

June 30, 2005
File: 54080.01

RECEIVED

JUL 05 2005

ENVIRONMENTAL PROTECTION

Mr. Scott Smale
Nevada Division of Environmental Protection
Bureau of Corrective Actions
333 W. Nye Lane
Carson City, Nevada 89706

**SUBJECT: Report of Field Activities
Phase I and II Closure Plan
Former Hawthorne Landfill
Mineral County, Nevada**

Dear Mr. Smale:

Kleinfelder is pleased to provide this letter report of field activities to the Nevada Division of Environmental Protection (NDEP) Brownfields Program for services performed at the former Hawthorne Landfill, Mineral County, Nevada (see Plate 1). The report documents the Phase I and Phase II Closure Plan activities performed at the former landfill from January 2005 through June 2005.

The Phase I Closure activities were performed in accordance with the approved scope of work dated January 5, 2005. The purpose of the Phase I Closure activities was to provide planning and training assistance for future surface debris consolidation at the former landfill. The Phase II Closure activities were performed in accordance with the approved scope of work dated February 2, 2005. The purpose of the Phase II Closure activities was to consolidate and dispose of surface debris. The services were performed under the existing contract between Kleinfelder and the Nevada Division of Environmental Protection (NDEP) (Contract No. DEP02-026).

Three individual contract phases of work were developed to organize implementation of the closure plan activities at the former Hawthorne Landfill.

<u>Contract Phase</u>	<u>Date</u>
I. Planning/Training	January 6 - February 8, 2005 (completed)
II. Surface Debris Consolidation	February 10 – June 30, 2005 (completed)
III. Trench and Cell Coverage	July 15, 2005 – June 30, 2006 (anticipated)

Phase I Closure activities included the following scope of work:

- Task 1: Job Descriptions/Advertisements/ Hiring**
- Task 2: Equip Field Personnel**
- Task 3: Train Field Personnel**
- Task 4: Grid Development and Identification of Consolidation Areas**
- Task 5: Report of Completion**

Kleinfelder subcontracted Mineral County to assist in planning and training activities. The use of Mineral County personnel and equipment and local suppliers provided project cost savings and supported local Hawthorne businesses. In addition, Day & Zimmerman Hawthorne Corporation (DZH) provided training assistance prior to surface debris consolidation activities, and the US Marine Corps provided equipment during surface debris disposal activities.

Planning and Training Activities

The Mineral County Brownfields Coordinator and Mineral County Recorder's Office created two job descriptions to assist in the implementation of the Phase I scope of work. A supervisor's position was created to oversee the field work and supervise the laborers. Laborer's positions were created to perform the field work.

Mineral County hired Mr. Warren Stevens as the Field Supervisor. Mr. Stevens provided constant oversight of field laborer activities. Laborers were selected from juniors and seniors at the Mineral County High School. The Mineral County High School utilized their school-to-work program guidelines to identify and generate a list of workers. A total of eleven field laborers were hired and trained to perform surface debris consolidation.

The surface debris consolidation component of the cleanup plan required laborers to walk and drive through the subject site while picking up surface debris. Laborers were provided overalls, gloves, steel toed boots and safety hats. Hand tools such as rakes, shovels, and wheelbarrows were also supplied.

DZH provided the field laborers environmental awareness training. Each laborer received 8 hours of training that included information on the following topics:

- Air- Clean Air Act
- Water – Clean Water Act
- Solid Waste – Resource Conservation and Recovery Act
- Drinking Water – Safe Drinking Water Act
- Site Contamination and Cleanup – Comprehensive Environmental Response, Cleanup and Liability Act
- Hazardous Materials and Substances – Emergency Planning and Community Right-to-Know Act
- Asbestos – Asbestos Hazardous Emergency Response Act
- Unexploded Ordnance Recognition and Avoidance

A copy of DZH environmental awareness training materials is included in Appendix A.

DZH also provided the field laborers first aid and hazardous materials awareness training. Each laborer received 8 hours of training intended to provide a basic knowledge of potential former landfill hazards. Class instructors were certified by the Red Cross and the State of Nevada Fire Marshall's Office. DZH provided a letter to document field laborer training. A copy is included in Appendix A.

Grid Development Activities

On January 28, 2005, Kleinfelder identified and marked eighteen grid areas at the subject site (see Plate 2). The grids were identified starting at the east site boundary and moving west. Each grid runs the length of the subject site from north to south, approximately 2,215 feet, and is 100 feet wide. A total of eighteen grids were located, and each grid area is approximately five acres for a total of approximately 90 acres. The grid boundaries are defined on the north and south by the subject site fence, and are defined east and west by painted stakes. Preliminary areas for surface debris consolidation were identified to the west of the Phase II Area.

During grid development, suspected asbestos containing materials (ACM) were observed at multiple locations on the subject site. The suspected ACM include cementitious roofing tiles observed at four locations and friable pipe insulation observed at one location.

