These data were collected from the literature, actual dredging operations at other sites, and potential equipment vendors.

The inputs used to calculate the equivalent sound levels (using Equation 4-1) are given in Table 4-2. The E.F. values are based on the measured or reported range of the equipment work cycle. The dredge, lights, generator, and pump are assumed to run continuously for any given hour (U.F. = 1.0). The tug and survey boat are assumed to operate near the location of dredging for only a brief period of any given hour (U.F. = 3 minutes/60 minutes = 0.05), while the work boat was assumed to work near the location of dredging for 20 minutes in a given hour (U.F.=20/60=0.33). These inputs were used, along with the L_{max} values presented in Table 4-1 and the actual distance from the source to the receptor, in the screening-level noise attenuation modeling (Equation 4-1).

4.1.4 Modeling Results

General Results

The modeled sound levels from unmitigated dredging and barging operations are provided in Table 4-3. The results show that at a distance of approximately 35 feet or more, the dredging operation will meet the daytime standard of 80 dBA for residential receptors. At a distance of 60 feet or more, the dredging operation will meet the daytime Control Level of 75 dBA for residential receptors. At a distance of approximately 35 feet or more, the dredging operation will meet the industrial/ commercial standard of 80 dBA. At a distance of approximately 200 feet or more, the dredging operation will meet the nighttime standard of 65 dBA for residential receptors. Backfilling operations will have similar source intensity and attenuation profiles as the dredging operations.

If sound levels from a second dredge set-up are approximately 10 dBA or less than the first dredge set-up, the cumulative impacts are negligible. This is based on how sound levels drop off with distance [20 log (D_1/D_2)]. When the ratio of (D_1/D_2) is approximately 3.25, the result difference is approximately 10 dBA. For example, if dredge #1 is 200 feet from a certain location, and dredge #2 is 650 feet from the same location, then the total sound level from the two dredge operations would be the sound level of dredge #1 (625 feet/200 feet = 3.25).

Site-Specific Results

Two site-specific examples of the dredging operation sound levels near residential areas are shown for perspective. Figure 4-1 shows the 65 dBA and 80 dBA sound level contours around a dredge operation on the east side of Rogers Island in dredge area NTIP02A. When the dredging activities are operating near the shoreline, several residences are expected to be within the 65 dBA contour. Figure 4-2 shows the 65 dBA and 80 dBA sound level contours around a dredge operation on the east side of Griffin Island in dredge area EGIA01B. When the dredging activities are operating near the shoreline in this area, two residences are expected to be within the 65 dBA contour.

4.1.5 Mitigation

Model results show that dredging and barging noise is only expected to be an issue within 200 feet of residences and only at night. As discussed in the *Phase 1 Environmental*

Monitoring Plan (Phase1 EMP – Appendix 1 to this Phase 1 FDR), a detailed measurement program will be done at the commencement of dredging to confirm the equipment sound levels and assumptions used in the modeling. If this study confirms the model predictions, the dredging contractor will be instructed that, if it is necessary to conduct dredging within 200 feet of residences at night, action must be taken to reduce the noise levels during such operations. There are a number of actions that the contractor could take to reduce the noise levels at night. For example, the contractor could use a smaller workboat instead of a tug to move the barge a short distance as the dredge and barge are repositioned. Alternatively, when transporting a barge to the Processing Facility, a workboat may be used to move the barge away from the residence to a location where the use of a tug would not result in exceeding the noise standard. Further, for those situations where a high solids pump is use to pump dredged sediment a short distance from the dredge to the barge, a portable noise barrier may be used around the pump if it is determined to be a significant contributor to nighttime sound levels when in the vicinity a residence.

4.2 Sheet Pile Installation

4.2.1 Modeling Procedure and Sound Level Data

Sheet piling may be used as a resuspension control technique in certain areas of the river, specifically in the East Griffin Island Area. Based on evaluation of the geotechnical characteristics of the sediments in this area during Final Design, it has been determined that certain pile-based support structures (batter piles and king piles) will need to be driven into the bedrock below the sediments to provide a stable and safe sheet pile resuspension control structure. While much of the sheet piling can be installed with a vibratory hammer, an impact hammer will be needed for driving king piles into the rock. GE estimates that this mix will include vibratory hammering approximately 80% of the time and impact hammering for the remaining 20% of the time. Sound level estimates for the installation of sheet piling were calculated using the same screening-level model as for the dredging operations.

The noise emission level for vibratory sheet piling is 96 dBA at 50 feet (U.S. DOT, Federal Transit Administration [FTA], 1995). This is equivalent to the (L_{max} + E.F.) term in the dredging model (Equation 4-1). It was assumed that the vibratory hammer will only be operating for 20 minutes per hour during sheet pile operations and the remainder of a given hour will be used to set the sheets. Therefore, a usage factor of 0.33 (20 minutes/60 minutes) was applied.

For impact hammering, the noise emission level is 101 dBA at 50 feet (FTA, 1995). It was assumed that the impact hammer will be operating for 20 minutes per hour during sheet pile installation operations that require such hammering. Therefore, a usage factor of 0.33 was applied.

4.2.2 Modeling Results

General Results

Expected sound levels from sheet pile installation at various distances are presented in Table 4-4a for vibratory hammering and Table 4-4b for impact hammering. Vibratory sheet pile installation is expected to produce noise levels of 80 dBA at a distance of approximately 180 feet and 75 dBA at a distance of approximately 325 feet. Impact hammering is expected to produce noise levels of 80 dBA at a distance of approximately 325 feet and 75 dBA at a distance of approximately 575 feet.

Site-Specific Results

Sheet piling is planned to be used in a portion of EGIA01B as a test of resuspension controls. Figure 4-3 shows the 75 dBA and 80 dBA sound level contours around the area of sheet pile installation on the east side of Griffin Island for vibratory and impact sheet pile installation methods. During impact or vibratory hammering, three residences and one commercial receptor location are within or partially within the 80 dBA contour. No additional receptor locations are within the 75 dBA contour.

4.2.3 Mitigation

The sheet pile installation will only occur during the daytime. Based on the results of the modeling, during some portion of the vibratory hammering, one residence is expected to be above the daytime standard of 80 dBA, and three residences are expected to be above the 75 dBA Control Level. During impact hammering, three residences are predicted to be above the daytime residential standard, and one non-residential establishment is predicted to be at the commercial/industrial standard of 80 dBA. For all of these receptors, several mitigation options have been considered.

Erection of a sound barrier wall (~20+ feet high) along the shoreline between the sheet pile installation and residences should provide enough sound level reduction to achieve the standards. However, installation of the wall would also generate noise. If pilings are necessary to install a sound barrier wall on shore, noise levels similar to the vibratory sheet piling could be encountered. An alternative approach to installing a shore-based sound barrier could include the use of soil augers instead of the pile driving equipment that would typically be used. Either approach would require the up-front installation of geotechnical boring on the property to assess the structural properties of the soil and the depth to bedrock, which could be further limiting factors. Barrier wall design and implementation details would need to be developed and access issues would need to be worked out with the homeowners. In these circumstances, installation of a 20+ foot high wall for temporary noise control for one to two weeks does not appear to be a practical approach.

Another potential option is the use of a temporary barge-mounted sound barrier wall (estimated height of ~30 feet) along shore. While this technique may be sufficient to reduce the noise from most of this sheet pile installation, it would not be a feasible option when driving sheets adjacent to the shoreline and in any case may not be practical.

Another potential option is the use of a sound dampening blanket around the pile driving hammer head. However, project-specific data that demonstrate the noise-reduction effectiveness of such blankets have not been identified, and hence it cannot be determined whether such blankets would be effective in reducing noise levels to achieve the standards. Potential noise mitigation options for the sheet pile installation will be continue to be investigated.

5.0 PROCESSING FACILITY OPERATIONS

5.1 Inventory of Equipment

Activities at the processing facility will include:

- Offloading dredged material from barges;
- Separation of the dredge material according to size;
- Thickening and dewatering of the fine fraction in the dredged material;
- Treatment of water separated from the dredged material and stormwater collected in processing areas;
- Loading and trucking of separated coarse fractions from the size separation area to the onsite staging area;
- Loading processed material from the onsite staging areas into rail cars; and
- Assembly of loaded rail cars into a train set for transportation to the final disposal facility.

For ease of organization and identification, the processing facility noise sources have been grouped by general activity category and assigned a source identification tag (ID). No major design changes have been made with respect to the equipment inventory since the submission of the *Phase 1 Intermediate Design Report* (Phase 1 IDR) (BBL, 2005).

The main equipment with respect to noise is listed below for each activity area. These sources are located on the processing site as shown on Figure 5-1. Figure 5-2 provides a close-up view of the barge unloading/waterfront area and size separation area.

<u>Barge Unloading/Waterfront Area</u>

1) Tug boat (BU-1);
2) Unloading crane (BU-2);
3) Large front-end loader (BU-3);
4) Off-road haul truck (BU-4); and

5) Slurry pump (BU-5).

Size Separation Area

1) Large front-end loaders (SS-1);
2) Off-road haul trucks (SS-2);
3) Rotary trommel screen (SS-3);
4) Rotary trommel water feed pumps (SS-4);
5) Sediment slurry tank water feed pumps (SS-5);
6) Hydrocyclone systems (SS-6);
7) Hydrocyclone feed pumps (SS-7);
8) Vibratory dewatering screens (SS-8); and
9) Hydrocyclone wet well pumps (SS-9).

Thickening, Dewatering, and Water Treatment Area

1) Filter press feed pumps (TH-1);
2) Filter press system air compressor (TH-2); and
3) Roll-off box (filter cake) transport trucks (TH-3).

Staging and Loadout Area

1) Locomotive switcher (locomotive) – idling (LO-1);
2) Locomotive – moving (LO-L1);
3) Large front-end loaders (LO-2);
4) Large air compressor (LO-3); and
5) Off-road haul trucks (SS-2).

Rail yard operations consist of rail cars arriving at the processing facility, switching and aligning rail cars at the processing facility, loading processed material into rail cars, and rail cars departing from the processing facility. Movement of the rail cars will be done using a yard-type locomotive. Front-end loaders will be used to load processed dredged material into the rail cars.

5.2 Noise Models

A site-wide noise model was applied to the processing facility operations using the equipment inventory listed above. The noise impacts associated with stationary (or minimal movement) sources at the processing facility and unloading area were predicted using the Cadna/A noise calculation model (DataKustik Corporation, 2005). This model uses the ISO 9613-2 industrial standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation). The noise impacts associated with mobile sources with significant movement within the site (haul trucks) were calculated using the Traffic Noise Model (TNM) developed by the FHWA (U.S. DOT, FHWA, 2005). In addition, noise related to workers reporting to the site by way of the proposed site access road were assessed using FHWA TNM.

