NIOSH HEALTH HAZARD EVALUATION REPORT

HETA #2005-0035-2988
Kentucky Sanitation District #1
Ft. Wright, Kentucky

December 2005

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

PREFACE

The Hazard Evaluation and Technical Assistance Branch (HETAB) of the National Institute for Occupational Safety and Health (NIOSH) conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health (OSHA) Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employers or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

HETAB also provides, upon request, technical and consultative assistance to federal, state, and local agencies; labor; industry; and other groups or individuals to control occupational health hazards and to prevent related trauma and disease. Mention of company names or products does not constitute endorsement by NIOSH.

ACKNOWLEDGMENTS AND AVAILABILITY OF REPORT

This report was prepared by Manuel Rodriguez and Chandran Achutan of HETAB, Division of Surveillance, Hazard Evaluations and Field Studies (DSHEFS). Field assistance was provided by Ronald Sollberger, Chad Dowell, Robert McCleery and Lynda Ewers. Desktop publishing was performed by Robin Smith and Shawna Watts. Editorial assistance was provided by Ellen Galloway.

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For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

Highlights of the NIOSH Health Hazard Evaluation

Evaluation of the Kentucky Sanitation District #1 Hearing Conservation Program and Employees Noise Exposures

The Kentucky Sanitation District #1 (SD#1) asked NIOSH to evaluate noise exposures to their employees, measure sound level of noise sources, and review a draft copy of their hearing conservation program.

What NIOSH Did

- We measured noise exposures on SD#1 employees.
- We measured noise levels on pumps, compressors, trucks, and other equipment used by SD#1 workers.
- We looked at the SD#1 Hearing Conservation Program (HCP) to see if it had all the components required by the OSHA hearing conservation standard such as employee noise monitoring, audiograms, training, and recordkeeping.

What NIOSH Found

- SD#1 did not have documentation of employee noise monitoring or sound level measurements of noise sources.
- Noise exposure results for a vactor truck driver and his assistant were above the OSHA Action Level (AL) and NIOSH Recommended Exposure Limit (REL).
- Noise exposure results for a treatment plant operator, maintenance worker, and a trackhoe operator and his assistant were above the NIOSH (REL).

What Kentucky Sanitation District #1 Managers Can Do

- Follow NIOSH recommendations to improve your HCP.
- Continue to check noise levels and compare results to evaluation criteria.
- Require the use of hearing protection, such as ear plugs or ear muffs, in areas where noise levels equal or exceed the NIOSH REL.
- Make sure employees who have a standard threshold shift on their hearing test receive proper follow-up, to include written notification and medical evaluation.

What Kentucky Sanitation District #1 Employees Can Do

- Wear hearing protection properly (ear plugs or ear muffs) in noisy areas at work.

What To Do For More Information:
We encourage you to read the full report. If you would like a copy, either ask your health and safety representative to make you a copy or call 1-513-841-4252 and ask for HETA Report 2005-0035-2988

Health Hazard Evaluation Report 2005-0035-2988
Kentucky Sanitation District #1
Ft. Wright, Kentucky
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SUMMARY

On November 8, 2004, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation from the Safety Manager for Kentucky Sanitation District #1 (SD#1) asking for assistance in evaluating the department's Hearing Conservation Program (HCP), employees' daily noise exposures, and sound levels of noise sources. The Sanitation District has 160 employees who maintain and install sewer lines. Workers also operate the Dry Creek Sewage Treatment plant and several small sewage treatment plants and pump stations. Because employees are potentially exposed to noise from pumps, compressors, vacuum trucks used to clear sewer lines, and construction equipment used to maintain and install sewer lines, all employees are included in the SD#1 HCP.