Phase I Activities Summary

Planning and training activities were completed in accordance with Phase I Closure Plan scope and budget. Grid development and consolidation area identification were also completed in accordance with the approved scope of work.

Phase II closure activities included the following scope of work:

- Task 1: Surface Debris Consolidation**
- Task 2: New Trench Location and Installation**
- Task 3: Surface Debris Disposal**
- Task 4: Report of Completion**

Prior to the start of field activities, Kleinfelder used flags to mark ACM locations in the Phase II area. The ACM were not handled during field activities.

Surface Debris Consolidation

On February 10, 2005, Kleinfelder conducted a health and safety meeting. Mineral County employees including field laborers, field supervisor and Director of Parks and Recreation were present. Subsequent field safety meetings were held by the Field Supervisor to review Health and Safety issues and to address additional site specific issues including abundant scorpions. A copy of the Health and Safety Plan (HASP) is included in Appendix B. Following the health and safety meeting, surface debris consolidation started at the northeast corner of the subject site and progressed south through the first grid area. Consolidation activities then progressed generally east to west through the Phase II area. Field laborers performed surface debris collection using hand tools, wheelbarrows and a flatbed truck for larger objects. Smaller objects were placed in bags and larger objects were moved individually. Debris was hand consolidated in piles along existing dirt roads on the subject site.

Field laborer activities were documented daily by the Field Supervisor. Fifty days of surface debris consolidation were performed from February 10, 2005, through May 27, 2005. The Field Supervisor documented a total of 881.5 field laborer hours. The Field Supervisor provided daily documentation of field laborer hours. A copy is included in Attachment C. Of the 11 field laborers hired, six were unable to complete the project. The five remaining field laborers were employed by Mineral County until May 29, 2005.

In addition to the field laborers, a Mineral County operator used a small front-end loader to further consolidate small piles and move objects too large for hand collection. Field laborers did

not work in the vicinity of any operating heavy equipment. A total of 37 days of equipment operation occurred from March 1, 2005 through June 5, 2005. A total of 111 hours of equipment time was utilized during surface debris consolidation activities. Equipment hours are documented in Attachment C.

On February 15, 2005, NDEP Brownfields Program and Solid Waste Division representatives visited the subject site and observed ongoing consolidation activities. Representatives of Kleinfelder and Mineral County were also present during the site visit. Discussions with the Field Supervisor indicated that surface debris consolidation activities were progressing in accordance with the scope of work.

On March 25, 2005, Kleinfelder performed a site visit to observe ongoing surface debris consolidation activities. The Field Supervisor indicated that ongoing field activities were being performed in accordance with the scope of work.

Surface Debris Disposal

Mineral County employees selected existing trench locations to dispose of surface debris. In addition, two new trenches were excavated adjacent to existing trenches in the northwest portion of the Phase II area. The existing trenches remain open from historic landfill activities. The disposal location was selected due to the proximity to the majority of larger solid waste disposal areas. Mineral County Public Works Department equipment, and a loader from the US Marine Corps were utilized for debris load and transport. Consolidated debris was loaded and hauled to the disposal trench location and placed in the trenches.

Disposal of approximately 1,000 piles of consolidated surface debris, constituting approximately 20,000 cubic yards of material, was performed. Heavy equipment operations were performed on weekends from April 30, 2005 through June 26, 2005. Heavy equipment operated for a total of 13 days. In addition, the small front-end loader operated for 32 hours over four days. Equipment hour documentation is included in Attachment C.

Large pieces of scrap metal were consolidated for recycling. American Salvage of Reno, Nevada provided steel collection and recycling services for the approximately 78 tons of consolidated scrap metal.

A water truck provided continuous dust control. Ambient soil conditions due to a wet winter and spring also mitigated dust generation. Preliminary cover has been placed over the trenches, but final surface grading will be completed during Phase III activities.

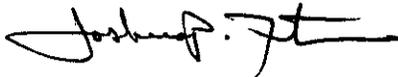
Phase II Activities Summary

Surface debris consolidation was performed in the entire Phase II area. Consolidation activities were approximately 90% effective in removing all surface debris. Minor remaining surface debris consolidation in the Phase II area will be completed during initial Phase III activities. A NDEP Brownfields Program representative performed final review of consolidation activities on June 14, 2005. Phase III activities are anticipated to start in July 2005.

We appreciate the opportunity to provide our services to the NDEP on this project. Please call the undersigned with any questions or comments regarding this Phase I ESA report, and with any requests for additional services.

Sincerely,

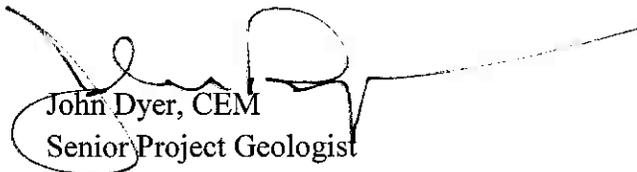
KLEINFELDER, INC.