The Cadna/A model allows for octave band calculation of noise from multiple noise sources, as well as computation of diffraction around building edges, and multiple reflections off parallel buildings and solid ground areas. In this manner, all significant noise sources and geometric propagation effects are accounted for in the noise modeling. The processing facility layout and terrain height contour elevations were also imported into Cadna/A. This allowed for terrain shielding where appropriate. No shielding credit from onsite structures was taken in the modeling. The model was run with standard meteorology conditions of 20 degrees C (68 degrees F), 50% relative humidity, and no wind. Ground attenuation credit was taken by the model where appropriate in accordance with ISO 9613-2.

The modeling conservatively assumed that all sources will be operating at full load simultaneously. The reality is that some of the mobile sources (e.g., tug, haul trucks, front-end loaders, and locomotive) will not operate continuously. For this analysis, it was also assumed that each source may run 24 hours per day. Again, some of the mobile sources (e.g., tug, locomotive) will operate intermittently during a given 24-hour day. It is anticipated that the rail yard locomotive will actually operate less than 12 hours per day. However, to provide flexibility to meet production goals, it was assumed that all sources may be operating every hour of the day and night. This provides conservatism to the analysis.

Noise impacts from rail car movement operations were calculated using noise calculation procedures developed by the FTA (U.S. DOT, FTA, 1995) for commuter rail and freight operations. These calculation algorithms are built around sound exposure levels measured for locomotive and train passbys at a distance of 50 feet. Correction terms for train speed, observer distance, and total number of train operations are then included to enable the computation of an average hourly sound level (L_{eq}) expected at each receptor. The sound levels for this project were computed assuming the use of a line-haul locomotive operating with a typical number of railcars, moving at an average speed of 2 mph, making six operations an hour, as could be the case when the locomotive is moving groups of cars out of and into the loading area. Although the rail yard is expected to be operated during daytime hours, the rail yard noise assessment includes potential nighttime operations. This conservative assumption will provide flexibility in the design for meeting productivity standards.

Haul truck noise was calculated using the FHWA's TNM traffic noise model, Version 2.5 (U.S. DOT, FHWA, 2005). This model can compute L_{eq} hourly average noise levels for highway noise from a variety of different sources, including cars and both medium and heavy trucks, and includes corrections for differing source heights for each vehicle type. Noise was computed using algorithms designed to account for differing traffic volumes and speeds. This model also allows for different road widths, ground zone types, and shielding from buildings and terrain lines. Noise levels computed from TNM were added to the noise levels computed from stationary sources to account for all sources of noise at receptors near the processing facility.

In summary, the following mobile sources were modeled using TNM:

- The haul trucks operating between the Size Separation Area and the Coarse Material Storage Area (source ID SS-2). Volumes are expected to be 12 trucks per hour (four trucks each making three round trips per hour).

- The haul trucks operating between the filter press building and the Fine Material Storage Area (source ID TH-3). Volumes are expected to be four trucks per hour.

- The worker vehicles accessing the site. Model input assumed 100 vehicles on a shift change and the entire shift change occurring within a 1-hour period.

The Cadna/A model assessed sound levels between the sources and receptors for all stationary sources. The assessment points used for the processing facility operations modeling are shown on Figure 5-3. These include lines of assessment points at or just beyond the fence line of the facility, as well as assessment points at a number of specific nearby receptor locations.

5.3 Reference Sound Level Data

Reference sound level data for each significant noise source associated with the processing facility and unloading operations are shown in Table 5-1 through Table 5-4. These sources are grouped by area. These data were collected from the literature, actual operations at other sites, and potential equipment vendors. Both A-weighted and octave band data were obtained whenever possible.

The source strength for each piece of equipment was calculated using the same methodology as outlined in Section 4.1.2 for the dredging and barging operations. Equation 5-1 displays the source strength calculation. The term [20 log (D/D_o)] from Equation 4-1 is the drop-off with distance term, which is handled internally by the Cadna/A model.

$$L_{eq}(h) = L_{max} + E.F. + 10 \log U.F. \qquad (5\text{-}1)$$

The E.F. and U.F. values used in this equation are given in Table 5-5. The E.F. values were based on the measured or reported range of the work cycle. The equipment at the processing facility was assumed to operate continuously during the course of any given hour. Therefore, the U.F. was assumed to be 1.0 for every such source. However, the tug boat, which will deliver a full barge to the unloading wharf and return an unloaded barge to the dredging operations, was assumed to operate at the unloading area for about 10 minutes in any given hour (10 minutes/60 minutes = U.F of 0.17). The inputs shown in Table 5-5, along with the reference sound levels presented in Tables 5-1 through 5-4, were used in the Cadna/A and TMN models to assess noise impacts for the processing facility operation and unloading area sources.

5.4 Modeling Results

Figure 5-4 presents the results of the unmitigated processing facility sound level modeling at the fence line receptors. These include contributions from the stationary processing facility equipment (using the Cadna/A model) plus the mobile sources (using the TNM and FTA method). The contributions from the mobile sources (haul trucks and worker vehicles) were all less than 40 dBA at the closest fence line receptors.

For purposes of clarity, not every receptor result is displayed. Based on a review of the surrounding land use for Hudson QoLPS purposes, the Fort Edward rail siding to the west and southwest of the site is considered commercial/industrial. The area immediately south of the site is considered residential and the area north of the site is considered commercial/industrial. The area immediately east of the Champlain Canal is owned by the New York State Canal Corporation (NYSCC) and is considered commercial. Beyond the NYSCC property line to the east is a mix of commercial and residential properties.

The results of the modeling indicate expected compliance with the Hudson QoLPS at all fence line locations around the facility, with the one exception being a small area directly across from the Barge Unloading/Waterfront Area and Size Separation Area (see Figure 5-4). These locations are slightly above the commercial/industrial standard, but are provided for informational purposes only as there is no receptor located at the shoreline of the Canal. Predicted sound levels at the commercial/industrial locations are all compared to the long-term commercial/industrial standard of 72 dBA (1-hour L_{eq}), and those at the residential locations are all compared to the long-term residential standard of 65 dBA (24-hour L_{dn}).

Sound levels along the western side of the site will be dominated by rail yard activities. Figures 5-4 and 5-5 show the 72 dBA L_{eq} impact line, which does not extend beyond the Fort Edward rail siding. For illustrative purposes, the processing facility impact was also calculated at one of the nearest commercial properties west of the rail siding. Impacts were 60 dBA (L_{eq}), which is well below the 72 dBA standard (see Figure 5-5).

Figure 5-6 provides a detailed view of the unmitigated modeled sound levels across from the barge unloading and size separation areas. The golf course located between NYSCC property and East Street is designated as in commercial use for purposes of assessing attainment of the Hudson QoLPS. The modeling results indicate that one residence on the west side of East Street is above the L_{dn} of 65 dBA; this residence is predicted to have an L_{dn} of 68 dBA. A portion of the NYSCC property line may be slightly over the L_{eq} of 72 dBA, but this is not a point of compliance since there are no receptors located there. The remaining residences along East Street are expected to meet the Hudson QoLPS.

Table 5-6 presents the five primary sources, in order of descending dB level, which contribute to the sound level at the one residence expected to exceed the Hudson QoLPS. It was not necessary to list all sources, since sources more than 10 dBA below the loudest one do not contribute any meaningful dBs to the total. These top five sources contribute approximately 90% of the sound energy at this location and the top three sources contribute more than 80% of the sound energy at this location. The purpose of this source contribution list is to identify the primary noise sources at the receptor of interest. Any noise control efforts should go towards these sources in a "top down" manner (highest to lowest).

5.5 Mitigation

Given the predicted exceedance at the nearest residence east of the Champlain Canal, the processing facility operations contractor will be directed to select and use equipment that will meet the 65 L_{dn} standard at that residence. Based on the source contribution list shown in Table 5-6, sound level reduction of the top two sources (trommel screen, unloading crane) would provide sufficient reduction at this residential receptor. This may take the form of selecting quieter equipment or installing a device (barrier, shroud) to reduce sound energy that reaches the residential location.

In the case of the rotary trommel screen (source ID SS-3), conversations with the vendor indicate that some noise controls are possible on targeted portions of the equipment (chain wrap drive, sound absorbing insulation hoods). A sound level reduction of approximately 10 dBA will be required to meet the standards (from an assumed L_{max} of 90 dBA at 50 feet to a mitigated L_{max} of 80 dBA at 50 feet). In the case of the unloading crane (source ID BU-2), specifying a quieter piece of equipment is a realistic option. A reduction of 8 dBA on this piece of equipment will be required to meet the standards (from an assumed L_{max} of 88 dBA at 50 feet to a mitigated L_{max} of 80 dBA at 50 feet). An appropriately sized excavator would likely meet this requirement.

In addition, if necessary based on monitoring, other mitigation measures could be implemented as appropriate – e.g., shrouding other equipment to reduce noise generation or shielding small stationary noise sources, such as pumps, through placement of solid objects to block the path of sound propagation.

6.0 PROCESSING FACILITY CONSTRUCTION

6.1 Inventory of Equipment

Construction of the processing facility will involve general earthwork, access road construction, utility installation, wharf construction, rail yard development, and installation of the processing facility equipment. Construction equipment at the processing facility is expected to include conventional earth-moving equipment, such as backhoes, front-end loaders, haul trucks, graders, and scrapers. This equipment will be used to grade and prepare the ground for construction of the processing facility. A drill rig is expected to be used to install piles that support the wharf structures. Downstream of Lock 7, an impact pile driver is assumed for dolphin installation. Either impact or vibratory pile driving is expected to be required in order to cross one feeder canal at the north end of the site access road.

6.2 Noise Models

Based on the configuration of the processing facility presented in the Phase 1 FDR, an analysis was made of the potential worst-case construction sound levels. The location of the construction equipment, and thus potential noise sources, will change during the construction period. Five general areas of construction activity were modeled at representative areas:

1. General site construction at the Fines Staging Area (proximate to the south fence line);
2. Wharf construction at the Barge Unloading/Waterfront Area;
3. Pile driving downstream of Lock 7 to install mooring dolphins;
4. Construction of the access road to the north of the processing facility; and
5. Earthwork trucks transporting fill along the access road for processing facility construction.

The actual locations of the on-site mobile equipment will be dispersed, but for purposes of calculating sound levels from the above sources, the equipment was assumed to remain in the same location. In addition, all pieces of equipment were assumed to be operating simultaneously. This is a conservative assumption because not all pieces of equipment will operate concurrently at maximum load. Due to the separation distance between the five construction areas, as compared to the distance to receptors (as shown on Figure 6-1, except for pile driving of dolphins, which will occur south of the processing facility), the total predicted impact at any given receptor is primarily from the one nearest activity.

General Site Construction

The analysis of noise impacts from general site construction used the technique prescribed in *Highway Construction Noise: Measurement, Prediction and Mitigation* (U.S. DOT, FHWA, 1976). This analysis included the loudest three pieces of construction equipment. Total sound levels from each piece of equipment were summed using a spreadsheet. The Fines Staging Area was analyzed as a representative section of the site. A conservative E.F. of -2 was assumed for each piece of mobile construction equipment based on the U.S. DOT reference. Based on actual experience, absolute values of E.F. levels are typically greater (more negative). The assumptions used for predicting noise levels for general site construction are provided in Table 6-1.

