WOODWARD-CLYDE CONSULTANTS

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Date: 8/18/93
Project: 93C0243A

TO: Dr. Ravi Arulanantham
Alameda County Dept. of Environmental Health
80 Swan Way, Room 200
Oakland, CA 94621

SUBJECT: Verdese Carter Park
Remediation Workplan

Transmitted herewith, is our draft Site Health & Safety Plan and Air Monitoring Plan for the upcoming contaminated soil removal work. We will send you sections of the overall draft remediation workplan as they are developed to keep you fully "within the loop".

Sincerely,

Michael McGuire, P.E.
Project Engineer
phone 510/874-3288

DRAFT SITE SAFETY PLAN
VERDESE CARTER PARK
98TH & SUNNYSIDE
OAKLAND, CA

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SCA ENVIRONMENTAL PROJECT NO. BI-777

1.0 FACILITY BACKGROUND & WORKPLAN

This site safety plan (SSP) is for remediation of lead- and arsenic-containing soils at Verdese Carter Park (the park) in Oakland, California. The park is located between 96th and 98th Avenues and between Sunnyside Street and Bancroft Avenues (see Figures 1 and 2 of this report). The remediation project will involve removal of lead- and arsenic-containing soils from the site. All lead and arsenic-containing soils which contain concentrations above a project limit (to be set) will be removed.

This SSP is designed as a comprehensive document. Procedures and requirements listed in this document are mandatory for all site personnel, including contractors, subcontractors, engineering personnel, health and safety personnel, etc. In some sections of this SSP, due to the highly specialized nature of the information, the SSP's of individual contractors, subcontractors, etc. are included by reference. A safe and accident-free job can only occur with good communications between groups. All site personnel are encouraged to develop good communication practices with all co-workers at the site.

Previous operations at the site include a wet-cell battery manufacturing operation and a plant nursery. Site characterization studies by Woodward-Clyde Consultants (WCC) have identified lead and arsenic at various soil depths throughout most of the park (reference: *Site Characterization Report for Verdese Carter Park*, dated July 19, 1993, WCC Project No. 93CO243A). In addition, elevated soil levels of lead and arsenic may also exist offsite under adjacent streets.

Concentrations of lead and arsenic, as measured by WCC, are tabulated in the following table. For more detailed information of WCC's soil sample results, see Appendix 1 of this report.

Analyte and Matrix	Range of Results Measured by WCC Site Characterization Study	Method(s)
Lead in Soil	<5 mg/kg to 6700 mg/kg	CAM 17 (EPA 6010)
Arsenic in Soil	<5 mg/kg to 734 mg/kg	EPA 6010

Other metals detected in the soil samples include mercury, chromium, antimony, copper, molybdenum, nickel, selenium, silver, vanadium, and zinc. In all cases, the metals were well below the Federal EPA and California EPA levels for hazardous wastes.

In general, the lead and arsenic are spread throughout the soil at the site, at various depths and varying concentrations. Exposure to the lead and arsenic by workers at the site would be through one of two primary routes:

- Inhalation of dust which contained lead and/or arsenic; this inhalation could occur at the site due to dusty conditions. In addition, it could occur after the worker has left the site and is exposed to dust which has settled on clothing, tools, vehicles, etc.
- Ingestion (swallowing) of dust which contained lead and/or arsenic; swallowing the dust could occur at the park or near the park after accidental contamination of food, beverages, cigarettes, or due to contamination of plates, silverware, drinking glasses, etc. Contamination of food items could also occur after the worker has left the site, from lead and arsenic dust on a worker's face, hands, hair, etc. if the worker does not thoroughly decontaminate prior to eating.

The lead and arsenic at the site are thought to occur only in a mixture with the soils. Unlike hydrocarbon-contaminated soils, which may have a tell-tale stained appearance, the lead- and arsenic-contaminated soils at the park may not be visibly different from the non-contaminated soils.

The remediation project has as its goals the safe removal and disposal of lead- and arsenic-containing soils at the park, and possibly under adjacent streets. The project will be considered a success only if this work is completed without safety or health impacts to the workers at the site, the surrounding communities, and the general environment.

2.0 KEY PERSONNEL AND RESPONSIBILITIES

Key personnel on the project are listed as follows:

Title	Name	Firm	Phone Number	Pager Number
City of Oakland Project Manager	Harry Shrauth, Office of Environmental Affairs	OPW	(510)	
Project Manager	Mike McGuire, PE Linda Locke, PE	WCC	(510) 893-3600	
Site Safety Officer	Steve Valladolid, EIT	SCA	(510) 848-0390	(510) 678-6216
Industrial Hygienist	Chuck Siu, CIH	SCA	(510) 848-0390	(510) 678-6592

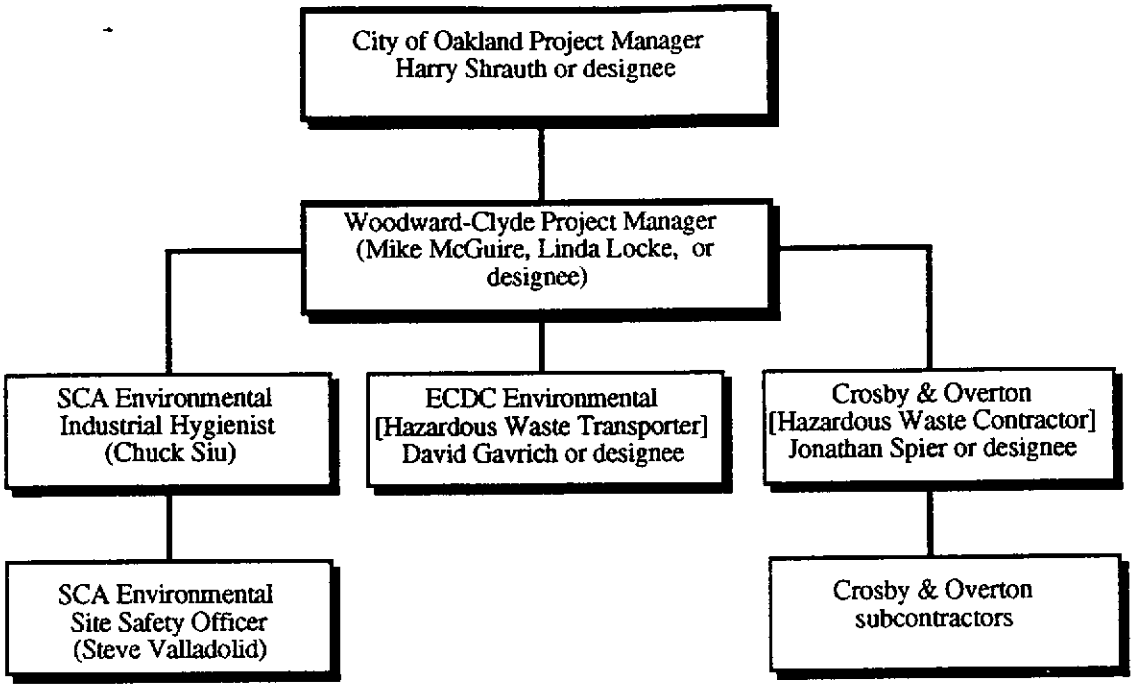
Woodward-Clyde's Project Managers are Mike McGuire and Linda Locke, who will be responsible for coordination, scheduling, and administrative issues, and who are representing the City of Oakland.

The Site Safety Officer will be Steve Valladolid of SCA Environmental. Mr. Valladolid will verify, based on spot checks, routine observations, and unannounced audits, that all site personnel are following procedures outlined in this SSP and in the project workplan. Mr. Valladolid will collect fenceline air samples and meteorological data to ascertain the extent of airborne emissions from the remediation project. Mr. Valladolid will be at the project site during critical phases of the project and for at least several hours each day. Mr. Valladolid will have the authority to temporarily suspend work in the event that a flagrant violation of the work procedures is observed, or if air sampling data or weather conditions so dictate. Note that the contractors will collect personal samples for lead, arsenic, and other materials as required by the various OSHA regulations which they operate under.

The project Industrial Hygienist will be Chuck Siu of SCA Environmental. Mr. Siu will design air sampling protocols and personal protective equipment requirements. In addition, Mr. Siu will review air sampling data, meteorological data, and daily reports on work activities and compliance with designated work procedures.

All personnel are responsible for following all procedures outlined in this SSP and in the workplan created by Woodward-Clyde Consultants. In addition, all personnel are responsible for bringing to the attention of the Site Safety Officer or the Project Manager any suspected unsafe or hazardous working conditions.

Reporting procedures and chain of command will be as follows:



3.0 JOB HAZARD ANALYSIS

The remediation project at the park may potentially expose workers to a variety of hazards. Each employer is responsible for safety aspects of its employees work. Tailgate-type safety meetings will be held at the start of the project, and will also be conducted for new staff coming to the site.

For purposes of discussion, the potential hazards at the park are divided into chemical and physical in this SSP.

Chemical hazards:
Primary chemical hazards at the site include lead and arsenic metals found in the soils. These materials are found in a soil matrix only. Soils containing these metals are indistinguishable from soils which do not, so all soil should be treated as potentially lead- and arsenic-containing.

Negative health effects of lead exposure include damage to the brain, nervous systems, and digestive systems. In addition, lead is a suspected teratogen, meaning that it can cause birth defects when pregnant women are exposed to it in sufficient quantities. Lead is cumulative in the body's tissues. Acute effects of lead exposure include irritation of the intestinal tract, leg cramps, muscle weakness, depression, coma, and even death in extreme cases. Chronic effects of lead exposure include facial pallor (paleness), a dark "lead line" on the gums, anemia, jaundice, and nerve damage.

Negative health effects of arsenic exposure include lung cancer and skin irritation. Acute effects of arsenic exposure include acute gastritis (irritation and pain of the gastrointestinal tract), as well as headache, vertigo, muscle spasm, and deliriums. Chronic effects of arsenic exposure include severe neural damage and crippling, and lung cancer..