Joshua P. Fortmann, CEM #1730, exp. 6/21/06
Staff Geologist

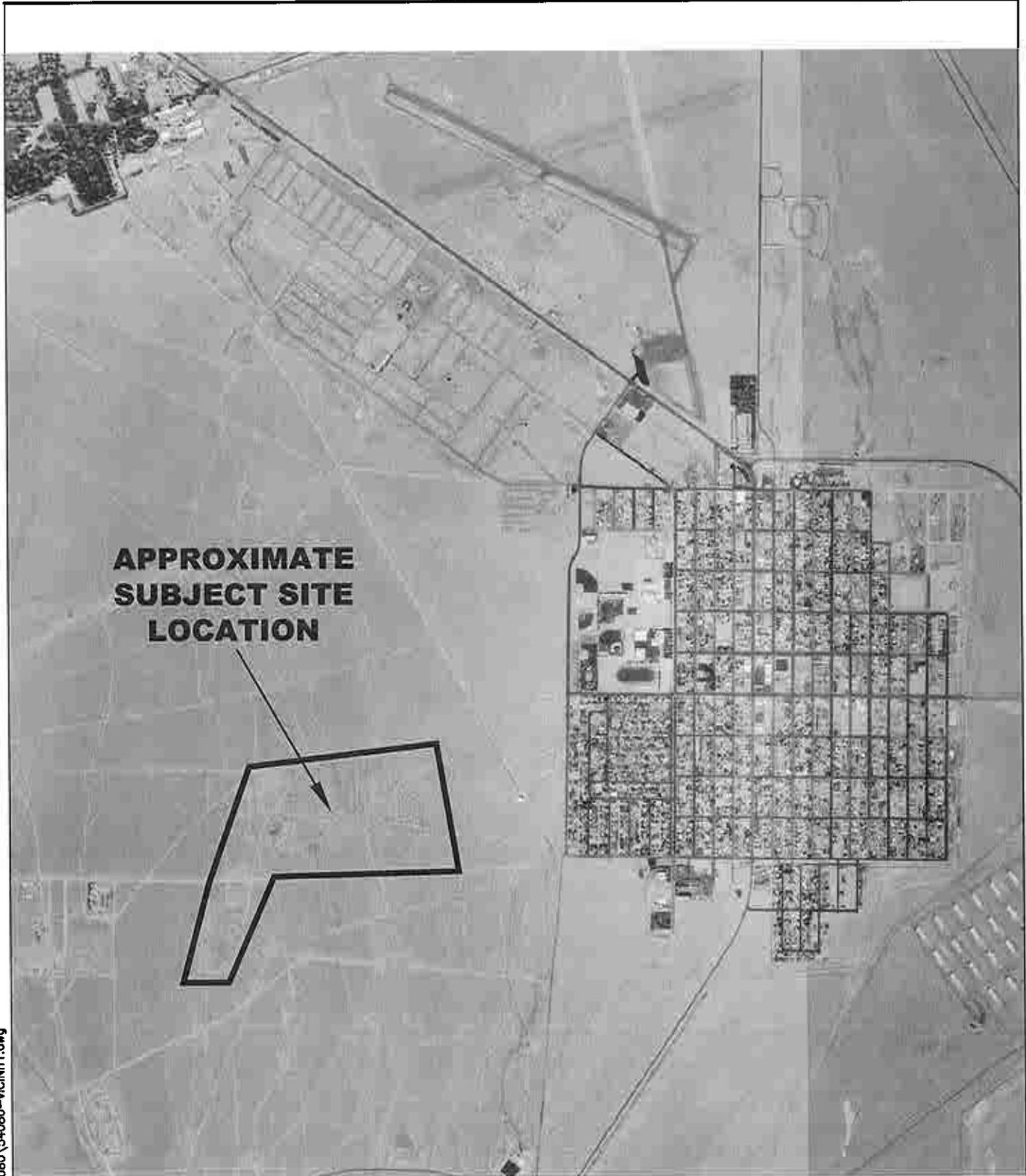
I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and to the best of my knowledge comply with all applicable Federal, State and local statutes, regulations, and ordinances.

Reviewed by:

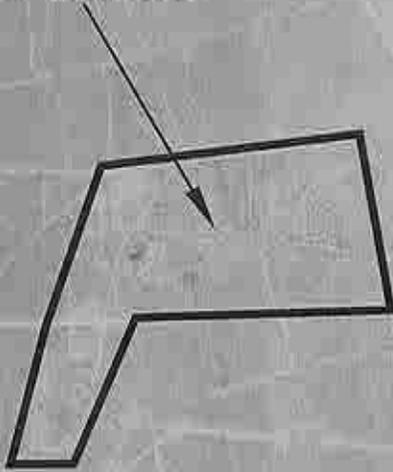


John Dyer, CEM
Senior Project Geologist

Plates



**APPROXIMATE
SUBJECT SITE
LOCATION**



CAD FILE: L:\2005\DRAWING\54080\54080-VICINITY.dwg

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KLEINFELDER

4875 LONGLEY LANE, SUITE 100
RENO, NEVADA 89502
Tel. (775) 689-7800

PROJECT NO. 54080.01

SITE VICINITY MAP

FORMER HAWTHORNE LANDFILL
HAWTHORNE, NEVADA

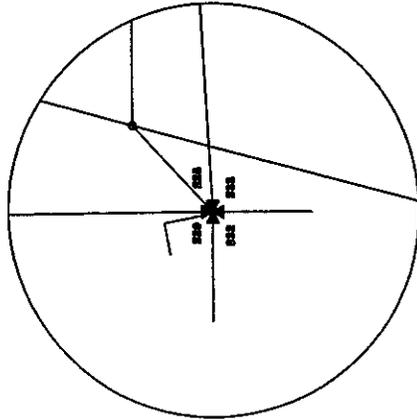
PLATE

1

MAP NOTE:

**TOTAL AREA SURVEYED
185.25 ACRES**

LINE TABLE



**DETAIL
(NOT TO SCALE)**

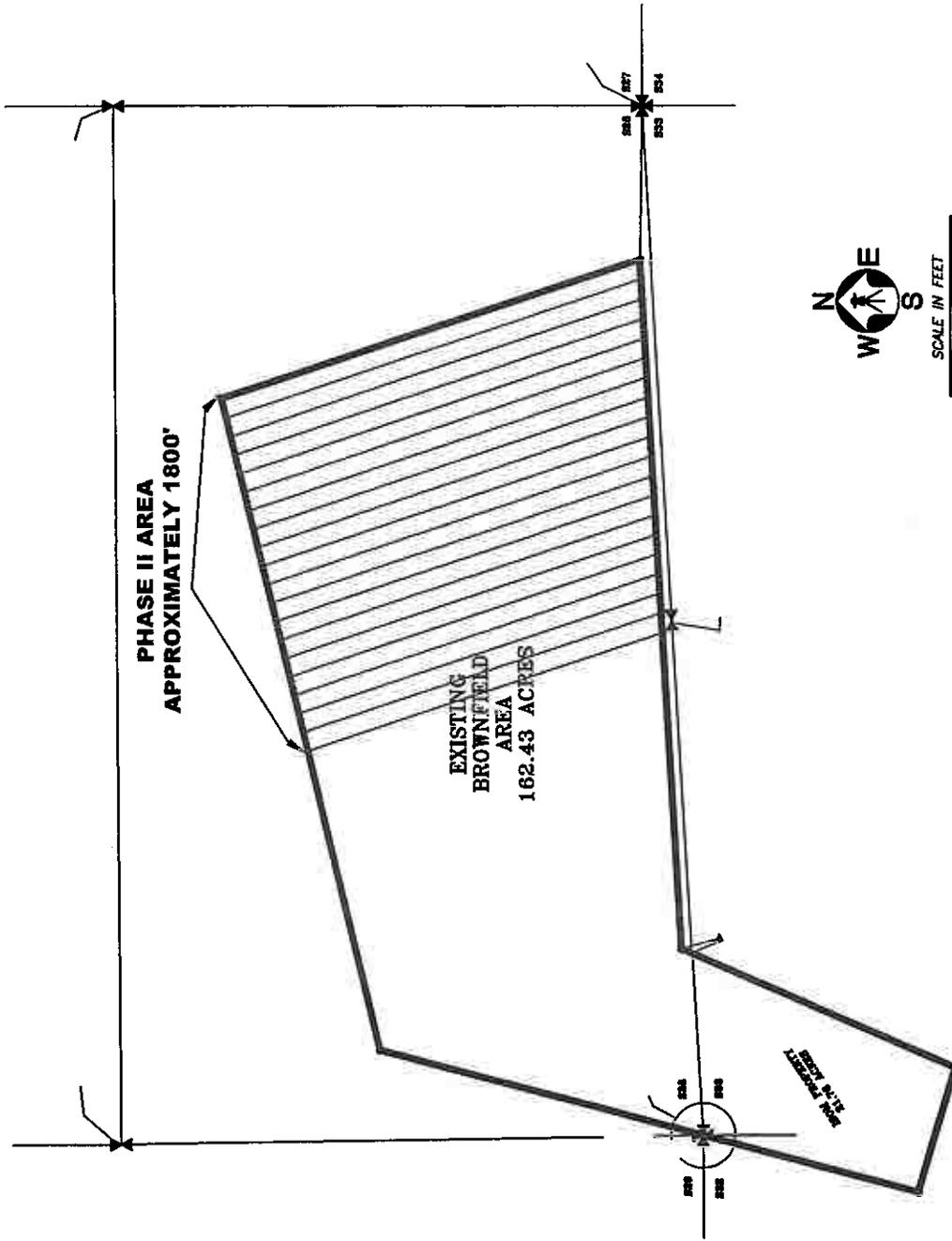
RECORD OF SURVEY FOR

MINERAL COUNTY

OF A PORTION
OF SECTIONS 28, 32 AND 33
IN SECTION 25 TOWNSHIP 8 NORTH RANGE 50 EAST
MOUNT DIABLO MERIDIAN
MINERAL COUNTY, NEVADA