Wharf Construction

The analysis of noise impacts from wharf construction used the same modeling technique as General Site Construction. The assumptions used for predicting noise levels for construction in the wharf area are provided in Table 6-2. The drilling is expected to be done with an auger-type drill rig. The actual drill time will be about 1 to 2 hours per pile depending on the hardness of the rock. The piles will be set in place using the same drill rig. Concrete will be pumped into the caissons from a concrete truck. The U.F. values for all sources were assumed to be 1.0. The pile driving activity for the two wharves is expected to last approximately 12 to 14 weeks.

Pile Driving Downstream of Lock 7

It is currently anticipated that pile driving just downstream of Lock 7 will be required to install a turning dolphin and several mooring dolphins to provide mooring locations for barges waiting to transit through Lock 7. This activity would be conducted through impact hammering, since vibratory installation was not considered effective for this installation from an engineering perspective. The modeling of this activity was conducted using the same model as the General Site Construction. The noise emission level for impact pile driving was 101 dBA at 50 feet (U.S. DOT, Federal Transit Administration [FTA], 1995). This is equivalent to the (L_{max} + E.F.) term in Equation 4-1. It was assumed that the impact hammer will drive the piles to the design depth in 30 minutes, and the remainder of a given hour will be used to reposition equipment and set the next pile in place. Therefore, a usage factor of 0.5 (30 minutes/60 minutes) was assumed. The pile driving activity is expected to last approximately 2 weeks.

Access Road Construction

The analysis of noise impacts from construction of the access road to the north of the processing facility used the same modeling technique as General Site Construction. The site access road construction will utilize a similar mix of equipment as assumed for the General Site Construction (see Table 6-1). In general, there are no residences along most of the length of the site access road. There are a few residences near the intersection of the access road and NYS Route 196. The modeling was used to predict sound levels at those residences. It is possible that sheet piles may need to be driven for foundation support for a bridge structure crossing the feeder canal immediately south of NYS Route 196. The design work is not sufficiently progressed to know whether impact or vibratory piles will be required. As a conservative estimate, impact pile driving (101 dBA at 50 feet [U.S. DOT, FTA, 1995]), and a usage factor of 0.5 were assumed.

Earthwork Trucks on Access Road

There will be noise related to the delivery of construction materials and equipment for the processing facility. In general, the number of deliveries per day will vary and is not expected to be significant from a noise perspective. However, the transport of construction fill to the site is anticipated to result in the greatest truck traffic during the construction period. Therefore, an evaluation of the truck traffic noise along the access road due to delivery of fill was performed using the TNM model (U.S. DOT, FHWA, 2005). For noise modeling purposes, the fill deliveries for one shift per day (12 trucks per hour) were assumed. Spreading the deliveries over a longer duration would result in less impact.

6.3 Modeling Results

General Site Construction

Expected sound levels from general site construction at the fines staging area are presented in Table 6-3. The point of analysis is the nearest property line to the south approximately 400 feet away. General site construction is expected to be a daytime-only activity. These results show that sound levels from construction activity will be 67 dBA or less at offsite residential receptors, which is well below the daytime Standard Level of 80 dBA and Control Level of 75 dBA.

Expected sound levels from the earthwork trucks delivering fill to the site will be 47 dBA or less at the nearest fence line receptors around the processing facility. This is greater than 10 dBA less than the sound level presented in Table 6-3. Therefore, the results from Table 6-3 are unchanged due to the onsite activity of the earthwork delivery trucks.

Wharf Construction

Expected sound levels from activities associated with wharf construction are presented in Table 6-3. The point of analysis is the nearest receptor to the east across the canal approximately 350 feet away. This location is in commercial use (golf course). The nearest residential receptor is 400 feet from the wharf construction activity. Wharf construction is expected to be a daytime-only activity. These results show that expected sound levels will be 71 dBA at 350 feet and less at 400 feet, which are below the commercial/industrial standard of 80 dBA and the residential daytime Control Level of 75 dBA at the offsite receptors. These results are likely overstated since they assume all aspects of the wharf construction are occurring concurrently (drilling and concrete pouring for example).

Pile Driving Downstream of Lock 7

Expected sound levels from the impact pile driving at various distances are presented in Table 6-4. Pile-driving is expected to be a daytime-only activity. The impact pile driving to install the dolphins is expected to produce sound levels of 80 dBA at a distance of approximately 400 feet and 75 dBA at a distance of approximately 700 feet. These distances are slightly different from the noise predictions from impact pile driving for the resuspension control sheet pile installation due to the slightly different usage factors. Figure 6-2 shows the 75 dBA and 80 dBA sound level contours around the dolphins. Four residences are expected to be within the 80 dBA contour and 11 residences are expected to be within the 75 dBA contour (including the four noted above).

Access Road Construction

Expected sound levels from construction of the 2-mile access road are presented in Table 6-3. The point of analysis is the nearest receptor to the west approximately 500 feet away. This location is in residential use. Access road construction is expected to be a daytime-only activity. These results show that expected sound levels from the construction activity will be 65 dBA or less at the nearest residential receptor, which is well below the daytime Standard Level of 80 dBA and Control Level of 75 dBA.

Impact sheet pile driving noise at the feeder canal was calculated to be 80 dBA at 325 feet and 75 dBA at 575 feet. The nearest receptor to the pile driving is a commercial location to the east across the Champlain Canal approximately 800 feet away. The nearest residence to this activity is approximately 900 feet to the northwest. Both of these locations are well beyond the 575 foot distance and thus are predicted to have sound levels below the applicable criteria (i.e., the commercial/industrial standard of 80 dBA and the residential daytime Control Level of 75 dBA).

Earthwork Trucks on Access Road

Expected sound levels from the earthwork trucks delivering fill to the site will be 53 dBA at a distance of 100 feet from the centerline of the access road. This assumes a speed of 40 mph. The actual speed is expected to be slower, thus reducing sound levels to less than 53 dBA. There are no receptors within 100 feet of the access road. In fact, there are no receptors within 500 feet of the access road. These results thus indicate that there will be no exceedances of any of the applicable noise criteria at receptors.

6.4 Mitigation

No mitigation measures are anticipated or required for construction of the processing facility, including the wharf structures or the access road, as no receptors are predicted to have noise levels above the applicable Standard or Control Level. However, 11 residences are expected to exceed the residential daytime Control Level of 75 dBA during pile driving of the mooring dolphins near Lock 7. For this activity, several potential mitigation measures have been considered. These include: (1) installing a sound barrier wall on shore between the pile driving and the residences; (2) placing a temporary barge-mounted sound barrier along the shore; and (3) using sound-dampening blankets around the impact hammer. However, these options are subject to the same practical limitations and uncertainties regarding their implementability and/or effectiveness as discussed in Section 4.2.3 with respect to the sheet pile installation. Potential noise mitigation options for this activity will continue to be investigated.

7.0 REFERENCES

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Tables

Table 4-1 Reference Sound Level Data – Dredging and Barging Operations

Source ID	Sound Source	No. of Units	Reference Sound Level per unit (dBA)	Reference Distance (feet)	Data Source	Comment
OW-1	Tug boat	1	87	50	Port of Oakland FEIS.	Assumes 900-1000 hp.
OW-2	Work boat	1	72	50	25-foot long twin screw tugboat measured at the Island End River site while moving a barge.	Tender tug
OW-3	Excavator clamshell dredge/backfill	1	77	50	Caterpillar 345B with 2 cy clamshell bucket measured at the Island End River site.	Point of reference: Bucyrus Erie 88-B clamshell dredge measured at 77 dBA.
OW-4	Survey boat/crew boat	2	81	50	New Jersey State Police Marine Division measurements – 1995	Police patrol boat – single 175 hp Johnson outboard engine at full throttle. One boat at a given location.
OW-5	Light tower	2	63	25	WhisperWatt 20kW unit by MQ Power (Multiquip) as measured at the Island End River site.	Assume light tower comparable to WhisperWatt 20 kW generator.
OW-6	Heavy duty electric generator	1	63	25	WhisperWatt 20kW unit by MQ Power (Multiquip) as measured at the Island End River site.	Equivalent to 57 dBA at 50 feet.
OW-7	High solids pump	1	94	3	Schwing BP 8800 concrete pump, Hoover & Keith; Table 7-12.	Rated at 560 hp.

Notes:
FEIS = Final Environmental Impact Statement
hp = horsepower
cy = cubic yard
kW = kilowatt

Table 4-2 Model Inputs – Dredging and Barging Operations

Source ID	Equipment	No.	EF	U.F.	D_o (feet)
OW-1	Tug boat	1	-2	0.05	50
OW-2	Work boat	1	-2	0.33	50
OW-3	Dredge	1	-5	1	50
OW-4	Survey boat	2	-7	0.05	50
OW-5	Lights	2	0	1	25
OW-6	Generator	1	0	1	25
OW-7	High solids pump	1	0	1	3

Table 4-3 Modeled Sound Levels – Dredging and Barging Operations

Distance	All Dredging Sources	Relevant Criteria
35 feet	80 dBA	QoLPS – Residential Daytime; Commercial and Industrial Anytime
50 feet	77 dBA	
60 feet	75 dBA	QoLPS – Residential Daytime Control Level
100 feet	70 dBA	
150 feet	67 dBA	
200 feet	65 dBA	QoLPS – Residential Nighttime
250 feet	62 dBA	

Table 4-4a Modeled Sound Levels – Vibratory Sheet Piling (Resuspension Control)

Distance	Vibratory Sheet Piling	Relevant Criteria [1]
100 feet	85 dBA	
150 feet	82 dBA	
180 feet	80 dBA	QoLPS -- Residential Daytime; Commercial and Industrial Anytime
200 feet	79 dBA	
250 feet	77 dBA	
300 feet	76 dBA	
325 feet	75 dBA	QoLPS – Residential Daytime Control Level
350 feet	74 dBA	

Note:
(1) Sheet piling will only occur during the daytime.

Table 4-4b Modeled Sound Levels – Impact Sheet Piling (Resuspension Control)

Distance	Vibratory Sheet Piling	Relevant Criteria [1]
100 feet	90 dBA	
200 feet	84 dBA	
300 feet	81 dBA	
325 feet	80 dBA	QoLPS -- Residential Daytime; Commercial and Industrial Anytime
400 feet	78 dBA	
500 feet	76 dBA	
575 feet	75 dBA	QoLPS – Residential Daytime Control Level
650 feet	74 dBA	

Note:
(1) Sheet piling will only occur during the daytime.