Regulatory and recommended limits for airborne exposure to lead are listed in the table which follows:

Reference	Exposure Limit	Comment
California OSHA Lead Safety Standard 8 CCR 5216	Action Level: 30 µg/cubic meter as an 8-hour time-weighted average Permissible Exposure Level (PEL): 50 µg/cubic meter as an 8-hour time-weighted average	Where workers' exposures exceed the action level, employers are required by OSHA to provide training, biological monitoring, respiratory protection, and periodic exposure monitoring.
National Institute of Occupational Safety and Health	100 µg/cubic meter	Recommended level only, not enforceable by statute
American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values	150 µg/cubic meter	Recommended level only, not enforceable by statute

Regulatory and recommended limits for airborne exposure to arsenic are listed in the table which follows:

Reference	Exposure Limit	Comment
California OSHA Arsenic Standard; 8 CCR 5214	Action Level: 5 µg/cubic meter as an 8-hour time-weighted average Permissible Exposure Level (PEL): 10 µg/cubic meter as an 8-hour time-weighted average	Where workers' exposures exceed the action limit, employers are required by OSHA to provide training, biological monitoring, respiratory protection, and periodic exposure monitoring.
National Institute of Occupational Safety and Health	2 µg/cubic meter 15-minute "ceiling" exposure	Recommended level only, not enforceable by statute
American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values	200 µg/cubic meter 8-hour time-weighted average	Recommended level only, not enforceable by statute

Physical Hazards:

A variety of physical hazards may be encountered on the project. The list given here is not meant to be comprehensive, but is meant to reflect the nature and type of physical hazards which may be encountered.

Heat Cramps, Heat Stress, and Heat Stroke

Heat-related injuries are a potential hazard on the job due to the required personal protective equipment. Heat cramps, stress, and stroke are all caused by continuous heavy exertion in warm environments. This continued exertion can exceed the body's ability to cool itself. The symptoms range from fairly mild symptoms (in the case of heat cramps) to incapacitation, brain damage, and/or death in the case of heat stress or heat stroke.

Anticipated weather conditions for the project are 50-80 F° during working hours, with relative humidities of 75% and below. Sunny weather will increase the heat load to the worker.

All companies with personnel at the site are required to have established rest procedures for employees engaged in heavy, continuous, manual labor. In addition, all companies are expected to have in-house policies for personal and area monitoring, where required by regulation.

Underground Utilities

Underground utilities carrying natural gas or high-voltage electricity can be encountered when digging or trenching. Accidental digging of these services can lead to disruption of electrical or gas service for households served by the underground utility. In addition, there is a risk to site personnel of electrocution and natural gas explosions.

Crosby & Overton personnel will be responsible for ascertaining the location of underground utilities prior to operating any digging or trenching equipment at the site. Remediation activities that require removing soil immediately adjacent to any utility lines will be performed by hand, and will be coordinated with the company which owns the utility lines

Trenching Activities

All trenching operations will involve shoring trench walls as required by OSHA construction regulations.

Explosion hazards

Gasoline and other fuels can form an explosion hazard. Explosions caused by these materials on other construction projects have led to serious injury or death.

Gasoline or other fuels should not be stored at the site, as far as is feasible. If their use is essential to the project and no alternative is available, they will be stored in containers designed for the purpose, and will be clearly labelled as flammable and gasoline-containing.

Noise

Construction equipment in use at the project should be expected to emit high noise levels. High noise levels can cause temporary and permanent hearing loss, fatigue, and disorientation.

Contractors and subcontractors on the site who operate the machinery or are otherwise exposed to high noise levels will be enrolled in a Hearing Conservation Plan as defined by Federal OSHA standard 29 CFR 1910.95. Non-contractor personnel may be required to enroll in a Hearing Conservation Plan if their exposure at the jobsite warrants it.

Moving Equipment Hazards

Heavy equipment in use at the site will pose a safety hazard to all personnel working nearby. In addition, to a source of high noise levels, heavy equipment can cause serious or deadly bodily harm

Heavy machinery operated by Crosby & Overton or their subcontractors will need to have appropriate back-up audible warning alarms which are loud enough to be heard by workers wearing hearing protection. Areas where heavy equipment is operating should be cordoned off with caution tape or construction barriers.

A Crosby & Overton supervisor must be present at the site any time that heavy equipment is in use. The supervisor is responsible to ensure that safety risks associated with use of the equipment are minimized. The supervisor must be able to reach the equipment operators by radio at all times.

Any workers at the site who need to access the areas where the heavy equipment is operating (for example, a geologist who needs to take a soil sample or make observations of soil) must first speak to the supervisor. The supervisor will contact the equipment operator by radio or hand signals in order to temporarily stop the equipment from operating during the time that the individual is in the area.

Waste Transporter Trucks

ECDC Environmental, the waste transporter, will use tractor-trailer trucks to remove contaminated soils from the site. These trucks are a potential hazard to workers at the site due to the possibility of a worker being struck or injured by a moving truck.

These trucks must remain in identified areas of the site during pick-up of soils. The pick-up route will be set up so that the trucks will not need to backup (a potentially dangerous operation) but can enter from one side of the site and exit out the other.

Ultraviolet light hazards

Sunlight can cause high exposures to ultraviolet light in personnel who are exposed to it for long durations. Ultraviolet light may cause skin cancers (melanomas) and premature aging of the skin.

Project personnel will wear clothing which covers the entire body for the majority of the project. For work which does not take place in full-body protective clothing, workers will use a combination of clothing and waterproof sun-screen lotion with an appropriate SPF rating to limit exposure to ultraviolet light.

Miscellaneous Safety Hazards

Miscellaneous safety hazards, such as falling objects, trip hazards, sharp objects on equipment, moving equipment parts, etc. are expected due to the nature of the project.

Various protective equipment will be worn to minimize injury from these safety hazards. This safety equipment will be worn at the site at all times:

- Leather Gloves;
- Steel-toed and steel-shanked boots;
- Long sleeved shirts or coveralls;
- Long pants or coveralls;
- Eye protection as required (based on dusty activities);

4.0 JOB HAZARD SUMMARY

Community Risks:
Risks to the surrounding community are expected to consist primarily of the movement of lead- and arsenic-containing dust off-site during excavation of soil, movement of soil to stockpile areas, storage of soil in stockpile areas, loading of soil into transporter trucks, and movement of transporter trucks off the site and through the neighborhood.

The extent of dust generation and movement during the remediation project will be controlled by wetting and by covering loose dirt with tarpaulins. See the following section of this site safety plan (Exposure Monitoring Plan) for details on air sampling, meteorological monitoring, and reporting procedures.

Offsite movement of lead and arsenic-containing water could also pose a potential environmental threat to the surrounding community. Water use at the site will be carefully monitored by the contractor to ensure that flowing water does not move off-site.

The health effects of lead and arsenic are detailed in section 3 of this report (Job Hazard Analysis).

Additional risks to the community will include increased noise levels during remediation activities. Contractor equipment at the site will be in compliance with City of Oakland community noise standards, however, it is expected that some increase in perceptible noise levels will still occur. High community noise levels can have negative health impacts, including increased stress levels.

Worker Risks:
All personnel at the site will be exposed to the physical and chemical hazards listed in section 3 of this report.

The primary chemical hazards are lead and arsenic in the soil. These materials are present in high enough quantities to potentially cause exposures above the Cal/OSHA action levels, based on sample results from WCC's initial site characterization report.

Physical risks include all the items listed in section 3, including heat-related conditions, underground utilities, trenching activities, explosion hazards, noise, moving equipment hazards, waste transporter truck movements, etc.

5.0 EXPOSURE MONITORING PLAN

Air Monitoring Plan

Four types of air quality and related monitoring will be conducted as part of the project, they are listed as follows:

Type of Monitoring	Agents	Responsibility	Reference Section of Air Monitoring Plan
Daily Fence line	Arsenic, Lead	SCA	1.0
Meteorological	wind direction, speed, temperature & relative humidity	SCA	2.0
Direct readout dust monitor	Generally respirable dusts	SCA	3.0
Personal monitoring	Arsenic, Lead	mainly Crosby & Overton	4.0

Sampling locations, frequency, and methodology are listed in the Air Monitoring Plan appendix to Woodward-Clyde's Workplan for the Verdese Carter remediation project.

6.0 PERSONAL PROTECTIVE EQUIPMENT AND ENGINEERING CONTROLS

The area of the site where active excavation is occurring will be considered as the work area. All personal protective equipment requirements are in effect for anyone entering this work area. The work area must be clearly established by use of barrier fences and clear labelling to prevent accidental entry into the work area by unprotected individuals. Under no circumstances will the work area be entered by any personnel who are not wearing the appropriate personal protective equipment. Minimum personal protective equipment to be worn during work activities involving the excavation or movement of soil will include:

- Full-face positive air-purifying respirators (PAPR) equipped with HEPA-filtered cartridges. All components will be NIOSH-approved for use against dusts, fumes, and mists. All PAPR's will be checked prior to entering the work area each time, and after exiting. This check will be conducted with a flow rate checking device compatible with the PAPR. The PAPR flow rate must be at least 4 cubic feet per minute, otherwise the PAPR will be considered damaged or undercharged. A hardcopy record of this PAPR flow-rate check will be maintained at the entrance to the work area. All personnel entering the work area will sign in their names, company affiliation, and will check to confirm that a PAPR flow check was performed, with adequate results. All personnel will be required to be clean-shaven and to have current medical, training, and fit test documentation relevant to wearing a PAPR.

- Disposable Tyvek® coveralls will be worn. The coveralls will be worn double-layered. The coveralls will be disposed of following each use. Ripped coveralls will be replaced promptly by the worker. Coveralls will be worn with the sleeves rolled down to meet gloves. The interface between the sleeve and the glove will be taped with several layers of overlapping duct tape so that dust can not penetrate into the interior of the garments. Similarly, the hood of the coverall will be taped to the face of the PAPR so that dust will not seep into the interior of the suits, and the leg of the coverall will be taped to the top of the outer boot.

- Impermeable, disposable gloves and outer boots will be worn and will be disposed of during each shift.

- Chemical resistant steel-toe and steel-shank boots will be worn under the outer boots.

Note that no downgrade of respiratory protection level is anticipated during the excavation phase.

Donning procedures will include inspection of disposable coveralls for tears and rips, taping of coveralls, inspection and flow checking of PAPR's, and signing the work area sign-in log. A buddy system is recommended for the doffing procedures in order to achieve better taping of the coveralls.