Surveyor
a professional corporation
REGISTERED IN NEVADA
Reno, Nevada
(775) 484-7800

C. STRAW JR.



SCALE IN FEET
0 450 900

PLATE

2

SITE PLAN

FORMER HAWTHORNE LANDFILL
MINERAL COUNTY, NEVADA

KH KLEINFELDER

4875 LONGLEY LANE, SUITE 100
RENO, NEVADA 89502
Tel. (775) 689-7800

PROJECT NO. 54080.01

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Appendix A

Field Laborer Training Documentation

April 4, 2005

On January 24th & 25th and February 3rd & 4th, Brownsfield school to work students received training in the areas of First Aid and HazMat Awareness. Each day, students attended 2 hours of training. Training in these areas provided students with basic knowledge in the hazards they may encounter while working on the Brownsfield project.

Instructors for these classes are certified through the Red Cross and the State of Nevada Fire Marshall's Office.

Any questions concerning this may be addressed to the DZHC Fire Department.

Timothy E. Rutherford



Fire Inspector
DZHC Fire & Emergency Services
(775) 945-7107

March 15, 2005

Josh Fortmann
Kleinfelder & Associates
Reno, NV

Dear Mr. Fortmann,

At the request of Mr. Orndorff, I am providing this letter confirming that Staff from the Environmental Services Division of the Day & Zimmermann Hawthorne Corporation provided environmental awareness training to JPO and Student-to-Work personnel involved in the Hawthorne Brownsfield project. This training was provided January 31, 2005 through February 3, 2005 for a total of eight hours. The training consisted of an introduction to the following environmental mediums and/or laws:

- Air- Clean Air Act
- Water – Clean Water Act
- Solid Waste – Resource Conservation Recovery Act
- Hazardous Waste- Resource Conservation Recovery Act
- Drinking Water – Safe Drinking Water Act
- Site Contamination & Clean-Up – Comprehensive Environmental Response
Compensation Liability Act
- Hazardous materials & Substance – Emergency Planning & Community
Right-to-Know Act
- Asbestos – Asbestos Hazardous Emergency Response Act
- Unexploded Ordnance Recognition & Avoidance

The attached documents were utilized as a lesson guide for this training and/or were provided to the students as handouts.

If you have any questions, please contact the undersigned at 775-945-7589.

Sincerely,

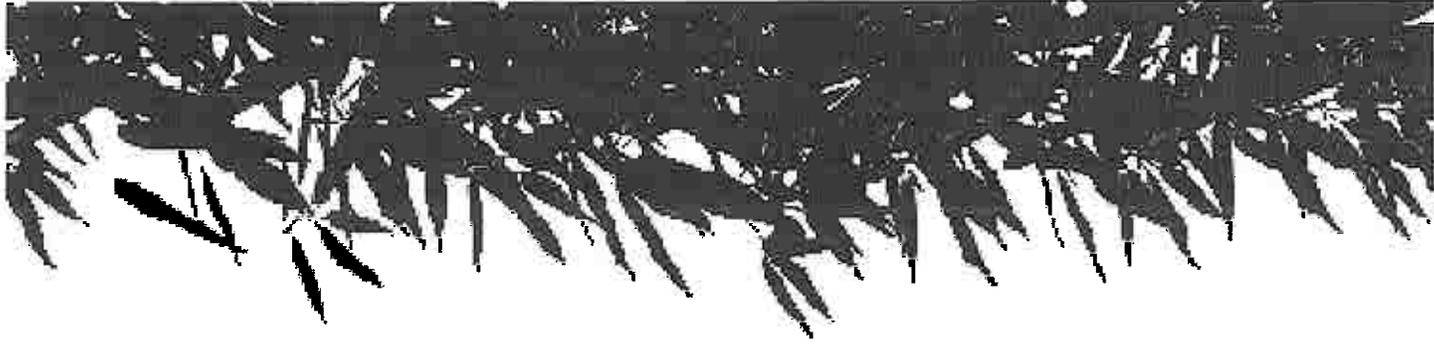


Charles P. Theisen, Manager
Environmental Services Division

Attachments (1)

Terms, Definitions, and Notes

- * Environment – Surroundings
- * Biosphere - Life sphere encapsulating the earth
- * Environmental Mediums – Air, water, soil (Renewability?)
- * Noble Cause – Intent of Legislation



Terms (cont.)