During November 2004 and February 2005 field surveys, NIOSH personnel measured noise levels, conducted noise dosimetry on personnel working around noise sources, and reviewed audiometric records, the OSHA 300 Log of Work-Related Injury and Illnesses, and a draft of the SD#1 written HCP guidelines. Noise sources within the SD#1 ranged from 70-98 dBA. Noise dosimetry results for a vactor truck operator and his assistant exceeded the OSHA Action Level (AL) of 85 dBA as an 8-hour time-weighted average (TWA). Noise dosimetry results for a treatment plant operator, maintenance worker, trackhoe operator and his assistant were above the NIOSH REL. The review of the HCP found no records of previous noise surveys or of noise dosimetry and hearing protection use was optional. Warning signs posted in high noise areas provided time limits for remaining in these areas without hearing protection; however, SD#1 had no noise measurements to support the time limits. Sound level measurements taken by NIOSH investigators in these areas indicated that the time limits did not meet OSHA criteria for noise exposure.

NIOSH investigators conclude that a potential noise hazard exists for SD#1 vactor truck operators, vactor truck assistants, treatment plant operators, maintenance workers, and trackhoe operators. Recommendations are provided to revise the SD#1 written HCP and the noise area warning signs. The recommendations will improve the HCP by ensuring that employees with standard threshold shifts (STSs) receive adequate follow-up and that STSs that meet the OSHA criteria for recordability are recorded on the OSHA 300 Log of Work-Related Injuries and Illnesses

Keywords: NAICS 221320, Noise, sewage plant, compressors, pumps, noise dosimetry, octave band analysis, audiograms, sewage treatment facilities

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INTRODUCTION

On November 8, 2004, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation (HHE) from the Kentucky Sanitation District #1 (SD#1), Ft. Wright, Kentucky. The request asked NIOSH for assistance in evaluating the SD#1 Hearing Conservation Program (HCP) and employees' exposures to noise. On November 11, 2004, NIOSH investigators visited the SD#1 and met with employee and safety representatives to discuss the scope of the evaluation. NIOSH investigators conducted a walk-through of the Dry Creek Treatment Plant in Villa Hills, Kentucky and the SD#1 Lakeview facilities in Ft. Wright, Kentucky. They also reviewed audiometric records, a draft of the written HCP, training records, and the Occupational Safety and Health Administration (OSHA) Form 300 Log of Work-Related Injury and Illnesses. During November 18-19, 2004, and February 15-16, 2005, NIOSH investigators conducted full shift personal noise dosimetry and measured sound levels of noise sources. This report provides the results of this evaluation and recommendations for improving the SD#1 Hearing Conservation Program.

BACKGROUND

Process Description

The SD#1 maintains the sewer and storm drainage systems for 33 cities in northern Kentucky and oversees 123 pumping stations, 15 flood pump stations, 9 small treatment plants, the Dry Creek Sewage Treatment Plant, and the Collections Systems Department (CSD). The CSD is comprised of a Construction Section and a Customer Service Section. This HHE evaluated noise exposures on employees within the Dry Creek Sewage Treatment Plant and the CSD.

A total of 65 employees are assigned to the Dry Creek Sewage Treatment Plant at Villa Hills, Kentucky, as operators, maintenance specialists, or laboratory personnel. The Dry Creek Sewage Treatment Plant has three departments; Operations, Maintenance, and Laboratory. The Operations Department has 20 treatment plant operators, 8 pump station operators, and 7 small plant operators. The Maintenance Department has 13 general maintenance workers, 7 electricians, and 2 heating, ventilation, and air conditioning mechanics. The laboratory has 8 employees in addition to the Lab Manager. The 20 treatment plant operators are divided into five-member crews who work 12-hour shifts performing a variety of tasks in the Control Room, the Zimpro Room (where sludge digestion occurs), the Chlorinator Room, and the Compressor Room. During their shift the plant operators typically spend 6 hours in the Control Room and 6 hours walking through the sewage treatment plant inspecting pumps, compressors, pressure gauges, and other components. The 25 maintenance specialists work 8-hour shifts maintaining the sewage treatment plant equipment. There are also eight pump station operators and seven small plant operators located throughout northern Kentucky.