Doffing procedures will include

- Removal and disposal of outer coveralls and outer boot covers, and washing of gross debris off of boots in one location;
- Walking over clean planking or masonite to a second location, where boots are detail cleaned and second coverall is removed and disposed of;
- Walking to shower chamber, where hair, hands, and entire body are washed with shampoo and soap; respirator is removed following thorough wetting of respirator surface and hair; respirator cartridges are either disposed of or taped closed to prevent emissions from filters; and
- Proceeding from shower to dressing area on "clean" side of site, outside of work zone. Dressing area will be visually isolated from surrounding community and will have private change areas for males and females. At this point all personnel will recheck the flow rate of PAPR's, sign work area sign-out log, and recharge PAPR batteries.

7.0 SITE CONTROL (WORK ZONES AND SECURITY MEASURES)

Work zones will be clearly indicated by use of barrier fence and posting of signs. Access to the work zones should be through a shower area for personnel. During off-hours, access to the work zone should be controlled by use of a padlock. A security guard may be required during off-hours.

8.0 DECONTAMINATION PROCEDURES

Exact locations of work zones and decontamination facilities are to be determined. Each discrete work zone will have a minimum of one decontamination chamber/shower facility immediately adjacent to it. All equipment leaving the work area is required to be thoroughly decontaminated by use of water with an added surfactant (such as TSP® or similar material). All personnel leaving the work zone, even for a short duration, are required to remove ("doff") personal protective clothing, shower, and fully decontaminate.

Doffing procedures will include

- Removal and disposal of outer coveralls and outer boot covers, and washing of gross debris off of boots in one location;
- Walking over clean planking or masonite to a second location, where boots are detail cleaned and second coverall is removed and disposed of;
- Walking to shower chamber, where hair, hands, and entire body are washed with shampoo and soap; respirator is removed following thorough wetting of respirator surface and hair; respirator cartridges are either disposed of or taped closed to prevent emissions from filters;
- Decontamination of any small equipment items, such as sampling vials, small tools, cameras, etc. can be conducted in the shower; and
- Proceeding from shower to dressing area on "clean" side of site, outside of work zone. Dressing area will be visually isolated from surrounding community and will have private change areas for males and females. At this point all personnel will recheck the flow rate of PAPR's, sign work area sign-out log, and recharge PAPR batteries.

Coveralls, gloves, outer boots, and other disposable items will be disposed of as hazardous waste materials. The water used to decontaminate people and equipment will be captured and drummed by the contractor, pending its characterization as hazardous due to lead, arsenic, or other metals content. Note that if waste water is to be stored on site for any length of time, a bacteriostatic agent will be added to avoid fermentative activity in the drum (alternately, an offgassing hole or bung will be installed on the drum).

9.0 GENERAL SAFE WORK PRACTICES

The hazards to site workers, which are detailed elsewhere in this report, will be minimized with the following work practices and procedures:

Heat Cramps, Heat Stress, and Heat Stroke

All contractor personnel are expected to be informed on the dangers and potential risks of heat-related conditions. All contractors are expected to address the heat-related conditions in their respective site-specific health and safety plans. This may include personal or area monitoring for heat exposure.

Underground Utilities

Crosby & Overton personnel will be responsible for ascertaining the location of underground utilities prior to operating any digging or trenching equipment at the site. Underground Service Alert (USA) should be contacted for information on the presence and location of underground utilities.

Trenching Activities

All trenching operations will involve shoring trench walls as required by OSHA construction regulations. Crosby & Overton personnel are responsible for the safe implementation of this shoring, and for labelling or posting trench areas to minimize other contractors' risk of entering a trench prior to its being shored.

Explosion hazards

Gasoline or other fuels should will not be stored at the site, as far as is feasible. If their use is essential to the project and no alternative is available, they will be stored in containers designed for the purpose, and will be clearly labelled as flammable and gasoline-containing. Where their use is required, fire extinguishers rated for gasoline fires will be available.

Noise

Contractors and subcontractors on the site who operate the machinery or are otherwise exposed to high noise levels are expected to be enrolled in a Hearing Conservation Plan as defined by Federal OSHA standard 29 CFR 1910.95. Non-contractor personnel may be required to enroll in a Hearing Conservation Plan if their exposure at the jobsite warrants it. Note that in all cases, 29 CFR 1910.95 requires personal exposure monitoring for noise where there is a possibility of overexposure, as defined by the regulation.

Moving Equipment Hazards

Heavy machinery operated by Crosby & Overton or their subcontractors will need to have appropriate back-up audible warning alarms which are loud enough to be heard by workers wearing hearing protection. Areas where heavy equipment is operating should be cordoned off with caution tape or construction barriers.

A Crosby & Overton supervisor will be present at the site any time that heavy equipment is in use. The supervisor is responsible to ensure that safety risks associated with use of the equipment are minimized. This includes coordinating site activities such as sampling, transporter truck filling, excavating, etc. The supervisor will be able to reach the equipment operators by radio at all times in order to expedite this coordination.

Any workers at the site who need to access the areas where the heavy equipment is operating (for example, a geologist who needs to take a soil sample or make observations of soil) will first speak to the supervisor. The supervisor will contact the equipment operator by radio or hand signals in order to temporarily stop the equipment from operating during the time that the individual is in the area.

Waste Transporter Trucks

ECDC Environmental, the waste transporter, will use tractor-trailer trucks to remove contaminated soils from the site. These trucks are a potential hazard to workers at the site due to the possibility of a worker being struck or injured by a moving truck.

These trucks must remain in identified areas of the site during pick-up of soils. The pick-up route will be set up so that the trucks will not need to back up (a potentially dangerous operation) but can enter from one side of the site and exit out the other.

Transporter truck drivers will be briefed on site layout and safety considerations when first arriving at the site.

Ultraviolet light hazards

Sunlight can cause high exposures to ultraviolet light in personnel who are exposed to it for long time durations. Ultraviolet light may cause skin cancers (melanomas) and premature aging of the skin.

Project personnel will wear clothing which covers the entire body for the majority of the project. For work which does not take place in full-body protective clothing, workers will use a combination of clothing and waterproof sun-screen lotion with an appropriate SPF rating to limit exposure to ultraviolet light.

Miscellaneous Safety Hazards

Miscellaneous safety hazards, such as falling objects, trip hazards, sharp objects on equipment, moving equipment parts, etc. are expected due to the nature of the project.

Various protective equipment will be worn to minimize injury from these safety hazards. This safety equipment will be worn at the site at all times:

- Leather Gloves;
- Steel-toed and steel-shanked boots;
- Long sleeved shirts or coveralls;
- Long pants or coveralls;
- Eye protection as required (based on dusty activities);

10.0 SANITATION

The water used to decontaminate people and equipment will be captured and drummed by the contractor, pending its characterization as hazardous due to lead, arsenic, or other metals content. Note that if waste water is to be stored on site for any length of time, a bacteriostatic agent will be added to avoid fermentative activity in the drum (alternately, an offgassing hole or bung will be installed on the drum). Any bacteriostatic agent added must be compatible with treatment procedures conducted if the material is considered hazardous. For example, if chlorine bleach is to be added as a bacteriostatic agent, the contractor will ensure that the precipitation process used to treat the water is compatible with the chlorine bleach.

If the water is approved as a non-hazardous material, disposal to a sanitary sewer is required, along with the applicable permits from the City of Oakland.

Restrooms will be provided in the form of porta-Johns or similar temporary, portable, private outhouse facilities. These facilities will be maintained with regular emptying and odor-suppressant materials such that no odors will be noticeable at the fenceline.

Any water supplies accessed to provide potable water to the site will be connected to using backflow prevention devices (BPD's) which are in compliance with City of Oakland code requirements.

All drinking, eating, smoking, chewing tobacco, chewing gum, etc. are forbidden inside the work zones (where respiratory protection is required). Outside the work zones, but still on the park site, drinking, eating, smoking, etc. is allowed only in designated areas.

11.0 STANDARD OPERATING PROCEDURES

These procedures will, in most instances, be established by each company which has workers on the site. Note that SCA's Site Safety Officer may review these protocols in circumstances where workers are not observed to be following good health and safety procedures.

- For decontamination protocols, see section 8 of this report;
- For fit testing protocols, all companies with workers on the site are referred to Federal OSHA regulation 29 CFR 1910.134. All companies with workers on site are responsible for having a written respiratory protection plan in place, including all medical monitoring, training, respirator selection, and other requirements;
- Equipment calibration should follow manufacturer's specifications, in the case of direct-read air monitoring and meteorological equipment, and OSHA recommended protocols, in the case of pump-driven air sampling equipment;
- Drill rig checkouts are a standard item to be addressed in Crosby & Overton's site-specific health and safety plan.
- Confined spaces are not expected to be encountered on the site.

12.0 EMERGENCY RESPONSE PLANS

In the event of medical emergencies, the nearest medical facility is San Leandro hospital at the corner of 136th street and East 14th street. A map of a route from the park to the hospital is included as Figure 2 of this SSP.

If a medical emergency occurs, 911 should be dialed, and the nature of the emergency described. If there is a potential for the individual to be contaminated with lead- or arsenic-containing soil, the emergency service must be alerted to this possibility.

If the medical problem is minor, and the injured person is being driven to the hospital, the hospital should be telephoned to alert them to the nature of the medical problem.

A list of emergency phone numbers is given below:

Emergency Medical Service (ambulance, police, etc.)	911
San Leandro Hospital Emergency Room	

Personnel at the site who have CPR/First Aid training include (to be filled in at time of site mobilization):

Name	Company	Contact Means (Pager Number, Cellular Phone Number, or typical location)

In the event of a medical emergency, cellular phones or site telephones will be used to contact the appropriate emergency medical service provider (911 or hospital). Cellular phones and site telephones are available in the following locations:

To be filled in at time of site mobilization: ________________

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In the event of a medical emergency, affected personnel will be decontaminated to the maximum extent possible. For injured persons with heart attacks, severe trauma, heat stroke, etc. who need immediate medical attention, decontamination will be performed only after the medical condition is stabilized. Following the stabilization, contaminated vehicles, clothing, etc. would be decontaminated or disposed.

For injured personnel with non-critical injuries, full decontamination would be performed with the assistance of other workers, prior to leaving the work zones.

For fire fighters or medical personnel responding to site emergencies, WCC and SCA onsite representatives will coordinate, inform, and direct the procedure of decontamination and protection needed for the emergency response personnel, on a case by case basis, with the intent of providing the needed medical attention with limited delays.