Table 5-1 Reference Sound Level Data – Processing Facility Operations – Barge Unloading/Waterfront Area

Source ID	Sound Source	No. of Units	Reference Sound Level per unit (dBA)	Reference Distance (feet)	Data Source	Comment
BU-1	Tug boat	1	87	50	Port of Oakland FEIS.	Assumes 900-1000 hp.
BU-2	Unloading crane	1	88	50	Manitowoc 4100W 200-ton crane measured at the Island End River site.	
BU-3	Large front-end loader	1	73	100	Measured at Newport Sand & Gravel, Newport, NH.	Caterpillar 980G with 5.5 cy bucket loading materials. Equivalent to L_{max} of 79 at 50 feet.
BU-4	Off-road haul truck	1	86	50	Measured at Colarusso Quarry, Hudson, NY.	Caterpillar 769C 35-ton truck fully loaded (~450 hp).
BU-5	Slurry Pumping	1	63	30	Godwinpumps.com	Assumes enclosure. Equivalent to 68 dBA at 50 feet.

Notes:
FEIS = Final Environmental Impact Statement
hp = horsepower
cy = cubic yard

Table 5-2 Reference Sound Level Data – Processing Facility Operations – Size Separation Area

Source ID	Sound Source	No. of Units	Reference Sound Level per unit (dBA)	Reference Distance (feet)	Data Source	Comment
SS-1	Large front-end loader	2	73	100	Measured at Newport Sand & Gravel, Newport, NH.	Caterpillar 980G with 5.5 cy bucket loading materials. Equivalent to L_{max} of 79 at 50 feet.
SS-2	Off-road haul truck	4	86	50	Measured at Colarusso Quarry, Hudson, NY.	Caterpillar 769C 35-ton truck fully loaded (~450 hp).
SS-3	Rotary trommel screen	1	90	50	McCloskey International Limited – trommel vendor.	Includes sediment processing noise; 125 hp.
SS-4	Rotary trommel water feed pump	2	94	3	Hoover & Keith; Table 7-12.	74 dBA + 10LOG (hp); 100 hp each.
SS-5	Sediment slurry tank water feed pumps	2	88	3	Hoover & Keith; Table 7-12.	74 dBA + 10LOG (hp); 25 hp each.
SS-6	Hydrocyclone system	2	85	3	Vendor data from Krebs Engineers.	
SS-7	Hydrocyclone feed pump	2	95	3	Hoover & Keith; Table 7-12.	88 dBA + 3LOG (hp); 150 hp each (1 spare).
SS-8	Vibratory dewatering screen	2	90	3	Vendor data from Derrick Corporation.	10 hp motors. 3/8-inch size.
SS-9	Hydrocyclone wet well pump	2	94	3	Hoover & Keith; Table 7-12.	88 dBA + 3LOG (hp); 125 hp each. Five total (two run at once).

Notes:
hp = horsepower
cy = cubic yard

Table 5-3 Reference Sound Level Data – Processing Facility Operations – Thickening and Dewatering System Area

Source ID	Sound Source	No. of Units	Reference Sound Level per unit (dBA)	Reference Distance (feet)	Data Source	Comment
TH-1	Filter press feed pump	12	82	3	Hoover & Keith; Table 7-12.	74 dBA + 10LOG (hp); 60 hp each. Source inside a building.
TH-2	Filter press system air compressor	1	70	3	US Filter.	30 hp. Source inside a building.
TH-3	Roll-off box truck	3	86	50	Measured at Colarusso Quarry, Hudson, NY.	Caterpillar 769C 35-ton truck fully loaded (~450 hp). Assume conservative compared to a roll-off box truck.

Notes:
hp = horsepower

Table 5-4 Reference Sound Level Data – Processing Facility Operations – Staging and Loadout Area

Source ID	Sound Source	No. of Units	Reference Sound Level per unit (dBA)	Reference Distance (feet)	Data Source	Comment
LO-1	Locomotive (idling)	1	80 (idle)	50	Federal Transit Administration Manual, April 1995.	Data is for a line-haul locomotive.
LO-L1	Locomotive (moving)	1	88 (throttle)	50	Federal Transit Administration Manual, April 1995.	Data is for a line-haul locomotive. Assume 6 passbys per hour max.
LO-2	Large front-end loader	2	73	100	Measured at Newport Sand & Gravel, Newport, NH.	Caterpillar 980G w/ 5.5 cy bucket loading materials. Equivalent to L_{max} of 79 at 50 feet.
LO-3	Large air compressor	1	97	3	Hoover & Keith; Table 7-15.	Approximately 50 hp. Supplies air for loaded outbound trains. Unit will be in a building.
SS-2	Off-road haul truck	4	86	50	Measured at Colarusso Quarry, Hudson, NY.	Caterpillar 769C 35-ton truck fully loaded (~450 hp).

Notes:
cy = cubic yards
hp = horsepower

Table 5-5 Model Inputs – Processing Facility Operations

Source ID	Sound Source	No. of Units	E.F.	U.F.	D_o, Reference Distance (ft)
BU-1	Tug boat	1	-2	0.2	50
BU-2	Unloading crane	1	-5	1	50
BU-3	Large front-end loader	1	-5	1	100
BU-4	Off-road haul truck	1	-7	1	50
BU-5	Pump	1	0	1	30
SS-1	Large front-end loader	2	-5	1	100
SS-2	Off-road haul truck	4	-7	1	50
SS-3	Rotary trommel screen	1	-2	1	50
SS-4	Rotary trommel water feed pump	2	0	1	3
SS-5	Sediment slurry tank water feed pumps	2	0	1	3
SS-6	Hydrocyclone system	2	-2	1	3
SS-7	Hydrocyclone feed pump	2	0	1	3
SS-8	Vibratory dewatering screen	2	-2	1	3
SS-9	Hydrocyclone wet well pump	2	0	1	3
TH-1	Filter press feed pump	12	0	1	3
TH-2	Filter press system air compressor	1	0	1	3
TH-3	Off-road haul truck	3	-7	1	50
LO-1	Locomotive (idling)	1	NA	NA	50
LO-L1	Locomotive (moving)	1	NA	NA	50
LO-2	Large front-end loader	2	-5	1	100
LO-3	Large air compressor	1	0	1	3

Note:
NA = Not Applicable for locomotives, per the FTA procedures [U.S. DOT, FTA, 1995.]

Table 5-6 Processing Facility Sound Levels – Primary Source Contributions at Residence

Source ID	Sound Source	Leq
SS-3	Rotary trommel screen	59 dBA
BU-2	Unloading crane	57 dBA
BU-1	Tug boat	53 dBA
BU-3	Front-end loader	49 dBA
SS-7	Hydrocyclone feed pumps	49 dBA
	Total (L_{eq})	**62 dBA**
	Total (L_{dn})	**68 dBA**

Table 6-1 Model Inputs – General Site Construction (Fine Staging Area)

Equipment	No.	Reference Sound Level (dBA)	EF	U.F.	D_o (ft)
Grader	1	81	-2	1.0	50
Front-end Loader	1	73	-2	1.0	100
Haul truck	2	86	-2	0.33	50

Table 6-2 Model Inputs – Wharf Construction

Equipment	No.	Reference Sound Level (dBA)	EF	U.F.	D_o (ft)
Excavator	1	85	-2	1.0	50
Drill Rig	1	83	-2	1.0	50
Concrete pump	1	78	0	1.0	50
Crane (steel erection)	1	82	-2	1.0	50

Table 6-3 Processing Facility Construction – Sound Level Results

Construction Area	Assessment Point	Distance	Sound Level	Noise Standard (1)
Fine Staging Area	Site Property Line	400 feet	67 dBA	80 dBA
Wharf Area	Nearest receptor (commercial)	350 feet	71 dBA	80 dBA
Access Road	Nearest receptor (residential)	500 feet	65 dBA	80 dBA

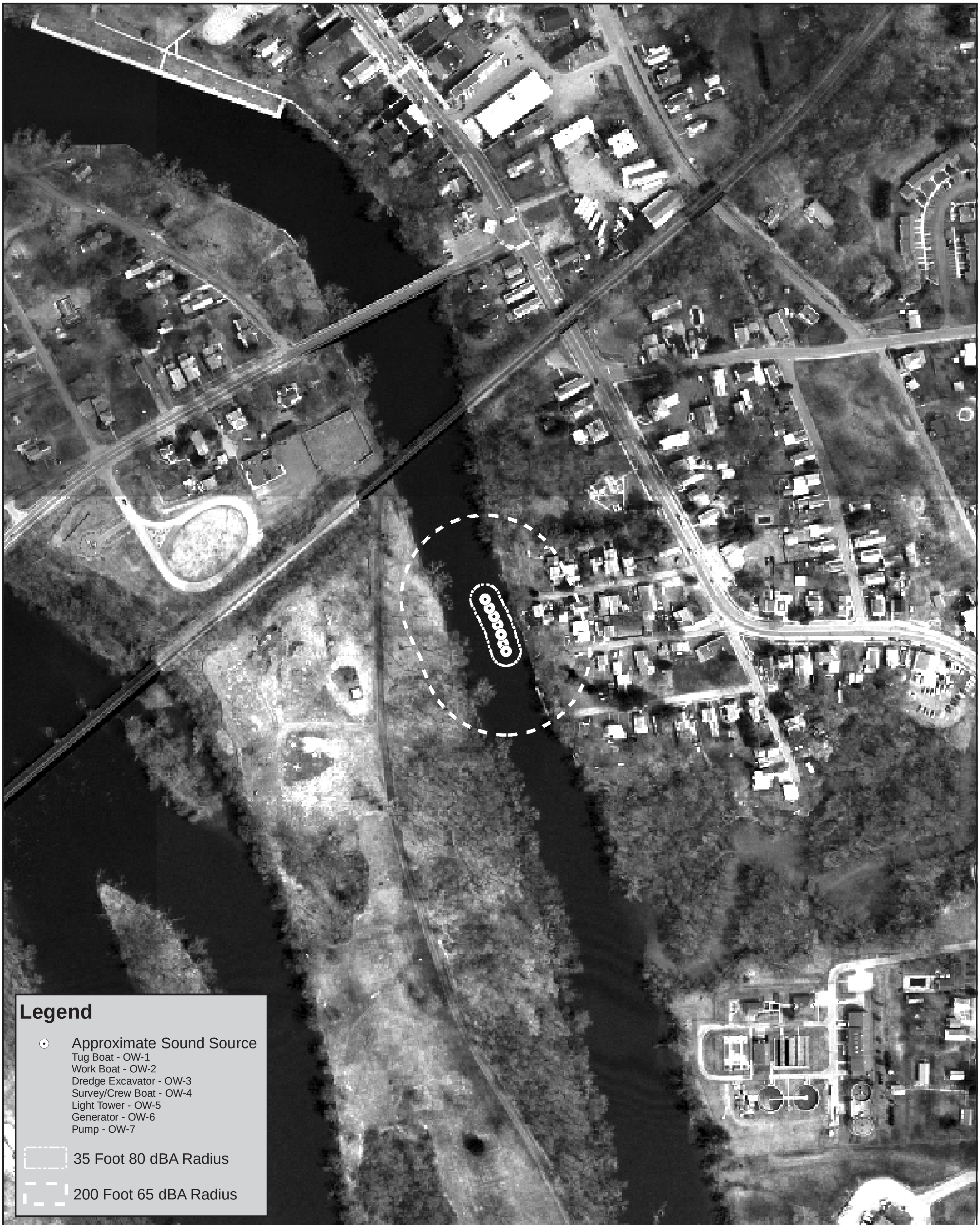
(1) Construction will be a daytime-only activity. Control Level is 75 dBA.