The CSD in Lakeview, Kentucky, employs 33 people in the Construction Department who install and repair sewer lines, storm drainage lines, manholes, and other sewer related construction activities. As such, these workers are exposed to noise from heavy equipment such as bulldozers and trackhoes, and tools such as jack hammers and circular saws. There are 27 employees assigned to the Customer Service Department to respond to trouble calls. These workers operate vacuum trucks (called vactor trucks) which use high-pressure water to dislodge grease and other debris from clogged sewer lines. If necessary, this waste material is then sucked from the sewer line.

METHODS

Noise Monitoring

Because all SD#1 employees participate in the HCP, NIOSH investigators selected employees from each job classification for noise dosimetry. The job categories evaluated were: Vactor Truck Operator and Assistant; Dry Creek Sewage Treatment Plant Operators working in the Zimpro Room; Control Room, Chlorinator

Room, and Compressor Room; electricians; maintenance personnel; construction workers from the CSD; small plant operators; and pump station operators. In addition, real-time instantaneous noise monitoring was conducted on noise sources identified during the evaluation.

Noise Sampling Instrumentation

Quest® Electronics Model Q-300 Noise Dosimeters were worn by the employees while they performed their daily activities. The noise dosimeters were clipped to the employee's belt, and a small microphone connected to the noise dosimeter was fastened to the employee's shoulder halfway between the collar and the end of the employee's shoulder. A windscreen provided by the dosimeter manufacturer was placed over the microphone during recordings. At the end of the employee's work shift the dosimeter was removed and paused to stop data collection. The information stored in the dosimeters was downloaded to a personal computer for interpretation with QuestSuite for Windows® software. All noise dosimeters were calibrated before and after use with a Quest CA-12B model calibrator according to the manufacturer's instructions.

Real time, instantaneous noise monitoring was done with a Quest Electronics Model 2400 Type II Sound Level Meter (SLM). The instrument was set to measure noise levels between 70 and 140 decibels (dB) on an A-weighted, slow-response scale (dBA). The SLM was calibrated before and after the measurement periods with a Quest CA-12B calibrator. Noise level readings were obtained three feet from each noise source. Both dBA and dBC readings were recorded. The dBC network (scale) on a sound level meter does not reflect relative attenuation of low frequencies as does the A-weighted network.

EVALUATION CRITERIA

Noise-induced loss of hearing is an irreversible, sensorineural condition that progresses with exposure. Although hearing ability declines with age (presbycusis) in all populations, exposure to noise produces hearing loss greater than that resulting from the natural aging process. This noise-induced loss is caused by damage to nerve cells of the inner ear (cochlea) and, unlike some conductive hearing disorders, cannot be treated medically.[1] While loss of hearing may result from a single exposure to a very brief impulse noise or explosion, such traumatic losses are rare. In most cases, noise-induced hearing loss is insidious. Typically, it begins to develop at 4000 or 6000 Hz (the hearing range is 20 Hz to 20000 Hz) and spreads to lower and higher frequencies. Often, material impairment has occurred before the condition is clearly recognized. Such impairment is usually severe enough to permanently affect a person's ability to hear and understand speech under everyday conditions. Although the primary frequencies of human speech range from 200 Hz to 2000 Hz, research has shown that the consonant sounds, which enable people to distinguish words such as "fish" from "fist," have still higher frequency components.[2]

The A-weighted decibel (dBA) is the preferred unit for measuring sound levels to assess worker noise exposures. The dBA scale is weighted to approximate the sensory response of the human ear to sound frequencies near the threshold of hearing. The decibel unit is dimensionless, and represents the logarithmic relationship of the measured sound pressure level to an arbitrary reference sound pressure (20 micropascals, the normal threshold of human hearing at a frequency of 1000 Hz). Decibel units are used because of the very large range of sound pressure levels which are audible to the human ear. Because the dBA scale is logarithmic, increases of 3 dBA, 10 dBA, and 20 dBA represent a doubling, tenfold increase, and hundredfold increase of sound energy, respectively. It should be noted that noise exposures expressed in decibels cannot be averaged by taking the simple arithmetic mean.