In the event of a fire, fire extinguishers are located in the following locations:

To be filled in at time of site mobilization: ______________________

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Material spills are not considered to be a condition of high risk for workers or for the surrounding areas, since the material being transported does not have a strong vapor phase (i.e., does not become a vapor or gas readily) and is not liquid. In the worst case scenario (if a transporter truck carrying lead- and arsenic-contaminated soil overturns while leaving the site or while proceeding through streets), the following emergency response actions are to be followed:

- Medical attention will be sought for any injured personnel;
- The area around the spilled soil will be cordoned off and secured from unprotected citizens or personnel;
- The soil will be covered with a tarpaulin to minimize any dispersion due to wind;
- Appropriate regulatory agency personnel will be contacted, including the Alameda County Health Department;
- The soil will be transferred to another transporter truck as soon as is feasible. All residual soil in the area will be removed with a wet-sweeping or wet-mopping procedure. The damaged transporter truck would likewise be decontaminated with wet-sweeping or wet-mopping procedures.

13.0 TRAINING REQUIREMENTS

A variety of training requirements exist for personnel working on the site. Individual companies with personnel at the project are expected to provide this training to all employees who require it. Documentation of this training must be available for audit by the SSO at all times. A summary of the training requirements is listed as follows:

- Hazardous Waste Site Operator, 40-hour training as defined in 29 CFR 1910.120 for all personnel in the work zone;
- Hazardous Waste Site Personnel, 24-hour training as defined in 29 CFR 1910.120 for all personnel visiting the site for brief periods and not required to enter the work zone;
- Site-specific hazard awareness training, as defined in 29 CFR 1910.120 for all personnel at the site;
- Respiratory Maintenance and Use training as defined in 29 CFR 1910.134;
- Hazard Communication Training, as defined in 29 CFR 1910.1200;
- Lead Awareness Training, as defined in 29 CFR 1926.62 and 8 CCR 5216;
- Arsenic Awareness Training, as defined in 29 CFR 1910.1018 and 8 CCR 5214; and
- Training on the safe operation of various types of mobile equipment, as required by 29 CFR 1926 (various sections).

14.0 MEDICAL SURVEILLANCE PROGRAMS

Medical surveillance will be conducted on the basis of personal monitoring results which indicate potential exposure to elevated levels of airborne lead or arsenic (as conducted by the contractors and subcontractors for their own personnel). All contractor and subcontractor companies onsite are expected to have an in-house personal exposure monitoring and medical surveillance program.

Contractors and subcontractors exposed to elevated levels of noise are expected to have a hearing conservation plan (HCP) with baseline and annual audiograms performed by qualified physicians.

15.0 DOCUMENTATION

All contractor and subcontractor companies onsite are expected to have an in-house record-keeping system for personal exposure monitoring, medical surveillance results, training conducted, injuries recorded, etc.

APPENDIX 1 - WOODWARD-CLYDE SOIL SAMPLING RESULTS

Table 1. Summary of Soil Results for pH and CAM 17 Metals (mg/kg).

Sample	pH	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
TTLC		500	500	1000	75	100	2500	8000	2500	1000	20	3500	2000	100	500	700	2400	5000
B-01-3	7.29	<15	5.09	194	<0.75	<1	44.6	8.31	25.4	88.7	0.1	<2.5	34	<15	<1	<20	56.8	72.3
B-02-1	6.26	<15	5.3	279	<0.75	<1	62.6	10.3	27	11.9	0.11	<2.5	51.7	<15	<1	<20	68.3	621
B-03-1	3.87	<15	18.8	224	<0.75	<1	59.1	4.78	78.3	13.2	<0.05	<2.5	30.6	<15	<1	<20	67.2	299
B-03-2	5.58	<15	8.1	244	<0.75	<1	60.5	9.2	38.5	10.9	0.06	<2.5	44.5	<15	<1	<20	66.7	326
B-04-2	3.41	<15	7.07	187	<0.75	1.51	53.6	7.05	84.6	10.9	<0.05	<2.5	37.4	<15	<1	<20	59.9	404
B-05-2	3.80	<15	5.02	106	<0.75	<1	57.8	12.6	29.9	12	<0.05	<2.5	52.5	<15	<1	<20	64	497
B-06-1	6.95	<15	<5	206	<0.75	<1	63.7	6.77	49	12.4	<0.05	<2.5	49.2	<15	<1	<20	75.1	62.7
B-07-1	6.85	<15	11.6	100	<0.75	<1	77.3	10.6	70.1	9.87	<0.05	<2.5	61.2	<15	<1	<20	72.1	76.5
B-08-2	4.79	<15	13.9	249	<0.75	1.09	56.2	13.4	40.9	13.7	<0.05	<2.5	50.2	<15	<1	<20	77.3	464
B-09-1	4.73	<15	7.24	150	<0.75	<1	56.8	9.42	24.9	8.14	<0.05	<2.5	48	<15	<1	<20	57.9	538
B-10-4	7.01	<15	6.64	176	<0.75	<1	55.6	6.98	40.7	13.8	<0.05	<2.5	36.5	<15	<1	<20	58.1	53.7
B-11-4	7.00	<15	9.38	222	<0.75	<1	51.8	10.3	30.8	41.6	0.17	<2.5	37.9	<15	<1	<20	64.1	67.1
B-12-3	7.44	<15	<5	260	<0.75	<1	53.8	19.9	33.5	95.1	0.11	<2.5	47.8	<15	<1	<20	67.2	103
B-13-1	7.66	<15	96.6	514	<0.75	1.13	49.6	7.86	49.4	1160	0.25	<2.5	35.7	<15	<1	<20	67.9	515
B-14-2	7.90	<15	5.89	239	<0.75	<1	50.9	4.79	34.5	484	0.07	<2.5	33.1	<15	<1	<20	49.6	65.6
B-15-4	7.43	<15	<5	156	<0.75	<1	64.3	12.4	81.4	9.61	<0.05	<2.5	57	<15	<1	<20	52.8	75
B-16-2	7.14	<15	<5	240	<0.75	<1	61	10.2	40.7	8.87	<0.05	<2.5	44.4	<15	<1	<20	62.5	52.4
B-16-3	6.99	<15	<5	148	<0.75	<1	52.4	8.91	38.7	6.97	<0.05	<2.5	39.2	<15	<1	<20	43.9	49.7
B-17-2	6.73	<15	<5	250	<0.75	<1	73.9	13.2	46.4	10.4	0.21	<2.5	73.3	<15	<1	<20	73.8	67
B-18-2	6.39	<15	<5	184	<0.75	<1	90.5	9.2	54	7.47	0.15	<2.5	54.7	<15	<1	<20	74.7	68.4
B-19-2	3.65	<15	<5	114	<0.75	1.8	72.5	8.12	58.7	20.2	0.11	<2.5	34.5	<15	<1	<20	64	72.4
B-20-2	7.37	<15	5.14	137	<0.75	<1	59.7	6.22	66.1	11.6	<0.05	<2.5	49.1	<15	<1	<20	51.7	73.2
COURT-1		10.7	397	612	<0.5	<0.5	3.2	<1.0	48.3	594	4.72	11.9	1.1	2.9	5.9	47.7	0.9	293
COURT-2	2.80	16.2	734	332	<0.5	<1.0	43.3	1.2	8.4	692	6.28	16.6	3.1	3.4	9.8	62.3	2.9	443

Note: Shading indicates result was greater than TTLC.

Table 2. Summary of Soil Results for pH and Arsenic, Lead, and Zinc (mg/kg).

Sample	Depth (feet)	pH	Arsenic	Lead	Zinc	Comments
TTLC			500	1000	5000	
B-01-1	0.5	7.25	11.1	116	94.7	PF
B-01-2	3		10.4	39.9	140	PF
B-01-3	4.5	7.29	5.09	88.7	72.3	OF
B-01-4	6	7.25		8.21	41.8	OF
B-01-5	7.5			<5	41.1	OF
B-01-6	10.5	8.23				
B-01-7	11	8.25		7.57	54.2	
B-01-8	13.5	8.30				
B-01-9	16					
B-01-10	19					
B-02-1	1	6.26	5.3	11.9	621	OF
B-02-2	3	7.25		5.78	44.1	
B-02-3	5.5	7.32		8.8	44.4	
B-02-4	6	7.30		8.94	48.3	
B-02-5	9	7.54		8.43	52.6	
B-02-6	11	7.94				
B-02-7	14					
B-03-1	0.5	3.87	18.8	13.2	299	AB
B-03-2	1	5.58	8.1	10.9	326	OF
B-03-3	3	7.08	<5	6.97	52.3	OF
B-03-4	4	7.59	<5	9.49	51.2	
B-03-5	4.5	7.66	<5	6.86	54.5	
B-03-6	8.5	7.72	<5	9.73	59.9	
B-03-7	10.5	7.78				
B-03-8	13.5					
B-04-1	0.5		458	144	432	AB?
B-04-2	1	3.41	7.07	10.9	404	OF
B-04-3	3	6.63		7.42	57.1	OF
B-04-4	4.5	7.05		9.85	44.6	OF
B-04-5	7.5	7.50		6.09	53	
B-04-6	8	7.36		6.37	62.9	
B-04-7	11	7.66				
B-04-8	13					
B-04-9	16					
B-05-1	0.5	3.31	388	496	328	AB?
B-05-2	1	3.80	5.02	12	497	OF

Note: Shading indicates result greater than TTLC.

AB= Aggregate Base Material
PF= Park Fill
OF= Intact Old Fill
1978= 1978 Fill
No note for native soil.

Table 2. Summary of Soil Results for pH and Arsenic. Lead, and Zinc (mg/kg).