Table 6-4 Modeled Sound Levels – Impact Pile Driving (Downstream of Lock 7)

Distance	Impact Pile Driving	Relevant Criteria (1)
100 feet	92 dBA	
150 feet	88 dBA	
200 feet	86 dBA	
250 feet	84 dBA	
300 feet	82 dBA	
400 feet	80 dBA	QoLPS -- Residential Daytime; Commercial and Industrial Anytime
500 feet	78 dBA	
600 feet	76 dBA	
700 feet	75 dBA	QoLPS – Residential Daytime Control Level

(1) Pile driving will be a daytime-only activity.

Figures



Scale 1:3,600
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150 0 150 300 Feet

N S E W

Figure 4 - 1
Rogers Island Sound Levels -- Dredging

GE Hudson River PCBs Superfund Site
Phase 1 Final Design

Basemap: 2004 Ortho Photography, NYS GIS

Epsilon Associates Inc.

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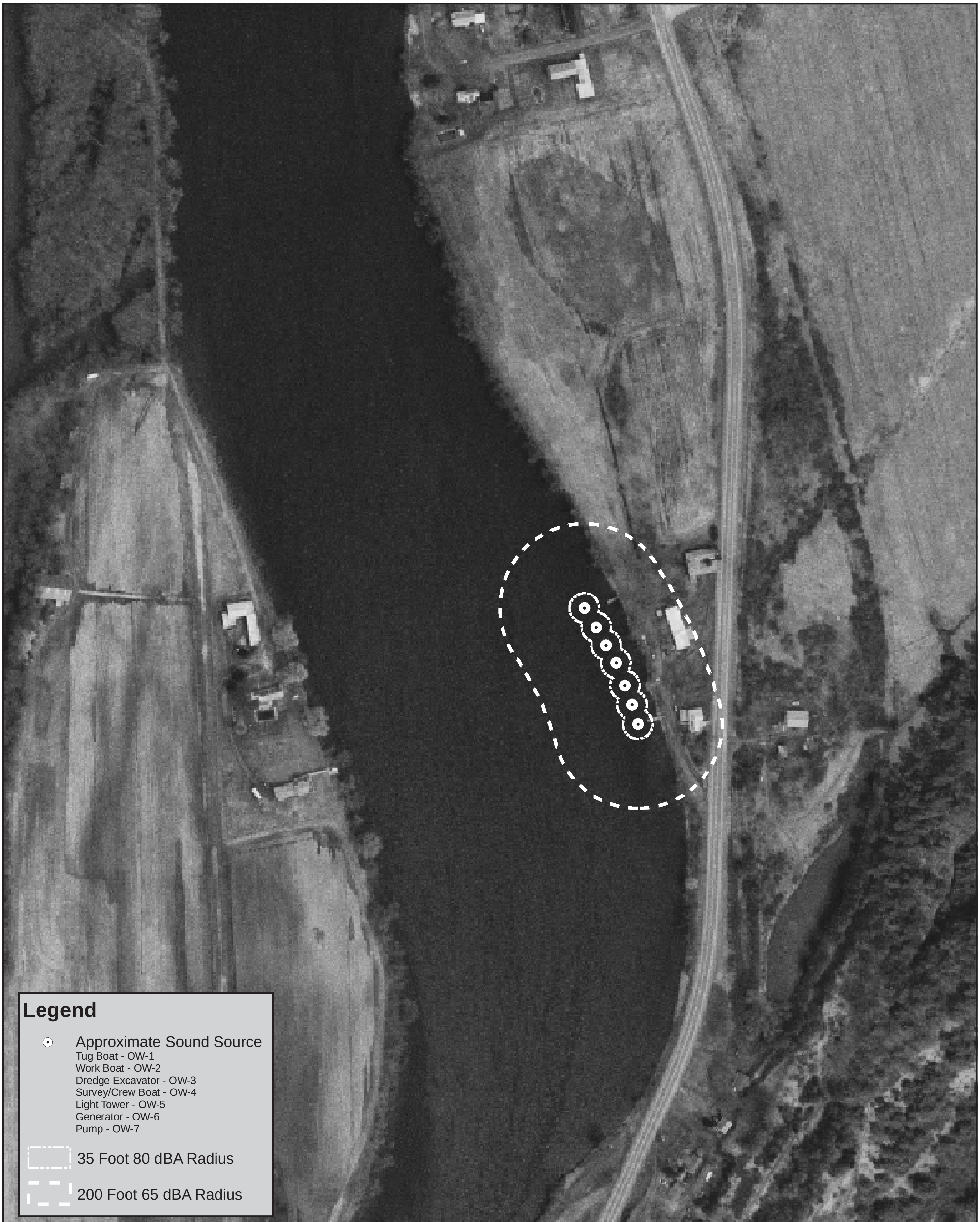


Scale 1:3,600
1 inch = 300 feet
150 0 150 300
Feet

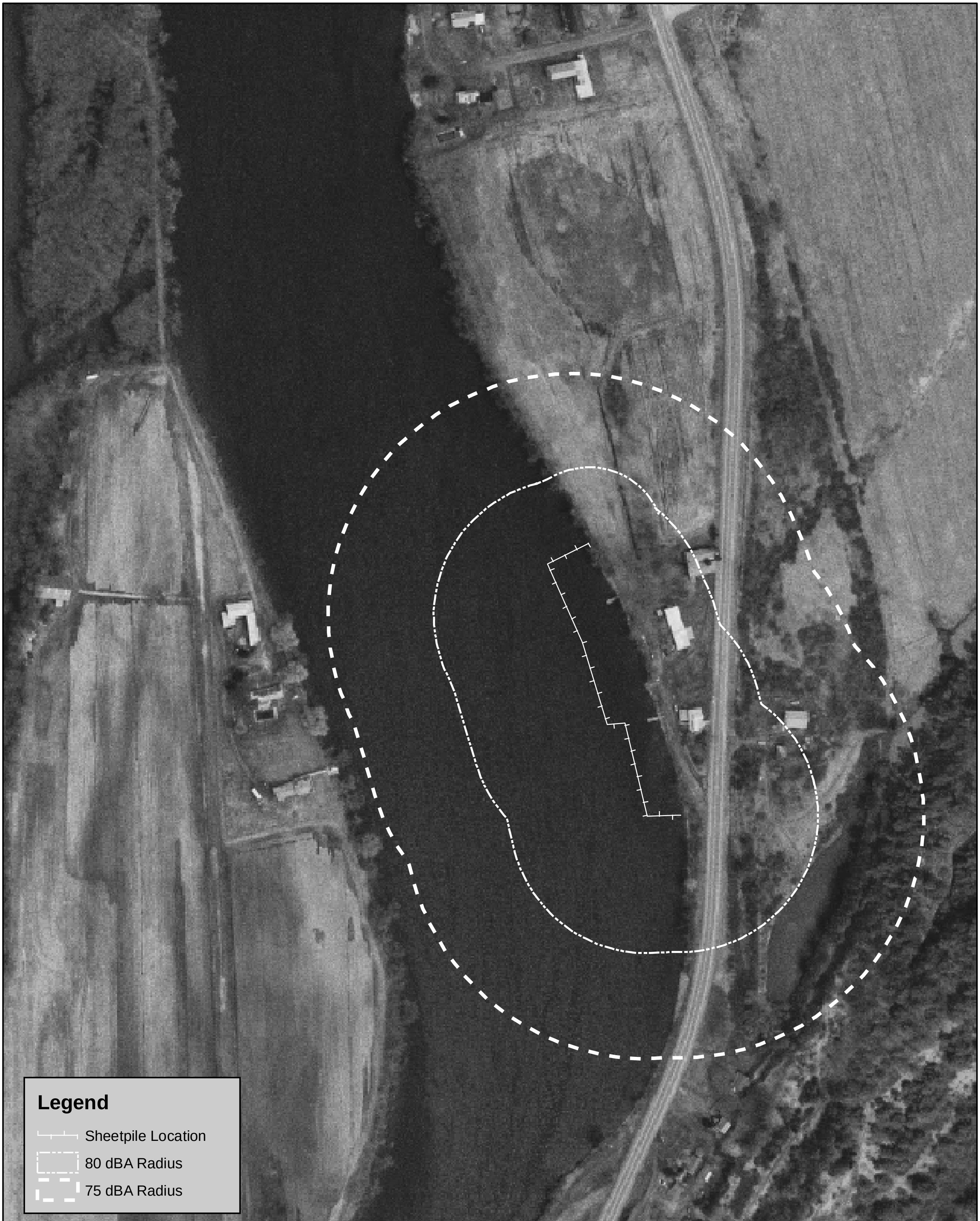
N W E S

Figure 4 - 2
East Griffin Island Sound Levels -- Dredging

Basemap: 2004 Ortho Photography, NYS GIS

GE Hudson River PCBs Superfund Site
Phase 1 Final Design

Epsilon Associates Inc.



Scale 1:3,600
1 inch = 300 feet
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Feet

Basemap: 2004 Ortho Photography, NYS GIS

Figure 4 - 3
Sheetpiling Sound Levels -- East Griffin Island

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Phase 1 Final Design

Epsilon ASSOCIATES INC.