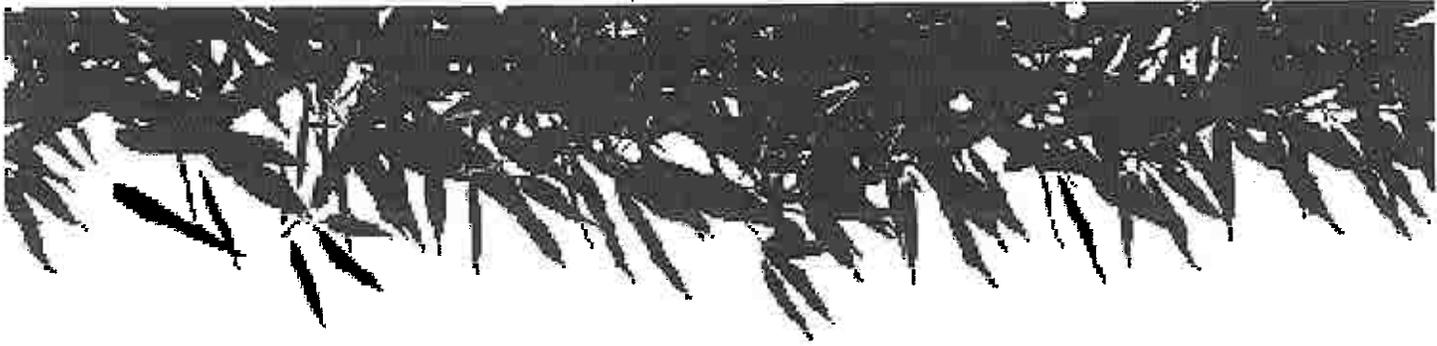
- * NRS+Agency (who)=Reg.=NAC
(how/where)
- * Sanctions=County commission
(who)=Ordinance (what, where, when,
how)
- * Sanctions=City Council
(who)=ordinance (what, where, when,
how)

Terms

- * Noble Cause=Intent of Legislation
(Why)
- * House/Senate Bill + Pres. Approval =
Act/Law (What/When)
- * Act/Law + Agency = Regulations=CFR
(How/Where)
- * Sanctions=Assembly/Senate Bill+Gov.
Approval=Act/Law (What/When)

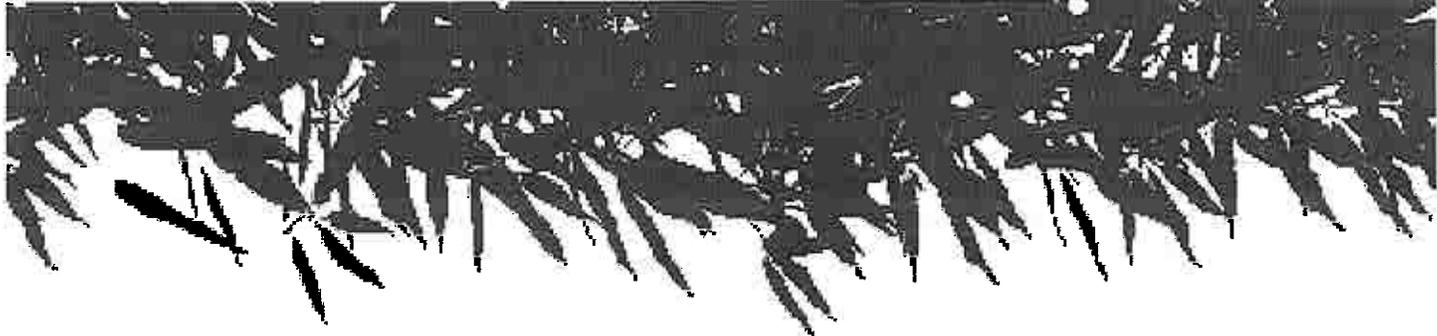
Who Makes the Rules?

- * *Federal:* House/Senate Bill → Bill
 - President signs → Law/Act (US Code)
 - Given to agency → Regulations (CFR)
- * *State:* Assembly/Senator Bill → Bill
 - Governor signs → Law/Act (NRS)
 - Given to agency → Regulations (NAC)
- * Primacy – Authority issued by the Federal government to States to enforce Federal laws, Regulations or Programs



Who Makes the Rules?

- * *County:* County Commissioner
→ Ordinance → Given to agency
→ Regulations
- * *City:* City Council → Given to agency
→ Regulations
- * DOD → DA → DZHC → YOU!!!!
- * Primacy- authority given to lower level
for enforcement



CAA Criteria Pollutants

POLLUTANT	HARM	NATURAL CAUSE	NATURE CURE	MAN'S CAUSE	MAN'S CURE
TSP (TOTAL SUSPENDED SOLIDS)	Respiratory Hazard	Wind Surface Disturbance	Precipitation	Surface Disturbance	Surfactants
SO _x	Acid Rain	Volcanoes	Neutralize	Fossil Fuels	Remove sulfur
NO _x	Smog	Lightning	NA	High Temp. Combustion	Remove nitrogen
VOC (VOLATILE ORG. CMPD)	Smog	Conifers	Fire	Chemical manufact.	Burn
LEAD (Pb)	Child Mental Development	NA	NA	Cars	Scrubbers Filters, Mgt.
OZONE (O ₃)	Smog	NA	NA	Cars, from VOC and NO _x	Reduction of emissions
CARBON MONOXIDE	Toxic	Combustion	Dilution	Cars	Change combustion