Sample	Depth (feet)	pH	Arsenic	Lead	Zinc	Comments
TTLC			500	1000	5000	
B-05-3	2.5	7.11		7.45	36	OF
B-05-4	4.5					
B-05-5	6.5	8.14		10.1	49.7	
B-05-6	7	8.14		8.4	51.2	
B-05-7	10			9.02	63.3	
B-05-8	12	8.10				
B-05-9	15					
B-06GRB	0.5	6.44	<5	<5	26.7	SAND
B-06-1	1	6.95	<5	12.4	62.7	OF
B-06-2	3	7.59				
B-06-3	5.5	7.90				
B-06-4	6	7.87				
B-06-5	9	7.54				
B-06-6	11	7.80				
B-06-7	14					
B-07GRB	0.5	6.34	<5	5.52	27.6	SAND
B-07-1	1.5	6.85	11.6	9.87	76.5	OF
B-07-2	3	7.00	<5	5.39	62	OF
B-07-3	6	7.69	<5	<5	72.9	
B-07-4	6.5	7.71	<5	7.92	63.6	
B-07-5	9.5	7.51	<5	6.67	50.4	
B-07-6	11	7.50				
B-07-7	14					
B-08-1	0.5	3.25	450	481	309	AB?
B-08-2	1	4.79	13.9	13.7	464	OF
B-08-3	3	6.80	<5	6.49	38.4	OF
B-08-4	4.5	7.68	6.24	7.1	33	OF
B-08-5	7	8.01	5.45	6.16	40.7	
B-08-6	7.5					
B-08-7	10.5	7.78				
B-08-8	12.5					
B-08-9	15.5					
B-09-1	1	4.73	7.24	8.14	538	OF
B-09-2	3	6.94		5.71	36.8	OF
B-09-3	4.5	7.23		6.32	55.6	
B-09-4	7	7.37		7.14	43.3	

Note: Shading indicates result greater than TTLC.

AB= Aggregate Base Material
PF= Park Fill
OF= Intact Old Fill
1978= 1978 Fill
No note for native soil.

Table 2. Summary of Soil Results for pH and Arsenic, Lead, and Zinc (mg/kg).

Sample	Depth (feet)	pH	Arsenic	Lead	Zinc	Comments
TTLC			500	1000	5000	
B-09-5	9.5	7.66				
B-09-6	10					
B-09-7	12					
B-09-8	15					
B-10-1	0.5	7.21	10.2	52.7	164	PF
B-10-2	2.5					PF
B-10-3	4	7.23	7.43	37.6	75.7	PF
B-10-4	6	7.01	6.64	13.8	53.7	OF
B-10-5	7.5	7.07				OF
B-10-6	9					
B-10-7	10.5	7.84				
B-10-8	11					
B-10-9	14.5	7.70				
B-10-10	17	7.96				
B-10-11	20					
B-11-1	1					PF
B-11-2	1.5	6.71	27.4	46.3	108	PF
B-11-3	3					OF
B-11-4	3.5	7.00	9.38	41.6	67.1	OF
B-11-5	4					OF
B-11-6	6.5	7.16				OF
B-11-7	9	7.22				
B-11-8	11	7.77				
B-11-9	14	7.56				
B-12-1	0.5	6.87	[illegible]	29.1	61.7	PF
B-12-2	1.5	7.19	6.65	105	108	PF
B-12-3	3	7.44	<5	95.1	103	PF
B-12-4	4			185	127	PF
B-12-5	4.5	7.55		502	95.5	PF
B-12-6	6					OF
B-12-7	9	8.01		8.8	78.7	OF
B-12-8	11	7.94				
B-12-9	14	7.93				
B-13-1	1	7.66	96.6	1160	515	OF
B-13-2	3	7.56	<5	6.05	39.8	OF
B-13-3	4.5		<5	<5	42.6	OF

Note: Shading indicates result greater than TTLC.

AB= Aggregate Base Material
PF= Park Fill
OF= Intact Old Fill
1978= 1978 Fill
No note for native soil.

Table 2. Summary of Soil Results for pH and Arsenic, Lead, and Zinc (mg/kg).

Sample	Depth (feet)	pH	Arsenic	Lead	Zinc	Comments
TTLC			500	1000	5000	
B-13-4	7	7.93	<5	6.22	55.9	
B-13-5	8.5	8.05				
B-13-6	9	8.04				
B-13-7	12					
B-13-8	14					
B-13-9	17					
B-14-1	1	7.22		13.3	60.3	PF
B-14-2	3	7.90	5.89	484	65.6	OF
B-14-3	4.5	11.03		6700	132	OF
B-14-4	6.5	7.39		6.26	49.6	
B-14-5	8.5	7.57		7.6	51.7	
B-14-6	9	7.67				
B-14-7	12	7.74				
B-14-8	14					
B-14-9	16.5					
B-15-1	1					PF
B-15-2	1.5	7.10	8.4	1520	91.9	PF
B-15-3	3.5	6.35	<5	[illegible]	44	PF
B-15-4	4.5	7.43	<5	9.61	75	
B-15-5	5	7.58				
B-15-6	7	7.75				
B-15-7	10.5	7.49				
B-15-8	12	7.37				
B-15-9	15.5	7.26				
B-16-1	1	9.49	[illegible]	138	65.4	1978/OF
B-16-2	2.5	7.14	<5	8.87	52.4	OF
B-16-3	3	6.99	<5	6.97	49.7	OF
B-16-4	4	6.81				
B-16-5	4.5					
B-16-6	6.5	8.08				
B-16-7	10	7.59				
B-16-8	11.5	7.47				
B-16-9	15					
B-17-1	1	7.87				1978
B-17-2	2.5	6.73	<5	10.4	67	OF

Note: Shading indicates result greater than TTLC.

AB= Aggregate Base Material
PF= Park Fill
OF= Intact Old Fill
1978= 1978 Fill
No note for native soil.

Table 2. Summary of Soil Results for pH and Arsenic. Lead. and Zinc (mg/kg).

Sample	Depth (feet)	pH	Arsenic	Lead	Zinc	Comments
TTLC			500	1000	5000	
B-17-3	3					OF
B-17-4	4.5	7.76				
B-17-5	6	7.89				
B-17-6	9.5	7.94				
B-17-7	14.5					
B-18-1	1	8.08				1978
B-18-2	2.5	6.39	<5	7.47	68.4	OF
B-18-3	4					OF
B-18-4	4.5	7.03				
B-18-5	7.5	7.57				
B-18-6	10.5	7.43				
B-18-7	12.5	7.56				
B-18-8	15					
B-19-1	1	7.67	<5	11.6	64.4	1978
B-19-2	3	3.65	<5	20.2	72.4	OF
B-19-3	4.5					OF
B-19-4	5.5	4.10		7.48	61.5	OF
B-19-5	6					
B-19-6	8.5	7.10		8.22	44.3	
B-19-7	11	7.56				
B-19-8	13					
B-19-9	16					
B-20-1	0.5	7.61				OF
B-20-2	2	7.37	5.14	13.6	73.2	OF
B-20-3	3.5	7.48				
B-20-4	6	8.13				
B-20-5	6.5	8.10				
B-20-6	9.5	7.79				
B-20-7	11.5	7.92				
B-20-8	14.5					
B-21-1	0.5					PF
B-21-2	1.5	7.29	<5	91	56.7	OF
B-21-3	3	7.44	<5	111	60.1	OF
B-21-4	6	7.12	5.89	8.61	41.4	
B-21-5	6.5					

Note: Shading indicates result greater than TTLC.

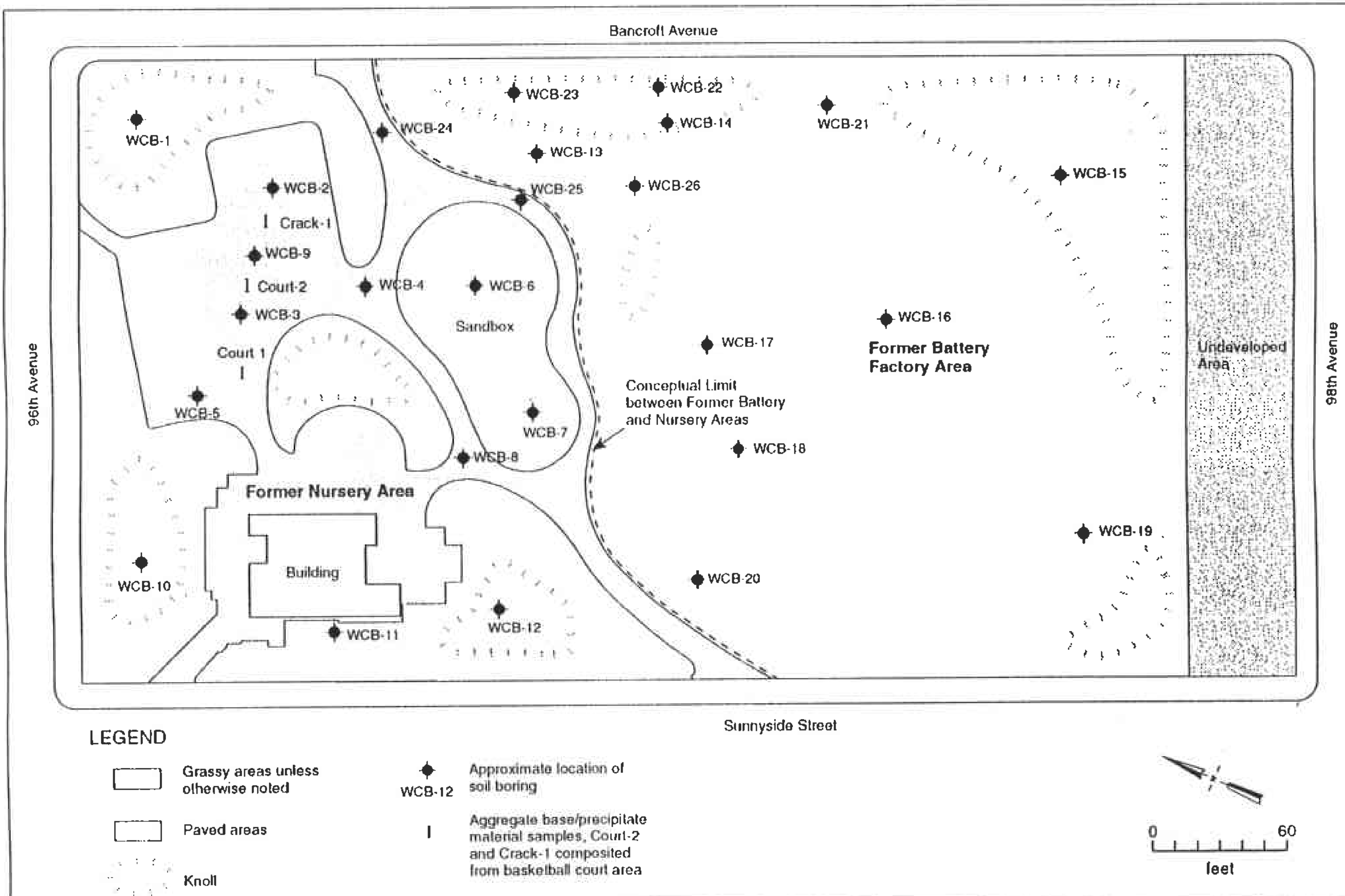
AB= Aggregate Base Material
PF= Park Fill
OF= Intact Old Fill
1978= 1978 Fill
No note for native soil.