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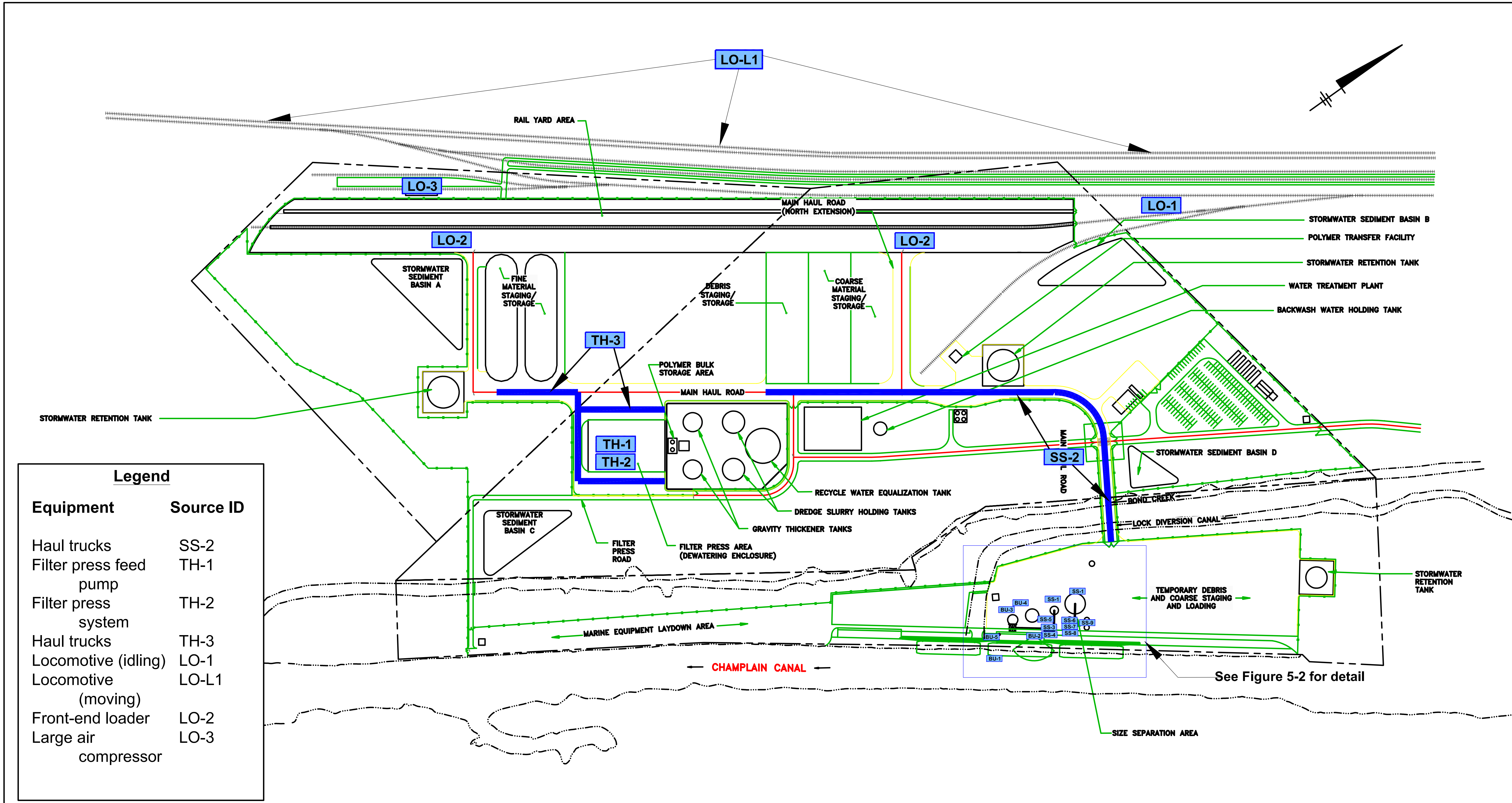

Note: Site layout and source locations are approximate.

Graphic Scale
150 0 150 300 Feet

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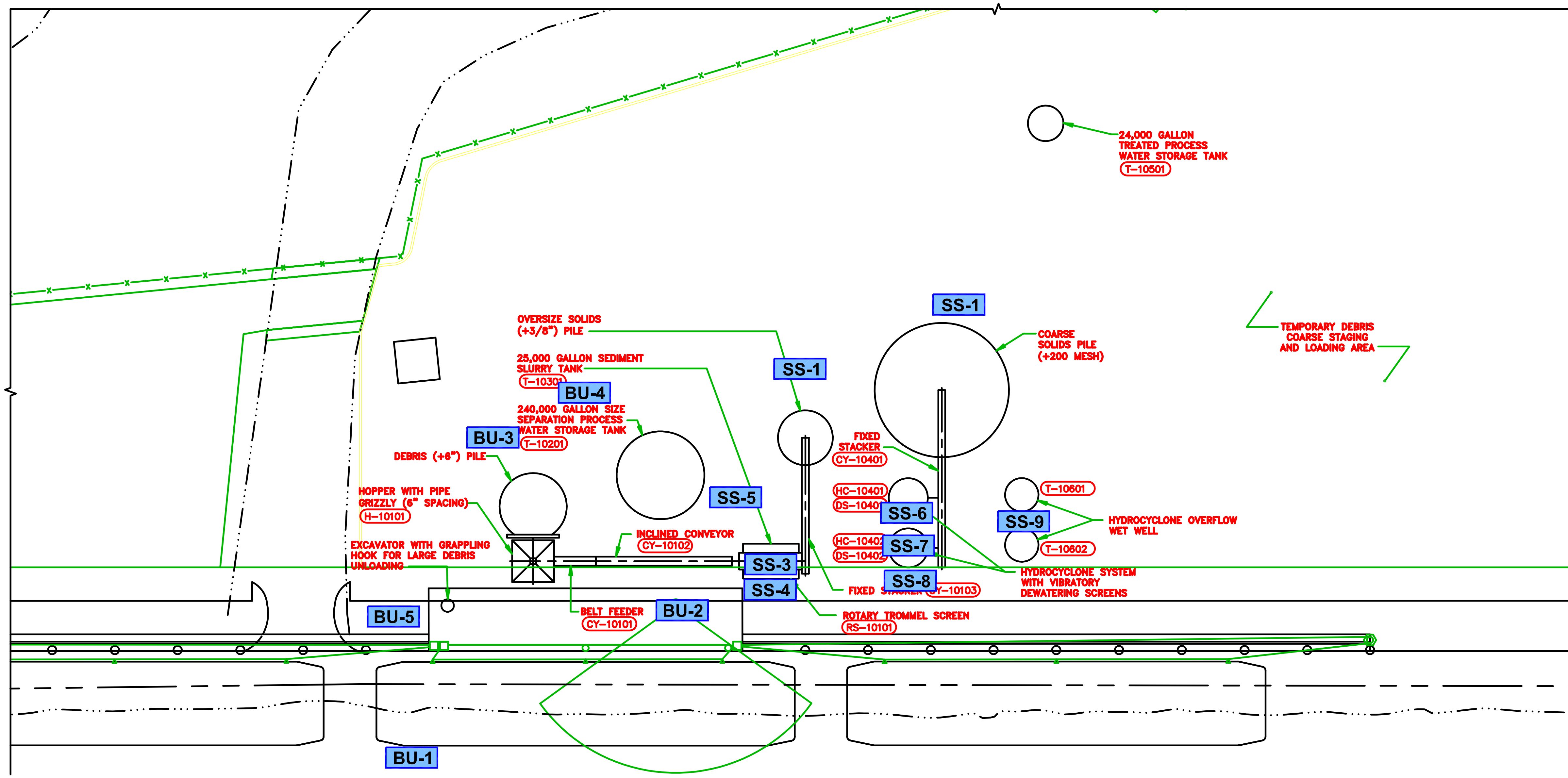
Phase 1 Final Design

Figure 5-1
Primary Sound Sources --
Processing Facility

\1735\Fig5-1And5-4.dwg

3/16/06



Legend

Equipment	Source ID
Tug boat	BU-1
Unloading crane	BU-2
Front-end loader	BU-3
Haul truck	BU-4
Slurry pump	BU-5
Front-end loader	SS-1
Trommel screen	SS-3
Trommel water feed pump	SS-4
Sediment slurry water feed pump	SS-5
Hydrocyclone system	SS-6
Hydrocyclone feed pump	SS-7
Vibratory dewatering screen	SS-8
Hydrocyclone wet well pump	SS-9

Note: Site layout and source locations are approximate.

Graphic Scale

30 0 30 60 Feet

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Phase 1 Final Design

Figure 5-2
Primary Sound Sources -- Processing Facility Barge Unloading and Size Separation Areas

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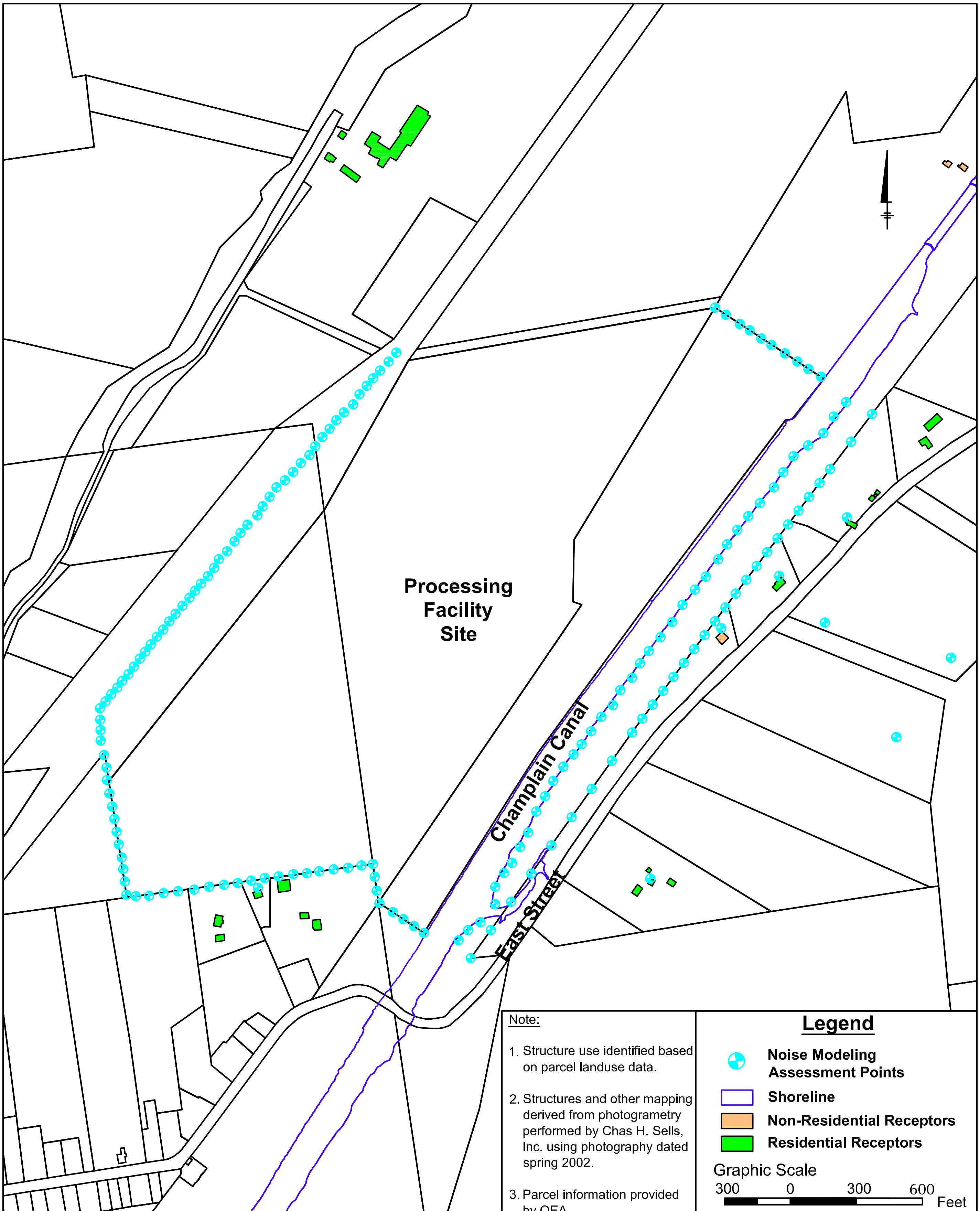
3/16/06



Note:

1. Structure use identified based on parcel landuse data.
2. Structures and other mapping derived from photogrammetry performed by Chas H. Sells, Inc. using photography dated spring 2002.
3. Parcel information provided by QEA.