The OSHA standard for occupational exposure to noise (29 CFR 1910.95)[3] specifies a maximum PEL of 90 dBA for a duration of 8 hours per day. The regulation, in calculating the PEL, uses a 5 dB time/intensity trading relationship, or exchange rate. This means that a person may be exposed to noise levels of 95 dBA for no more than 4 hours, to 100 dBA for 2

hours, etc. Conversely, up to 16 hours exposure to 85 dBA is allowed by this exchange rate. The duration and sound level intensities can be combined in order to calculate a worker's daily noise dose according to the formula:

Dose = 100 X ($C_1/T_1 + C_2/T_2 + ... + C_n/T_n$),

where C_n indicates the total time of exposure at a specific noise level and T_n indicates the reference duration for that level as given in Table G-16a of the OSHA noise regulation. During any 24-hour period, a worker is allowed up to 100% of his daily noise dose. Doses greater than 100% are in excess of the OSHA PEL.

The OSHA regulation has an additional action level (AL) of 85 dBA; an employer shall administer a continuing, effective hearing conservation program when the 8-hour time-weighted average (TWA) value exceeds the AL. The program must include monitoring, employee notification, observation, audiometric testing, hearing protectors, training, and record keeping. All of these requirements are included in 29 CFR 1910.95, paragraphs (c) through (o). Finally, the OSHA noise standard states that when workers are exposed to noise levels in excess of the OSHA PEL of 90 dBA, feasible engineering or administrative controls shall be implemented to reduce the workers' exposure levels.

NIOSH, in its Criteria for a Recommended Standard,[4] and the ACGIH,[5] propose exposure criteria of 85 dBA as a TWA for 8 hours, 5 dB less than the OSHA standard. The criteria also use a more conservative 3 dB time/intensity trading relationship in calculating exposure limits. Thus, a worker can be exposed to 85 dBA for 8 hours, but to no more than 88 dBA for 4 hours or 91 dBA for 2 hours. Twelve-hour exposures have to be 83 dBA or less according to the NIOSH REL.

RESULTS

Employee Noise Exposure Monitoring

NIOSH investigators collected 20 full-shift personal noise dosimetry samples on SD#1 employees during the November 18-19, 2004, and February 15-16, 2005, field surveys. The noise dosimeters were set to integrate noise exposure data using both NIOSH and OSHA criteria. Noise dosimetry was performed on four Dry Creek Sewage Treatment Plant Operators, two vactor truck operators, two electricians, one maintenance worker, two small plant operators, and two construction workers. No sample results exceeded the OSHA PEL; however, results for a vactor truck operator and his assistant exceeded the OSHA AL. Six of 20 noise dosimeter results exceeded the NIOSH REL, and five others were within 1 decibel of the REL. These job categories included trackhoe and vactor truck operators, a vactor truck assistant, a treatment plant operator, and a maintenance worker. The personal noise dosimetry results are provided in Table 1. Noise dosimeter results for the trackhoe operator and assistant ranged from 81.5-87.1 dBA (sample size = 3) using NIOSH criteria. Results for the vactor truck operator and assistant ranged from 84.4-92.2 dBA (sample size = 4), for the small plant operators 79.3-79.9 dBA (sample size = 2), for the electricians 78.1-84.4 dBA (sample size = 2), for the treatment plant operators 78.6-86 dBA (sample size = 5), 76.5-86.1 dBA (sample size = 3) for the maintenance workers, and 84.4 dBA for a pump station operator. Exposure results varied daily. For example maintenance workers and electricians may spend one day working on equipment in a noisy room and another day working in a relatively quiet area. For trackhoe and vactor truck operators the daily noise exposure depends on their workload, i.e., how often they operate the equipment.