Table 2. Summary of Soil Results for pH and Arsenic, Lead, and Zinc (mg/kg).

Sample	Depth (feet)	pH	Arsenic	Lead	Zinc	Comments
TTLC			500	1000	5000	
B-21-6	8.5	7.49	<5	5.68	47	
B-22-1	0.5	6.93	6.81	115	133	PF
B-22-2	3	7.94	5.59	319	42.4	OF
B-22-3	3.5	7.86	<5	18	47.9	OF
B-22-4	7.5	3.63	8.81	<5	68.3	
B-22-5	8					
B-23-1	0.5	6.26	12.6	1100	113	PF
B-23-2	2.5	7.74	6.04	1310	73.1	PF
B-23-3	5.5	7.17	<5	10.4	38.7	OF
B-23-4	8	7.32	<5	6.21	37.8	
B-24-1	0.5	4.08	9.2	<5	177	AB?
B-24-2	2.5	5.27	34.2	10.7	51.7	
B-24-3	3	7.02	8.7	5.86	44.1	
B-24-4	5.5	7.12	6.5	5.87	46.8	
B-24-5	7.5	7.28	10.3	<5	52.1	
B-25-1	0.5	5.91	<5	8.0	65.5	AB?
B-25-2	1	6.85	<5	7.5	44.8	OF
B-25-3	2.5	7.20	<5	5.88	47.1	
B-25-4	3					
B-25-5	4.5*					
B-25-6	5	7.24	17.1	7.77	49.2	
B-25-7	7	7.70	6.04	6.62	53.8	
B-26-1	0.5	6.59	6.91	12.6	83	1978
B-26-2	3	7.30	<5	8.07	54.5	OF
B-26-3	6	7.73	<5	8.09	44.4	
B-26-4	8	7.52	<5	6.83	51.7	
COURT-1			397	594	291	AB
COURT-2		2.8	734	692	443	AB
CRACK-1		1.5	14.4	5.5	7450	PPT

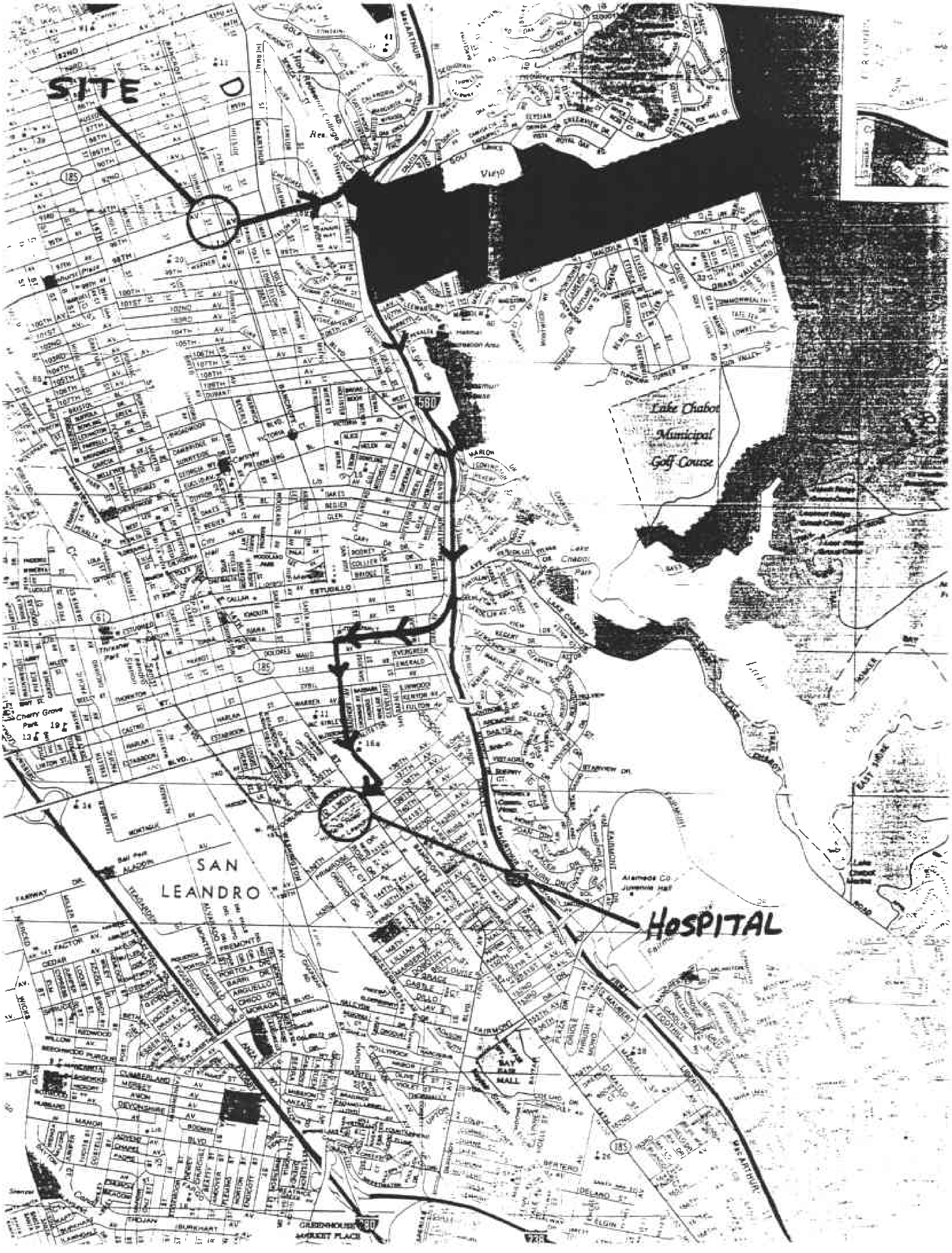
Note: Shading indicates result greater than TTLC.

AB= Aggregate Base Material
PF= Park Fill
OF= Intact Old Fill
PPT=Precipitate
1978= 1978 Fill
No note for native soil.
* Sample contained slough from above: results are not representative of actual conditions.



Project No. 93C0243A	Verdese Carter Park Oakland, California	SITE AND SAMPLE LOCATION PLAN	Figure 1
Woodward-Clyde Consultants			

93C0243A-3000/071993


SITE
HOSPITAL
SAN LEANDRO
Lake Chabot
Municipal
Golf Course
Alameda Co.
Juvenile Hall
Cherry Grove Park
GREENHOUSE
MARKET PLACE
BAY FAIR MALL
MACARTHUR
FOOTHILL
ESTUDILLO
LAKE CHABOT
EAST SHORE
STARVIEW DR.
580
185
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DRAFT EXPOSURE MONITORING PLAN
VERDESE CARTER PARK
98TH & SUNNYSIDE
OAKLAND, CA

TABLE OF CONTENTS

SCA ENVIRONMENTAL PROJECT NO. BI-777

1.0 Introduction

Six types of air, noise, heat stress and related monitoring will be conducted as part of the project, they are listed as follows and discussed further in the sections shown:

Type of Monitoring	Agents	Responsibility	Section
Daily Fence line	Arsenic, Lead	SCA	2.0
Meteorological	wind direction, speed, temperature & relative humidity	SCA	3.0
Direct readout dust monitor	Generally respirable dusts	SCA	4.0
Personal exposure monitoring	Arsenic, Lead, noise, heat stress	mainly Crosby & Overton	5.0

2.0 Daily Fence Line Monitoring

The purpose of fence line monitoring is to document the project's air quality impact to the environment and the human populations immediately off site. To document the baseline values before significant mobilization onsite by the Contractor (CO), SCA will collect one set of samples for comparison against existing background air monitoring data as recorded by the California Air Resources Board (CARB) and the Bay Area Air Quality Management District (BAAQMD). A Project Fenceline Action Level (PFAL) will be established as an index above which additional mitigation measures will be required from the Contractor (CO), in order to minimize the potential health hazards to the neighboring populations, and liability to the City of Oakland.

Two agents have been selected for sampling and analysis because of their known toxicity, and relatively high levels measured in soil samples at the site: lead and arsenic. Four sampling stations will be set up to envelope the site. Specific siting of the samples will take into account of the local conditions, including equipment security, ingress and egress of the Contractor's machinery and vehicles, terrain, local meteorological conditions, etc. Samples will be collected on a daily basis, and submitted for analysis with the results made available by 5 PM the following work day. The parameters are listed below:

Element	**Arsenic (As)**	**Lead (Pb)**
Method Reference #	NIOSH 7901	NIOSH 7082
Analytical Technique	Graphite AA	Flame AA
Sampling Media	37 mm 0.8 μ MCEF	37 mm 0.8 μ MCEF
Daily sample volume	1.000 liter (2-2.5 LPM)	1,000 liter (2-2.5 LPM)
Hours	7 AM - 330 PM	7 AM - 330 PM
Detection Limit	0.06 $\mu g/M^3$	0.6 $\mu g/M^3$
Number of Samples	4/day + 1 blank/day	4/day + 1 blank/day
maximum total dust loading	< 2 mg/filter	na
Laboratory Accreditation	AIHA	AIHA
Turnaround Time	≤24 hours upon receipt (generally before	
	5 PM the next day)	
Sample Delivery	Daily, via courier	Daily, via courier
Standards	**$\mu g/M^3$**	**$\mu g/M^3$**
EPA NAAQS	**na**	**1.5**
EPA NESHAPS	**na**	**na**
Project Fenceline Action Level (PFAL)	**to be determined***	**1.5***

* pending additional background information from BAAQMD and CARB

Calibration will be performed prior to beginning sampling, and at the conclusion of sampling in each case. Calibration will be via BGI-brand rotameter which has been recently calibrated against a primary standard (Gilibrator-brand soap bubble burette).