Clean Air Act (CAA)

- * NESHAPS: National Emission Standards for Hazardous Air Pollutants
- * Title III: Toxic Abatement (189 Toxic Pollutants)
- * AHERA: Asbestos Hazard Emergency Response Act
- * AQOP: Air Quality Operating Permits required prior to construction (HWAD has 48 plus 3 open burning)
- * CFC's: Chloroflurocarbons
 - Greenhouse Effect
 - Smog ozone vs. Stratospheric ozone



PART I

ENVIRONMENTAL REGULATORS & LAWS (*EXCEPT RCRA*)

Environmental Regulators and Laws

Introductory Terms, Definitions, and Notes

Environment = Surroundings

Biosphere = Life sphere encapsulating the earth

Environmental Mediums = Air, Water, Soil (*Renewability Lecture Explanation*)

Noble Cause (*Clean Environment, Safe Workplace, Safe Transportation, etc.*) No ill effect to human health or the environment.

Noble Cause = Intent of Legislation (*Why*)

House Bill/Senate Bill + Presidential Approval = Act/Law (*What/When*)

Act/Law x Implementing Agency (*Who*) = Regulations = CFR (*How/Where*)

Sanctions = Assembly/Senate Bill + Governor Approval = Act/Law (*What/When*)

NRS x Implementing Agency (*Who*) = Regulation = NAC (*How/Where*)

Sanctions = County Commission (*Who*) = Ordinance (*What, Where, When, How*)

Sanctions = City Council (*Who*) = Ordinance (*What, Where, When, How*)

Primacy = Authority issued by the Federal Government to States to enforce Federal Laws, Regulations or Programs.

Note = State or Local Laws/Regulations may be more stringent than Federal Laws/Regulations but not less stringent.

Note = Laws/Regulations often overlap or may contradict other laws, however, the more stringent law generally applies unless otherwise specified.

A. Environmental Regulatory Agencies

1. **EPA** Environmental Protection Agency
2. **OSHA** Occupational Safety and Health Administration
3. **DOT** Department of Transportation
4. **DOD** Department of Defense
5. **DA** Department of Army
6. **NDEP** Nevada Division of Environmental Protection
7. **NDEM** Nevada Division of Emergency Management
8. **SFMD** State Fire Marshall Division
9. **LEPC** Local Emergency Planning Commission
10. **NDOSH** Nevada Division of Occupational Safety and Health

7. Army Environmental Regulations (AR200-1)

8. **CAA** Clean Air Act -- HWAD
 - a. Criteria Pollutants
 - (1) **TSP** = Total Suspended Particulates and PM - 10 = Particulate Matter less than 10 microns (*respirable*)
 - (2) **SO_x** = Sulfur Oxides -- Acid Rain
 - (3) **NO_x** = Nitrogen Oxides -- Smog
 - (4) **CO** = Carbon Monoxide -- (*Toxic*)
 - (5) **O₃** = Ozone -- (*Smog*)
 - (6) **VOC** = Volatile Organic Compounds -- (*Smog*)
 - (7) **Pb** = Lead -- (*Toxic*)

 - b. **NESHAPS** = National Emission Standards for Hazardous Air Pollutants

 - c. **Title III** = Toxic Abatement (*189 Toxic Pollutants*)

 - d. **AHERA** = Asbestos Hazard Emergency Response Act

 - e. **CFCs** = Chloroflorocarbons causing the "**Greenhouse Effect**"
(*Smog Ozone vs. Stratospheric Ozone*)

- f. AQOP required prior to construction/operation
- g. **AQOP** = Air Quality Operating Permits -- HWAD has 48 plus 3 open burning

9. **CWA** Clean Water Act

- a. **NPDES** -- National Pollution Discharge Elimination System (Permit)
 - (1) WADF Process Water Treatment Facility
 - (2) Sewage Treatment Facility
 - (3) Stormwater Discharge Permit

NOTE: NPDES Permit establishes maximum chemical, biological and turbidity effluent concentrations, and operational parameters.

NOTE: WADF NPDES Permit supersedes RCRA.