The vactor truck operator was observed wearing damaged ear muffs (the foam seal was cracked and had lost elasticity), and the vactor truck assistant wore ear plugs, but only intermittently. Sound levels measured inside a vactor truck cab while driving to a job site ranged from 70 dBA with the windows closed to 84 dBA with the windows open.

Sound Level Readings of Noise Sources

Sound level readings were made at sources that were either on a list provided by the SD#1

Safety Manager or were noted during the NIOSH walk-through. Sound levels ranged from 70-98 dBA and 73-117 dBC. The dBC sound level readings were higher than their corresponding dBA readings, indicating that lower frequency noise was present. Table 2 lists the noise sources measured, but does not include all potential noise sources at SD#1, such as pneumatic and other powered tools. Sound level readings of handheld pneumatic and powered tools were not conducted due to intermittent use. For the vactor truck the highest sound level reading recorded was by the driver's side when unreeling the hose. There was little variation in noise levels in rooms with compressors and pumps; sound levels were generally around 90 dBA. Sludge pumps C and D were as much as 10 dBA louder than other sludge pumps. Blower #2 was also a very loud noise source with sound level readings of 95-99 dBA. Revving up the engine on a Bobcat increased the noise level from 84 dBA with the engine idling to 101 dBA. The cement truck was also a loud noise source with sound level readings ranging from 86-99 dBA depending on where the measurement was taken.

Hearing Conservation Program

The written SD#1 Respiratory Protection Program (RPP) was used as a template for the written HCP. Several sections from the RPP still erroneously remained in the HCP. A review of the audiometric records revealed that many employees had large threshold shifts (in some cases as much as 50 dB increases at some frequencies relative to the baseline). In addition, records indicated that many of the Standard Threshold Shifts (STS) that met the OSHA criteria for a recordable hearing loss had not been recorded on the OSHA 300 Log. There was also no indication in the company records that these employees had been provided written notification of the STS within 21 days as required by OSHA.

Employees were provided hearing protection, but use was voluntary. They have a choice of MSA Sound Blocker ear muffs with a noise reduction rating (NRR) of 26 dB, E-A-R Classic® Foam ear plugs with a NRR of 29 dB, and Howard Leight Max™ ear plugs with a NRR of 33 dB.

While warning signs posted in high noise areas provided time limits for unprotected entry into these areas, the SD#1 had no documentation of previous noise dosimetry or sound level measurements of noise sources to substantiate these time limits.

DISCUSSION

Based on noise dosimetry results only the vactor truck operator and assistant met the OSHA criteria for inclusion in a HCP. Because noise dosimetry results for trackhoe and treatment plant operators and maintenance workers, exceeded the NIOSH REL for noise, NIOSH recommends including them in the SD#1 HCP.

The SD#1 HCP requires modifications to meet OSHA requirements and NIOSH recommendations. OSHA requirements for a HCP include: an employee noise monitoring program, annual audiograms for current employees in the program and baseline audiograms for new employees who will working in job categories with the potential for hazardous noise exposure based on noise dosimetry results, proper follow-up of employees with an STS and notification of the STS within 21 days, proper training on the hazards of noise exposure and how to care for hearing protective devices (HPDs), when to replace HPDs, and logging STSs that meet the OSHA criteria for recordability on the OSHA 300 Log.

Engineering controls should be the first order of protection from excessive noise exposure. NIOSH defines engineering control "as any modification or replacement of equipment or related physical change at the noise source or along the transmission path (with the exception of hearing protectors) that reduces the noise level at the employee's ear." A practical solution would be buying less noisy equipment when equipment has to be replaced and administering an effective hearing conservation program.

RECOMMENDATIONS

NIOSH investigators offer the following recommendations to improve the SD#1 HCP and to protect workers from noise-induced hearing loss.

1. Ensure that vactor truck operators and assistants remain in the SD #1 HCP. Additionally, because noise exposures for the trackhoe operator, a treatment plant operator, and a maintenance worker exceeded the NIOSH REL, these employees should also remain in the HCP.