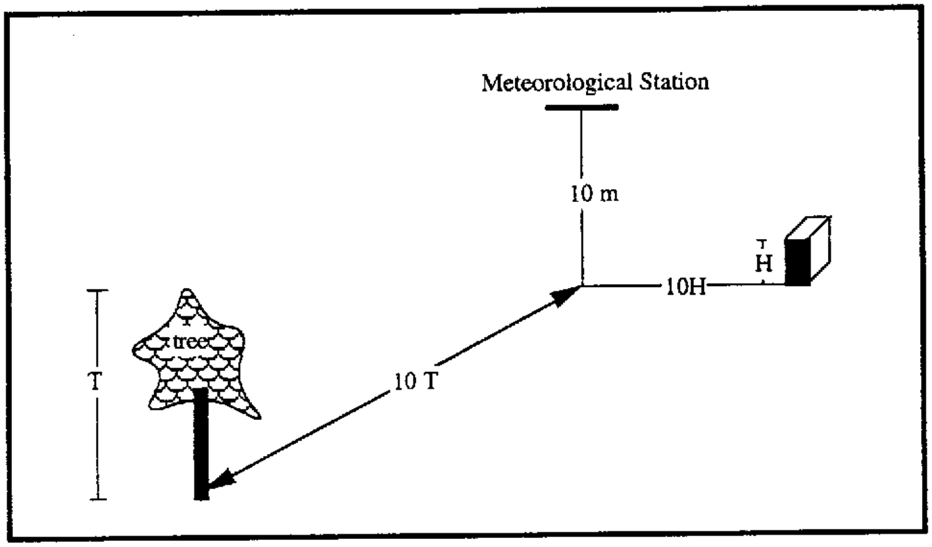
3.0 Meteorological Monitoring

SCA will set up a meteorological monitoring station including monitors for wind direction, wind speed, temperature and relative humidity. All equipment will be calibrated with standards traceable to the National Institute of Standards and Technology (NIST, formerly the National Bureau of Standards, NBS).

Siting of the station will be in accordance with the conventions published by the World Meteorological Organization:

1. At a height of 10 meters above ground; and
2. At a distance 10H from any obstruction, where H is the height of that obstruction.

Therefore:



The parameters of wind speed, direction, temperature and relative humidity will be gathered on a daily basis using chart recorders. The data will be used to:

1. evaluate proper siting of the fence line monitoring equipment; and
2. identify additional mitigating measures in case if elevated levels of the primary agents of concern are measured (e.g., limiting loading of the waste containers to certain times of the day when the impacts from wind conditions can be expected to be minimal.)

4.0 Direct Readout Dust Monitor

To provide immediate feedbacks to the Contractor (CO), SCA will use a direct readout PM10 dust monitor so that the levels of respirable dust can be determined onsite without waiting for the lab results of lead and arsenic, which would lag for a period of as long as 1.5 days. Knowing the lead and arsenic contents of the soil (obtained from WCC's 7/19/93 Site Characterization Report), SCA will take spot and cumulative readings of the dust levels, and over time, establish additional guidelines for the Contractor to minimize chances of elevation of lead and arsenic levels. The monitor in use will be a PDM-3 "Mini-Ram," mfg. MIE, Inc., without a datalogger.

Calibration will be performed on a periodic basis as per manufacturer's instructions. For use in extremely dusty conditions, the PDM-3 will be calibrated daily. For less dusty conditions, calibration will be performed on a twice-weekly or weekly basis. During calibration procedures, the PDM-3 optical chamber will be disassembled, cleaned with a compressed air source, and reassembled. The unit will be calibrated to a zero point and to a constant "span" point. Records of this calibration will be recorded in SCA's project log book or on data sheets devised for the purpose.

5.0 Personal Monitoring for Lead, Arsenic, Noise and Heat Stress

Current CALOSHA regulations require that an employer conduct personal monitoring for lead, arsenic and noise when such potential exposures are reasonably expected to approach the action levels, so that evaluation of work practices and proper personal protective equipment can be made to reduce exposures, or to trigger additional actions, such as training, biological monitoring.

In this project, the Contractor (CO) will be expected to sample and analyze such agents for its workers. Other parties, including SCA, WCC, and ECDC may also be required to conduct such monitoring for their workers pending the work conditions. SCA will notify the parties involved of the sampling necessity, or the validity of pooling monitoring data from various parties so as to satisfy the monitoring requirements at a reasonable cost.

5.1 Lead and Arsenic Sampling Parameters

The required sampling parameters for lead and arsenic are tabulated below:

Element of concern	Arsenic (As)	Lead (Pb)
Method Reference #	NIOSH 7901	NIOSH 7082
Monitoring frequency	10% of employees until the exposure profiles have been established, and whenever there is a change of procedures and operating personnel	
Analytical Technique	Graphite AA	Flame AA
Sampling Media	37 mm 0.8 μ MCEF	37 mm 0.8 μ MCEF
Daily sample volume	about 1,000 liter	about 1,000 liter
Sample durations	7 AM - 330 PM	7 AM - 330 PM
Detection Limit	0.06 $\mu g/M^3$	0.6 $\mu g/M^3$
Laboratory Accreditation	AIHA	AIHA
Turnaround Time	within one week of collection	
Occupational Standards	$\mu g/M^3$	$\mu g/M^3$
CALOSHA 8-hr TWA	10	50
CALOSHA 8-hr AL	5	30
NIOSH Recommended	2 (15 minute ceiling)	100
ACGIH Recommended	200	150

Calibration should be performed following good industrial hygiene practices. At the minimum, a primary standard such as a clean soap-bubble burette should be used to directly calibrate sampling pumps in the field. Calibration should be performed prior to sampling, and at the conclusion of sampling. Alternately, a secondary standard (BGI-brand rotameter or equivalent) can be calibrated periodically against the primary standard and used in the field.

5.2 Noise Exposure Monitoring

The Contractor (CO) will be required to conduct the initial noise exposure monitoring to comply with 8 CCR 5095, Control of Noise Exposure. If the 8-hour time weighted average exposure is greater than the Action Level (85 dBA, slow response), the Contractor will institute the necessary Hearing Conservation Program (HCP), including the supervised use of hearing protection.

5.3 Heat Stress Monitoring

The Contractor (CO) will be required to monitor for the Wet Bulb Globe Temperature Index (WBGT), inclusive of the solar loading, and taking into account of the use of the respirators and semi-permeable disposable coveralls. Refer to the following ACGIH guidance for both monitoring and use of the index to determine the necessary work-rest regimen:

HEAT STRESS

Note: Materials on the Notice of Intended Changes have been incorporated into the text and are indicated by a ‡ preceding the revision/addition and by a vertical rule in the margin. [See pages 91, 92, and 98.]

The heat stress TLVs specified in Table 1 and Figure 1 refer to heat stress conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse health effects. These TLVs are based on the assumption that nearly all acclimatized, fully clothed (e.g., lightweight pants and shirt) workers with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 38°C (100.4°F).

‡Where there is a requirement for protection against other harmful substances in the work environment and additional personal protective clothing and equipment must be worn, a correction to the WBGT TLV values, as presented in Table 1 and Figure 1, must be applied. The values in Figure 1 are approximations and are not intended as a substitute for physiological monitoring.

Since measurement of deep body temperature is impractical for monitoring the workers' heat load, the measurement of environmental factors is required which most nearly correlate with deep body temperature and other physiological responses to heat. At the present time, the Wet Bulb Globe Temperature Index (WBGT) is the simplest and most suitable technique to measure the environmental factors. WBGT values are calculated by the following equations:

TABLE 1. Examples of Permissible Heat Exposure Threshold Limit Values [Values are given in °C and (°F) WBGT]*

	Work Load		
Work — Rest Regimen	**Light**	**Moderate**	**Heavy**
Continuous work	30.0 (86)	26.7 (80)	25.0 (77)
75% Work — 25% Rest, each hour	30.6 (87)	28.0 (82)	25.9 (78)
50% Work — 50% Rest, each hour	31.4 (89)	29.4 (85)	27.9 (82)
25% Work — 75% Rest, each hour	32.2 (90)	31.1 (88)	30.0 (86)

* For unacclimatized workers, the permissible heat exposure TLV should be reduced by 2.5°C.

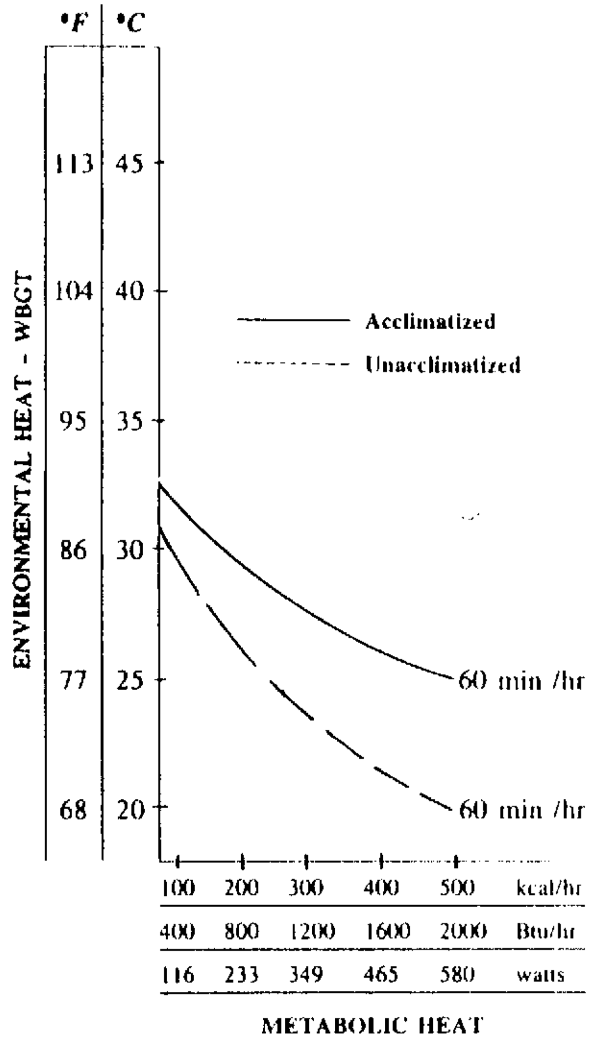


Figure 1 — Permissible heat exposure Threshold Limit Values for heat acclimatized and unacclimatized workers.

Note: Figure 1 has been modified from the 1990-91 TLV/BEI Booklet by deletion of "Xs" on the two curves and the addition of marks on the x and y axes for the numerical indices.

1. Outdoors with solar load:
   WBGT = 0.7 NWB + 0.2 GT + 0.1 DB
2. Indoors or Outdoors with no solar load:
   WBGT = 0.7 NWB + 0.3 GT

where:

WBGT = Wet Bulb Globe Temperature Index
NWB = Natural Wet-Bulb Temperature
DB = Dry-Bulb Temperature
GT = Globe Temperature

The determination of WBGT requires the use of a black globe thermometer, a natural (static) wet-bulb thermometer, and a dry-bulb thermometer.