Legend

- Noise Modeling Assessment Points
- Shoreline
- Non-Residential Receptors
- Residential Receptors

Graphic Scale

300 0 300 600 Feet

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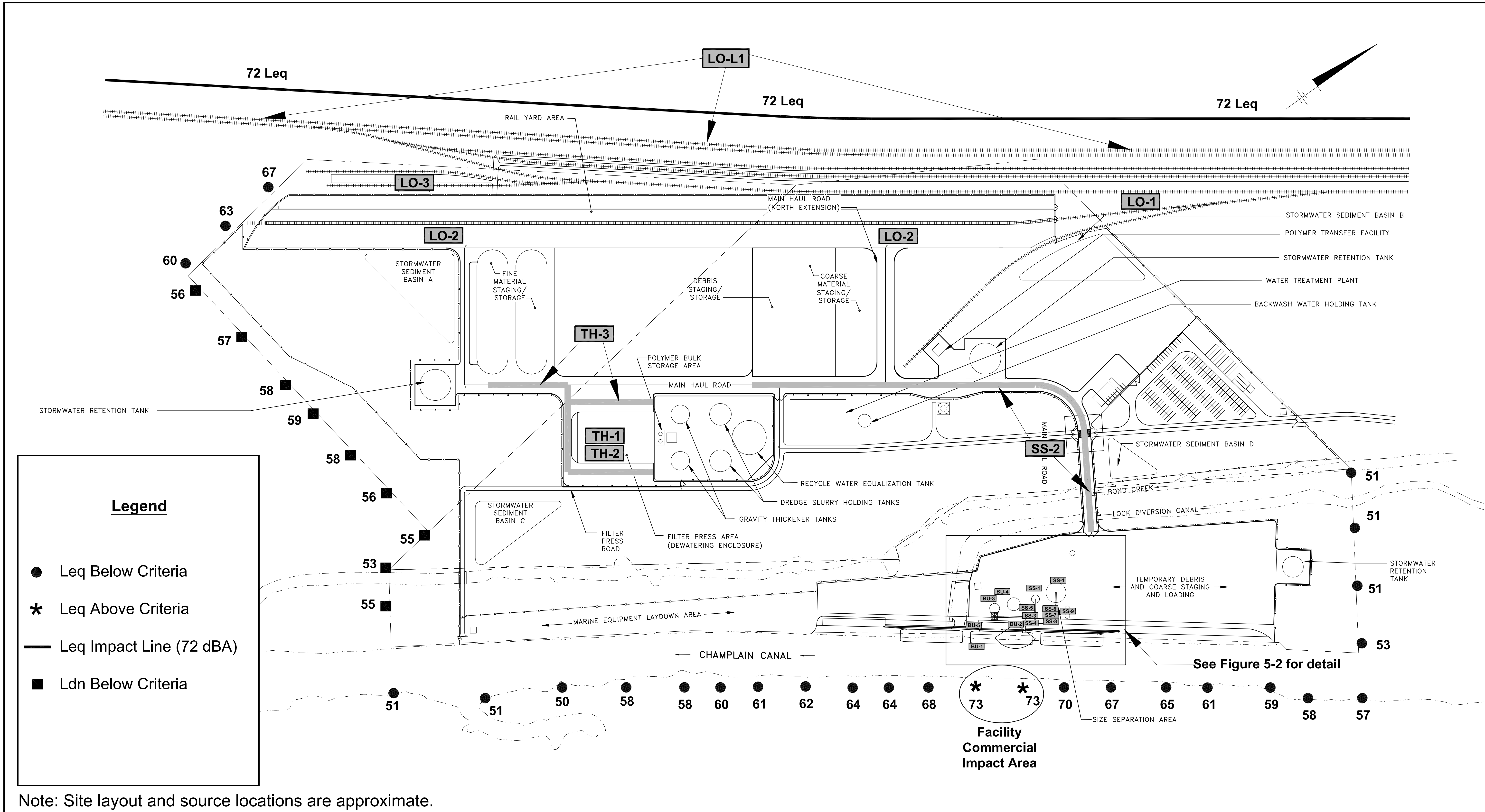
Figure 5-3 Noise Modeling Assessment Points -- Processing Facility

\1735\EA-Receptors-NoiseMapData.dwg

3/6/06



Graphic Scale

150 0 150 300 Feet

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Figure 5-4
Property Line Sound Levels

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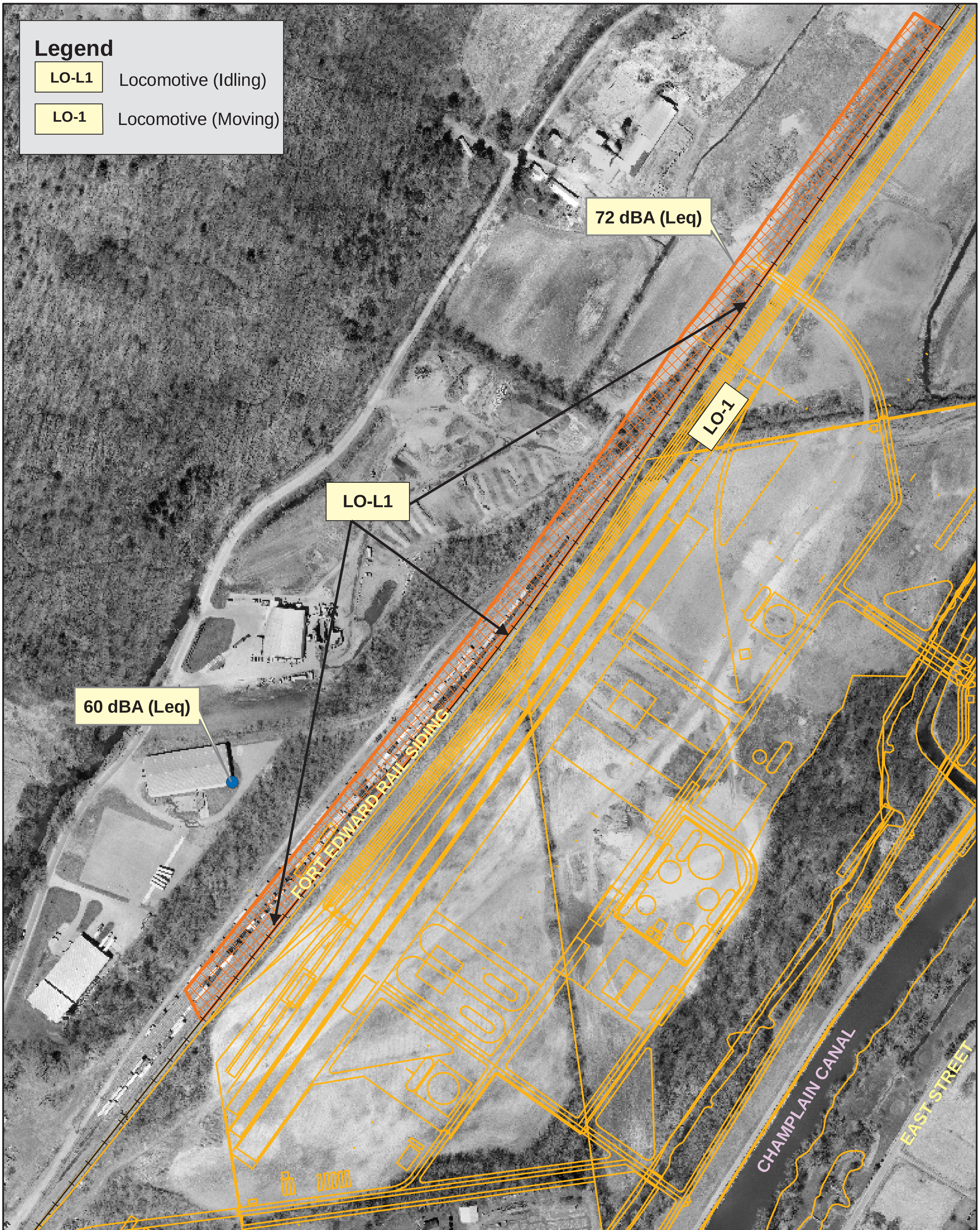
3/16/06



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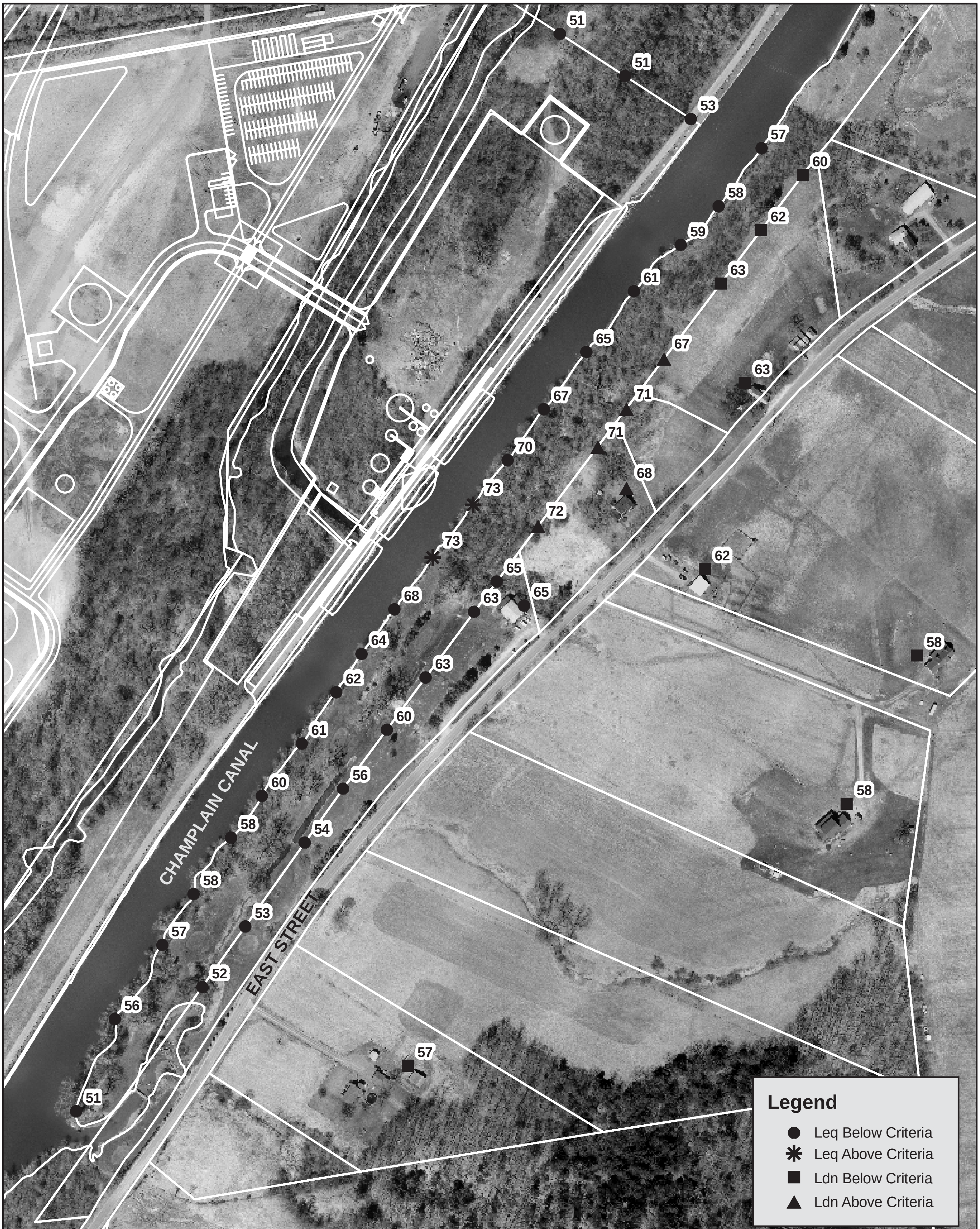
200 0 200 400
Feet