2. Improve the written guidelines for your HCP by removing references to respiratory protection, identifying which job categories should participate in the HCP, and including a list of hazardous noise areas and equipment. The following NIOSH website includes a NIOSH Hearing Conservation checklist that may be useful in managing the HCP: http://www.cdc.gov/niosh/hpprgmch.html

3. Ask vehicle occupants to keep the windows closed when driving vactor trucks, roto rooter trucks, the cement trucks, and other vehicles that produce loud noise.

4. Require employees whose noise dosimetry results exceeded the OSHA AL or NIOSH REL to wear hearing protection while in noise hazardous areas until noise levels are reduced through engineering controls or noise dosimetry indicates that employee noise exposures are below an 8-hour TWA of 85 dBA. The MSA ear muffs and the E-A-R® and MAX® earplugs worn by employees will provide adequate hearing protection if properly worn.

5. Train employees on how to properly insert and maintain hearing protection devices. Employees with an STS are required to wear hearing protection.

6. Replace the noise warning signs with signs that require the use of hearing protection at all times when in a hazardous noise area. Do not provide time limits for unprotected entry into hazardous noise areas.

7. Record eligible STSs on the OSHA 300 Log of Work-related Injuries and Illnesses and ensure that employees who have an STS receive adequate follow-up as required by OSHA standard 29 CFR 1910.95. A flow chart for determining whether an STS is recordable is provided in Appendix 1.

8. Train a safety representative to interpret audiometric results and ensure proper follow-up of employees with a STS. The following website has training courses approved by the Council for Accreditation on Hearing Conservation: http://www.caohc.org/ohccertified.html.

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Table 1
Personal Noise Dosimeter Results
KY Sanitation District #1
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Date	Department	Duration (hh:mm)	Job Task	Dose (Percent)			8-hr TWA in dBA[4]		
				OSHA AL[1]	OSHA PEL[2]	NIOSH/ ACGIH[3]	OSHA AL[1]	OSHA PEL[2]	NIOSH/ ACGIH[3]
11/18/04	Construction	09:00	Trackhoe Operator	45.3	19.2	162.6	84.3	78.1	87.1
	Plant Operations	07:52	Small Plant Operator	9.9	0.8	27.0	73.3	55.4	79.3
	Customer Service	07:37	Vactor Truck Assistant	23.4	8.8	86.8	79.5	72.5	84.4
	Plant Operations	07:25	Small Plant Operator	8.9	2.1	31.0	72.5	62.0	79.9
	Plant Operations	07:58	Electrician	5.8	1.5	20.5	69.5	59.7	78.1
	Plant Operations	08:00	Maintenance	7.9	3.7	78.8	71.7	66.1	84.0
	Customer Service	07:25	Vactor Truck	32.0	15.7	116.9	81.8	76.6	85.7
	Plant Operations	11:33	Operator Zimpro	6.3	1.9	23.1	70.1	61.6	78.6
	Plant Operations	11:48	Operator	26.2	9.7	79.4	80.3	73.1	84.0
11/19/04	Plant Operations	11:40	Operator	32.2	17	125.4	81.8	77.2	86.0
	Plant Operations	07:28	Electrician	4.0	2.7	88.0	66.7	63.8	84.4
	Plant Operations	11:28	Operator Zimpro	10.3	3.6	39.1	73.6	65.9	80.9
2/15/05	Plant Operations	12:25	Operator Zimpro	20.1	5.9	60.9	78.4	69.6	82.8
	Plant Operations	07:39	Pump Station	24.8	10.5	88.1	79.9	73.8	84.4
	Customer Service	07:58	Vactor Truck Assistant	52.6	28.8	202.3	85.4	81.0	88.1
	Construction	07:54	Trackhoe Operator	10.5	4.7	67.4	73.8	67.9	83.3
	Construction	07:49	Trackhoe Op Assistant	11.9	3.7	45.1	74.6	66.2	81.5
	Customer Service	07:58	Vactor Truck Operator	80.2	59.7	523.3	88.4	86.3	92.2
2/16/05	Plant Operations	07:46	Maintenance*	8.9	3.7	130.3	72.5	66.3	86.1
	Plant Operations	07:45	Maintenance	4.9	0.4	14.0	68.3	50.7	76.5

The dose percentages are the amount of noise accumulated during a work day, with 100% representing the maximum allowable daily dose. 8-hr TWA refers to the averaging of different noise exposure levels during a sample period.