Higher heat exposures than those shown in Table 1 and Figure 1 are permissible if the workers have been undergoing medical surveillance and it has been established that they are more tolerant to work in heat than the average worker. Workers should not be permitted to continue their work when their deep body temperature exceeds 38°C (100.4°F).

Evaluation and Control

I. *Measurement of the Environment*

The instruments required are a dry-bulb, a natural wet-bulb, a globe thermometer, and a stand. The measurement of the environmental factors should be performed as follows:

A. The range of the dry and the natural wet bulb thermometer should be −5°C to +50°C (23°F to 122°F) with an accuracy of ± 0.5°C. The dry bulb thermometer must be shielded from the sun and the other radiant surfaces of the environment without restricting the airflow around the bulb. The wick of the natural wet-bulb thermometer should be kept wet with distilled water for at least 1/2 hour before the temperature reading is made. It is not enough to immerse the other end of the wick into a reservoir of distilled water and wait until the whole wick becomes wet by capillarity. The wick should be wetted by direct application of water from a syringe 1/2 hour before each reading. The wick should extend over the bulb of the thermometer, covering the stem about one additional bulb length. The wick should always be clean and new wicks should be washed before using.

B. A globe thermometer, consisting of a 15-cm (6-inch) diameter hollow copper sphere painted on the outside with a matte black finish or equivalent, should be used. The bulb or sensor of a thermometer (range −5°C to +100°C [23°F to 212°F] with an accuracy of ± 0.5°C) must be fixed in the center of the sphere. The globe thermometer should be exposed at least 25 minutes before it is read.

C. A stand should be used to suspend the three thermometers so that they do not restrict free air flow around the bulbs, and the wet-bulb and globe thermometer are not shaded.

D. It is permissible to use any other type of temperature sensor that gives a reading identical to that of a mercury thermometer under the same conditions.

E. The thermometers must be placed so that the readings are representative of the conditions under which the employees work or rest, respectively.

II. *Work Load Categories*

Heat produced by the body and the environmental heat together determine the total heat load. Therefore, if work is to be performed under hot environmental conditions, the workload category of each job should be established and the heat exposure limit pertinent to the workload evaluated against the applicable standard in order to protect the worker exposure beyond the permissible limit.

A. The work load category may be established by ranking each job into light, medium, or heavy categories on the basis of type of operation:

(1) light work (up to 200 kcal/hr or 800 Btu/hr): e.g., sitting or standing to control machines, performing light hand or arm work,

(2) moderate work (200–350 kcal/hr or 800–1400 Btu/hr): e.g., walking about with moderate lifting and pushing, or

(3) heavy work (350–500 kcal/hr or 1400–2000 Btu/hr): e.g., pick and shovel work.

Where the work load is ranked into one of said three categories, the permissible heat exposure TLV for each workload can be estimated from Table 1 or calculated using Tables 2 and 3.

B. The ranking of the job may be performed either by measuring the worker's metabolic rate while performing a job or by estimating the worker's metabolic rate with the use of Tables 2 and 3. Additional tables available in the literature[1-3] may be utilized also. When this method is used, the permissible heat exposure TLV can be determined by Figure 1.

III. *Work-Rest Regimen*

The TLVs specified in Table 1 and Figure 1 are based on the assumption that the WBGT value of the resting place is the same or very close to that of the workplace. Where the WBGT of the work area is different from that of the rest area, a time-weighted average value should be used for both environmental and metabolic heat.

The time-weighted average metabolic rate (M) should be determined by the equation:

TABLE 2. Assessment of Work Load

Average values of metabolic rate during different activities.

A. Body position and movement	kcal/min
Sitting	0.3
Standing	0.6
Walking	2.0-3.0
Walking up hill	add 0.8 per meter (yard) rise

B. Type of Work		Average kcal/min	Range kcal/min
Hand work	*light*	0.4	0.2-1.2
	heavy	0.9	
Work with one arm	*light*	1.0	0.7-2.5
	heavy	1.7	
Work with both arms	*light*	1.5	1.0-3.5
	heavy	2.5	
Work with body	*light*	3.5	2.5-15.0
	moderate	5.0	
	heavy	7.0	
	very heavy	9.0	

$$\text{Av. M} = \frac{M_1 \times t_1 + M_2 \times t_2 + \ldots + M_n \times t_n}{t_1 + t_2 + \ldots + t_n}$$

where M_1, M_2...and M_n are estimated or measured metabolic rates for the various activities and rest periods of the worker during the time periods t_1, t_2...and t_n (in minutes) as determined by a time study.

The time-weighted average WBGT should be determined by the equation:

$$\text{Av. WGBT} = \frac{\text{WBGT}_1 \times t_1 + \text{WBGT}_2 \times t_2 + \ldots + \text{WBGT}_n \times t_n}{t_1 + t_2 + \ldots + t_n}$$

where WBGT_1, WBGT_2 ... and WBGT_n are calculated values of WBGT for the various work and rest areas occupied during total time periods; t_1, t_2 ... and t_n are the elapsed times in minutes spent in the corresponding areas which are determined by a time study. Where exposure to hot environmental conditions is continuous for several hours or the entire work day, the time-weighted averages should be calculated as an hourly time-weighted average, i.e., $t_1 + t_2 + \ldots t_n = 60$ minutes. Where the exposure is intermittent, the time-weighted averages should be calculated as two hour time-weighted averages, i.e., $t_1 + t_2 + \ldots + t_n = 120$ minutes.

The TLVs for continuous work are applicable where there is a work-rest regimen of a 5-day work week and an 8-hour work day with a short morning and afternoon break (approximately 15 minutes) and a longer lunch break (approximately 30 minutes). Higher exposure values are permitted if additional resting time is allowed. All breaks, including unscheduled pauses and administrative or operational waiting periods during work, may be counted as rest time when additional rest allowance must be given because of high environmental temperatures.

TABLE 3. Activity Examples

- Light hand work: writing, hand knitting
- Heavy hand work: typewriting
- Heavy work with one arm: hammering in nails (shoemaker, upholsterer)
- Light work with two arms: filing metal, planing wood, raking of a garden
- Moderate work with the body: cleaning a floor, beating a carpet
- Heavy work with the body: railroad track laying, digging, barking trees

Sample Calculation

Assembly line work using a heavy hand tool.

A.	Walking along	2.0 kcal/min
B.	Intermediate value between heavy work with two arms and light work with the body	3.0 kcal/min
	Subtotal:	5.0 kcal/min
C.	Add for basal metabolism	1.0 kcal/min
	Total:	6.0 kcal/min

IV. *Water and Salt Supplementation*

During the hot season or when the worker is exposed to artificially generated heat, drinking water should be made available to the workers in such a way that they are stimulated to frequently drink small amounts, i.e., one cup every 15–20 minutes (about 150 ml or 1/4 pint).

The water should be kept reasonably cool, 10°C to 15°C (50°F to 60°F) and should be placed close to the workplace so that the worker can reach it without abandoning the work area.

The workers should be encouraged to salt their food abundantly during the hot season and particularly during hot spells. If the workers are unacclimatized, salted drinking water should be made available in a concentration of 0.1% (1 g NaCl to 1.0 liter or 1 level tablespoon of salt to 15 quarts of water). The added salt should be completely dissolved before the water is distributed, and the water should be kept reasonably cool.

V. *Other Considerations*

A. *Clothing:* The permissible heat exposure TLVs are valid for light summer clothing as customarily worn by workers when working under hot environmental conditions. If special clothing is required for performing a particular job and this clothing is heavier or it impedes sweat evaporation or has higher insulation value, the worker's heat tolerance is reduced, and the permissible heat exposure TLVs indicated in Table 1 and Figure 1 are not applicable. For each job category where special clothing is required, the permissible heat exposure TLV should be established by an expert.

[Table 4 identifies TLV WBGT correction factors for representative types of clothing.

B. *Acclimatization and Fitness:* Acclimatization to heat involves a series of physiological and psychological adjustments that occur in an individual during the first week of exposure to hot environmental conditions. The recommended heat stress TLVs are valid for acclimated workers who are physically fit. Extra caution must be employed when unacclimated or physically unfit workers must be exposed to heat stress conditions.

C. *Adverse Health Effects:* The most serious of heat-induced illnesses is heat stroke because of its potential to be life threatening or result in irreversible damage. Other heat-induced illnesses include heat exhaustion which in its most serious form leads to prostration and can cause serious injuries as well. Heat cramps, while debilitating, are easily reversible if properly and promptly treated. Heat disorders due to excessive heat exposure include electrolyte imbalance, dehydration, skin rashes, heat edema, and loss of physical and mental work capacity.

If during the first trimester of pregnancy, a female worker's core temperature exceeds 39°C (102.2°F) for extended periods, there is an increased risk of malformation to the unborn fetus. Additionally, core temperatures above 38°C (100.4°F) may be as-

†TABLE 4. TLV WBGT Correction Factors in °C for Clothing

Clothing Type	Clo Value*	WBGT Correction
Summer work uniform	0.6	0
Cotton coveralls	1.0	-2
Winter work uniform	1.4	-4
Water barrier, permeable	1.2	-6

*Clo: Insulation value of clothing. One clo unit = 5.55 kcal/m²/hr of heat exchange by radiation and convection for each °C of temperature difference between the skin and adjusted dry bulb temperature.

Note: Deleted from Table 4 are trade names and "fully encapsulating suit, gloves, boots, & hood," including its Clo value of 1.2 and WBGT correction of -10.

sociated with temporary infertility in both females and males.

References

1. Astrand, P.O.; Rodahl, K.: Textbook of Work Physiology. McGraw-Hill Book Co., New York, San Francisco (1970).
2. Ergonomics Guide to Assessment of Metabolic and Cardiac Costs of Physical Work. Am. Ind. Hyg. Assoc. J. 32:560 (1971).
3. Energy Requirements for Physical Work. Research Progress Report No. 30. Purdue Farm Cardiac Project, Agricultural Experiment Station, West Lafayette, IN (1961).
4. Durnin, J.V.G.A.; Passmore, R.: Energy, Work and Leisure. Heinemann Educational Books, Ltd., London (1967).