Figure 5 - 5
Locomotive Noise Impacts -- Processing Facility

GE Hudson River PCBs Superfund Site
Phase 1 Final Design

Basemap: 2005 Ortho Photography, Chas H Sells

Epsilon Associates Inc.



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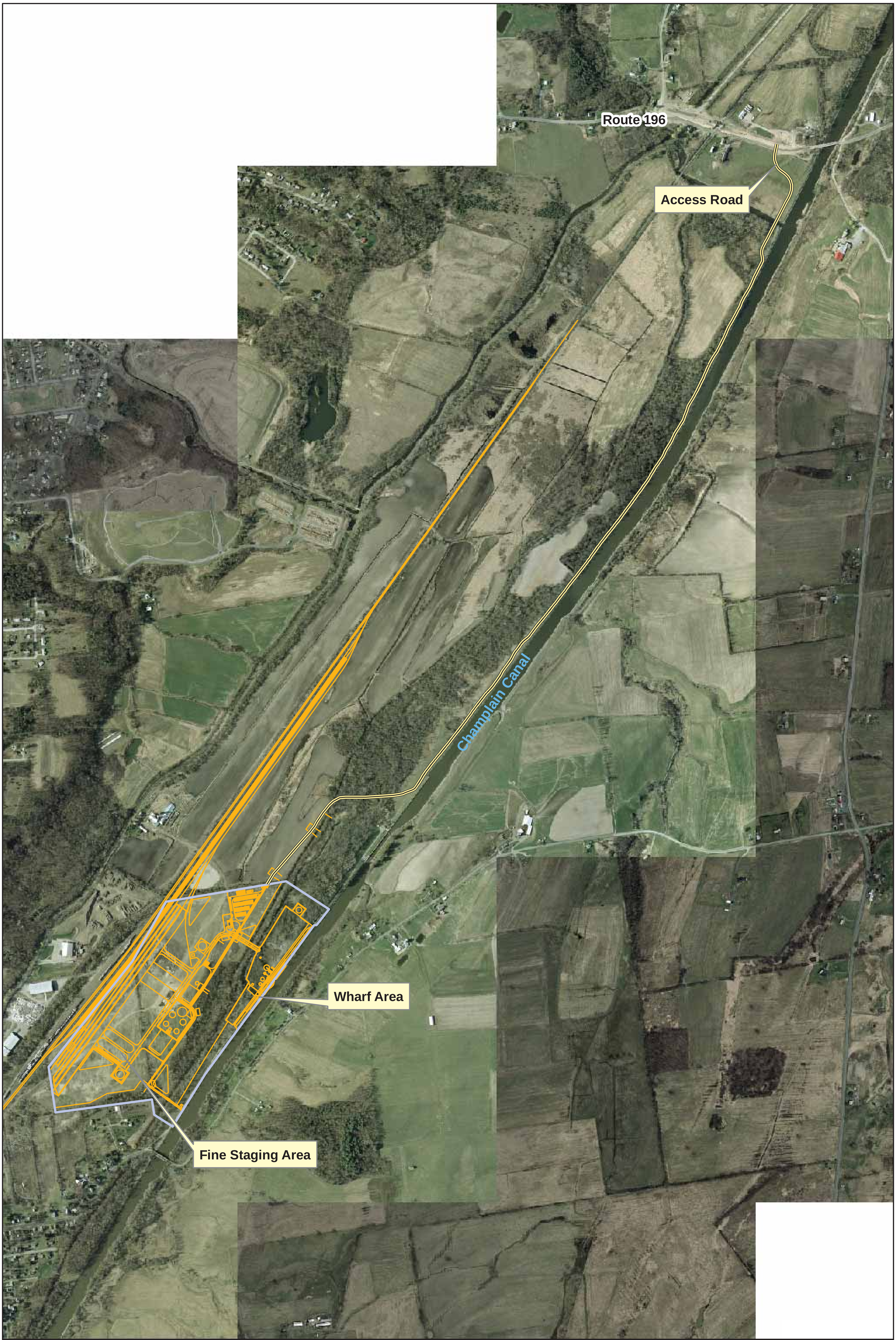
1 inch = 300 feet
150 0 150 300
Feet

Figure 5 - 6
Processing Facility -- Sound Levels

GE Hudson River PCBs Superfund Site
Phase 1 Final Design

Basemap: 2005 Ortho Photography, NYGIS

Epsilon Associates Inc.



Scale 1:12,000
1 inch = 1,000 feet
500 0 500 1,000
Feet

Figure 6-1
General Areas of Construction for Noise Analysis

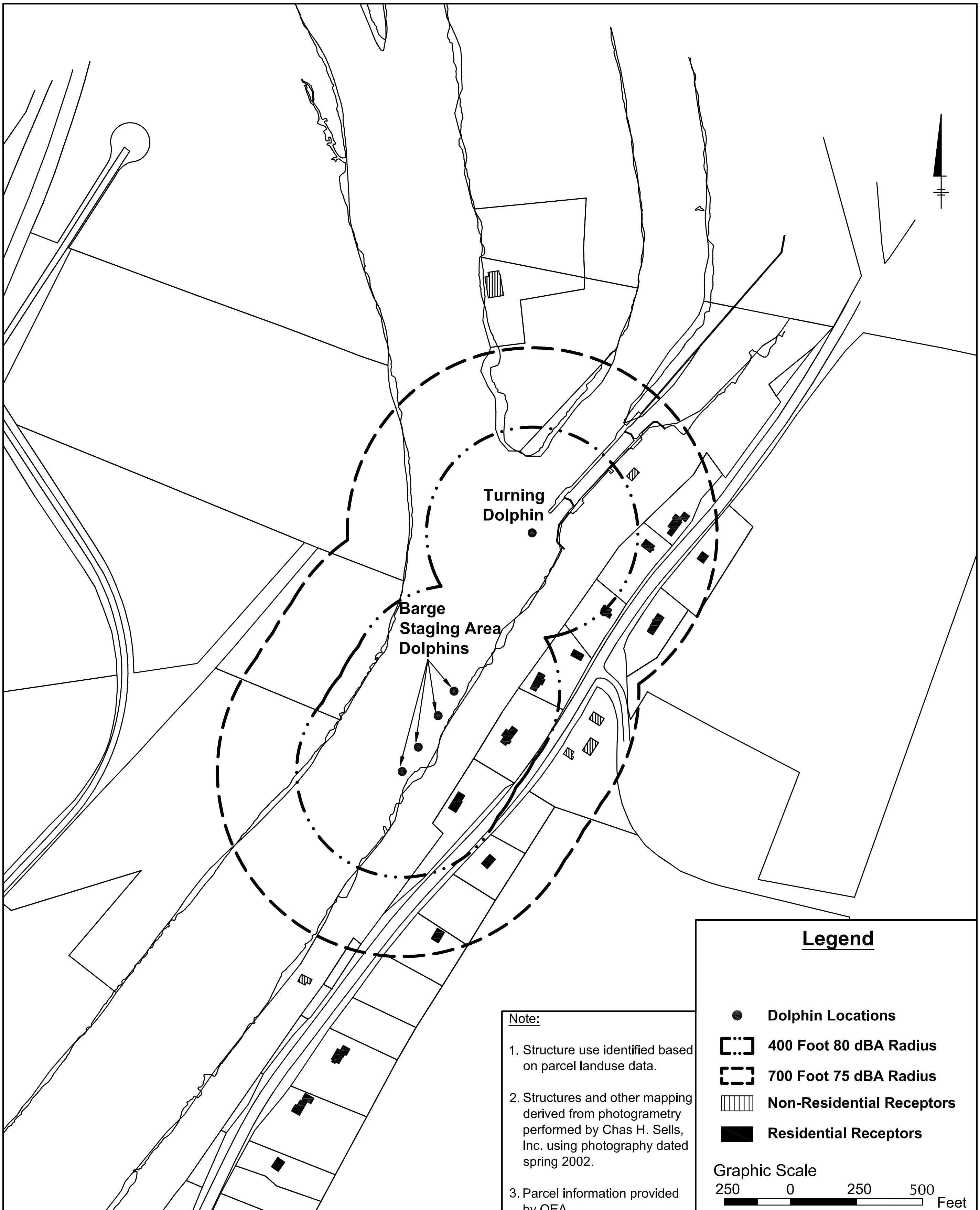
GE Hudson River PCBs Superfund Site
Phase 1 Final Design

Basemap: 2004 Ortho Photography, NYS GIS

Epsilon ASSOCIATES INC.

G:\Projects2\NY\1735_GE\Fig6-1_construction_areas.mxd

3/15/06



Legend

- Dolphin Locations
- 400 Foot 80 dBA Radius
- 700 Foot 75 dBA Radius
- Non-Residential Receptors
- Residential Receptors

Graphic Scale
250 0 250 500 Feet

Note:

1. Structure use identified based on parcel landuse data.
2. Structures and other mapping derived from photogrametry performed by Chas H. Sells, Inc. using photography dated spring 2002.
3. Parcel information provided by QEA.

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Figure 6-2 Pile Driving Sound Levels -- Downstream of Lock 7

\1735\EA-20426n01 Lock 7.dwg 2/24/06