[1] AL: OSHA Action Level = 85 dBA or 50% dose

[2] PEL: OSHA Permissible Exposure Limit = 90 dBA or 100% dose

[3] NIOSH/ACGIH REL = 85 dBA or 100% dose

[4] 8-hr Time-weighted average in decibels on an A-weighted scale. Calculated for OSHA AL using a 90 dBA criterion and a 5 dB exchange rate integrating all sounds from 70-140 dBA. Calculated for OSHA PEL using a 90 dBA criterion and a 5 dB exchange rate integrating all sounds from 90-140 dBA. For NIOSH/ACGIH the TWA is calculated using an 85 dBA criterion and a 3 dB exchange rate integrating all sounds from 70-140 dBA.

* Working on boiler in Zimpro room.

Table 2
Noise Sources
KY Sanitation District #1
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Noise Source	Location of Measurement*	dBA	dBC
Vacuum Truck	In cab driver's side window closed	70	101
Vacuum Truck	In cab driver's side window open	84	109
Vacuum Truck	In cab passenger's side window open	84	108
Vacuum Truck	Operator unreeling hose, standing by control panel	93	101
Vacuum Truck	Assistant unreeling hose approx 30 feet from the truck	78	88
Vacuum Truck	Unreeling hose standing by driver's side door	98	107
Compressor Room	Right side 701A	90	116
Compressor Room	Front of 701A	90	115
Compressor Room	Between 701A & 701C	90	111
Compressor Room	Front of 701C	91	117
Compressor Room	Left side of 701C	91	110
Compressor Room	Front bag pump A	91	111
Compressor Room	Front bag pump B	91	110
Sludge Pumps C & D	Front	97	97
Sludge Pumps A & B	Front	88	89
Sludge Pumps E & F	Front	75	78
Chlorinator Room	Center	71	73
Grease Concentrator	Front	72	79
Roto Rooter Truck	Outside passenger side	85	89
Neaves Sanitation Truck	Outside passenger side	92	105
Turboplex Blower	Front	95	96
Plant Drain Pump	Front	86	101
Plant Water Pump	Front	90	98
D & E Scrubber Fans	Front	90	97
Zimpro Control Room	Center	65	76
Zimpro Heat Exchanger A	Front	89	96
Zimpro Heat Exchanger B	Front	89	96
Zimpro Heat Exchanger C	Front	88	97

Table 2 Cont'd Noise Sources KY Sanitation District #1 HETA 2005-0035-2988			
Noise Source	**Location of Measurement***	**dBA**	**dBC**
Steam Generator A	Front	88	96
Steam Generator B	Front	87	95
Steam Generator C	Front	87	96
Bobcat small bulldozer	By driver's seat, engine idling	85	91
Bobcat small bulldozer	By driver's seat, engine revved	101	104
Bobcat small bulldozer	In cab driver's seat engine revved	96	102
Bobcat small bulldozer	In cab driver's seat engine idling	84	91
Blower Room	Center	92	95
Zimpro Room	By boilers	88	92
Cement Truck for backfill	Front driver's side	99	100
Cement Truck for Backfill	Front passenger's side	97	102
Cement Truck for Backfill	Back driver's side	86	93
Cement Truck for Backfill	Back passenger's side	87	92
Blower #2	Front	95	95
Blower #2	Side	99	100

* Sound level readings were taken 3 feet from the noise source.
dBA = Sound level in decibels read on the A scale of the sound level meter
dBC = Sound level in decibels read on the C scale of the sound level meter

Appendix 1
Standard Threshold Shift Flow Chart
Kentucky Sanitation District
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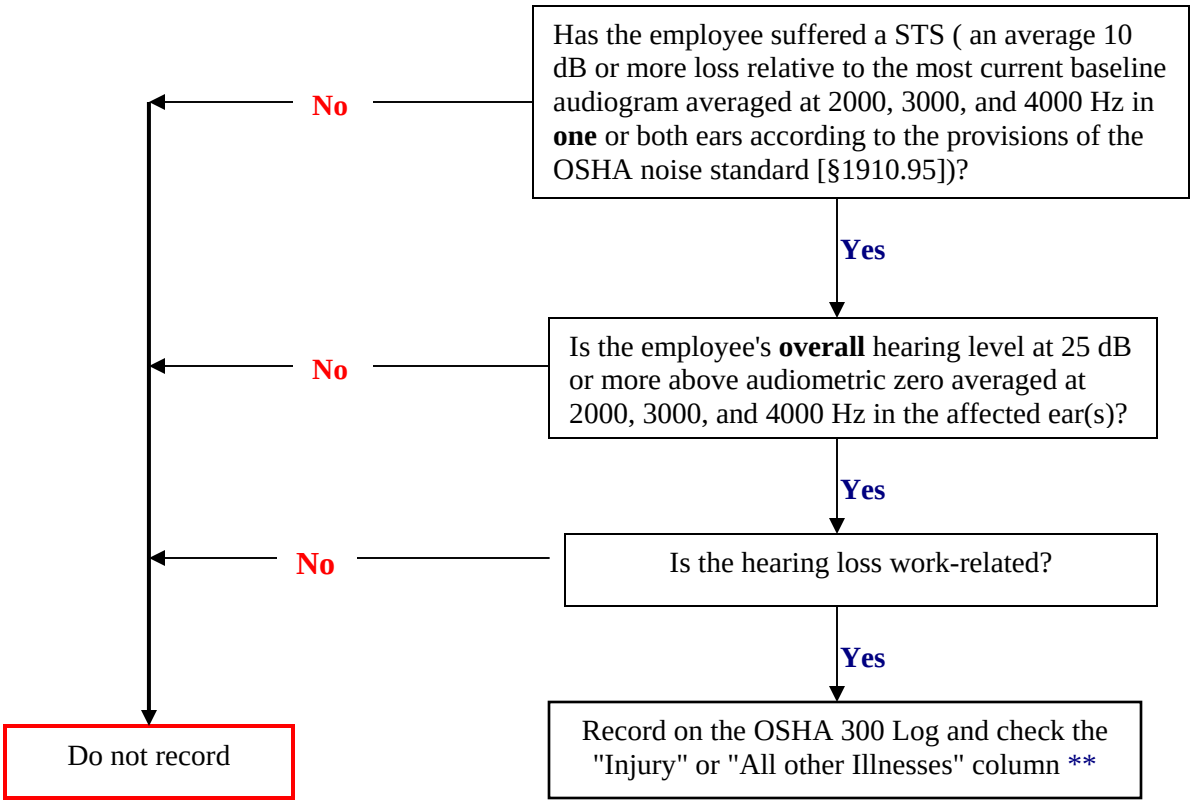
Use this **'decision tree'** to determine whether the results of an audiometric exam given on or after January 1, 2003 reveal a recordable Standard Threshold Shift **(STS)**.



Note: In all cases, use the current baseline to determine recordability as you would to calculate a STS under the hearing conservation provisions of the noise standard (§1910.95). If an STS occurs in only one ear, you may only revise the baseline audiogram for that ear.
* The audiogram may be adjusted for presbycusis (aging as set out in 1910.95).
** A separate hearing loss column on the OSHA 300 Log beginning in Calendar year 2004.

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