- 10. **SDWA** Safe Drinking Water Act establishes standards and procedures for potable water disinfection.
- 11. **MSHA** Mining Safety Health Act -- (*HWAD has 1 open pit mine*)
- 12. **OSHA** Occupational Safety Health Act -- (Army Regulation AMC-R 385-100)
- 13. **FIFRA** Federal Insecticide, Fungicide, and Rodenticide Act

14. **CERCLA** Comprehensive Environmental Response Compensation, and Liability Act -- a.k.a. "**Superfund**"

- a. **SARA** Superfund Amendment Reauthorization Act
(Release Reporting)
- b. **EPCRA** Emergency Planning and Community Right to Know Act - Hazard Communication (*HAZCOM*) and Hazardous Waste Operations and Emergency Response (*HAZWOPER*)
- c. **DERP** Defense Environmental Restoration Program
- d. **DERA** Defense Environmental Restoration Account
- e. **FUDS** Formerly Used Defense Sites
- f. **LUST** Leaking Underground Storage Tanks
- g. **SWMU** Solid Waste Management Units
- h. **MSWLF** Municipal Solid Waste Landfills (*HWAD has 2 permits*)
- i. **PRP** Potentially Responsible Party

15. **TSCA** Toxic Substance Control Act
 - a. Premanufacture review
 - b. PCBs — Polychlorinated Biphenyls

16. **FFCA** Federal Facilities Compliance Act

PART II

HAZARDOUS SUBSTANCES -- HAZARDOUS MATERIALS — HAZARDOUS WASTE

Introductory Terms and Definitions (Critical)

NOTE: These definitions are the practical paraphrased definitions and are not the quotes from the appropriate CFR.

HS Hazardous Substance -- is a product or chemical harmful to aquatic life or to the environment which is regulated if it is spilled or otherwise released as defined by the Clean Water Act (CWA) and/or CERCLA or as listed in 40 CFR 302.

HM Hazardous Material -- is a product or chemical defined by DOT or 49 CFR 100-109 that is an unreasonable risk to safety, health, or property during transportation, defined or listed in 49 CFR 172.101 or meets the definition of "*hazard class*" requiring DOT placarding.

U - WASTES

SPECIFIC CHEMICAL WASTES

U002

Acetone

U220

Methyl Benzene

U239

Dimethyl Benzene

B. "CHARACTERISTIC" HW (*Lecture Explanations*)

Products or chemicals that exhibit the "CHARACTERISTIC" as defined in Subpart C of 40 CFR 261, their EPA HW Codes and examples of "CHARACTERISTIC" HW possibly encountered at HWAD.

1. Ignitable "CHARACTERISTIC" HW will have EPA HW Code D001
 - a. A liquid with a flashpoint of 140 degrees F or less (*i.e. waste gasoline*).
 - b. A solid capable of igniting under standard pressure and temperature or of causing fire through friction or spontaneous chemical change such that when ignited burns vigorously and persistently sufficient to cause a hazard (*i.e. waste white phosphorus or waste picric acid*).
 - c. An ignitable compressed gas defined by 49 CFR 173 (*i.e. waste hydrogen and waste methyl chloride*).
 - d. An oxidizer as defined by 49 CFR 173 (*i.e. waste ammonium perchlorate*).

2. Corrosive "CHARACTERISTIC" HW will have EPA HW Code D002
 - a. An aqueous solution having a pH < 2 or > 12.5
(i.e. waste anhydrous hydrazine or hydrochloric acid.)
 - b. A liquid that corrodes steel (SAE 1020) a rate > 6.35mm (.25 in) per year at 130 degrees F.
(i.e. waste IRFNA or Inhibited Red Fuming Nitric Acid)
3. Toxic "CHARACTERISTIC" HW will have EPA HW Code D004 through D043
 - a. A product or chemical that exceeds toxicity limits specified by 40 CFR 261 when tested by TCLP (***Toxicity Characteristic Leachate Procedure***) Analysis *(i.e. wastes contaminated with heavy metals such as lead, arsenic, barium, cadmium, chromium, etc.)*
 - b. Toxic Substances vs. Toxic Waste
4. Reactive "CHARACTERISTIC" HW will have EPA HW Code D003
 - a. Capable of detonating or is a Class 1.1, 1.2, or 1.3 *(i.e. waste sufficiently contaminated with explosives to detonate)* or is waste explosives.

- b. A solid that is normally unstable and readily undergoes violent change without detonating.
- c. Reacts violently with water.
- d. Forms potentially explosive mixtures with water.
- e. Generates toxic gases when mixed with water.

Note: Donor charge is not considered waste and therefore, not a hazardous waste.

C. "Mixture Derived From" Rule (*Lecture Explanation*)

- 1. **POL** -- Petroleum, Oils, Lubricants.
- 2. Known HW vs. Required Analysis (*POL, Corrosive, Pink Water, Reactive*).
- 3. Process Mixtures vs. Environmental Medium Mixtures of "LISTED" vs. "CHARACTERISTIC" HW

D. TSDF — Treatment, Storage, Disposal Facility

Facility permitted by EPA and assigned an EPA identification number. HWAD's EPA ID # is NV1210090006 except for New Bomb which is NV5210090010.

Chapter 1

Water Facts and Usage

Earth has been called the "water planet" with good reason; water covers 75% of the globe. However, water does not restrict itself to the surface of the planet. It also filters through the crust of the Earth and floats in the atmosphere, in vapor form, as clouds. Earth is the only planet in our solar system with water on the surface, underground, and in the atmosphere.

Water obeys the laws of gravity. It seeks the lowest level possible, finding its way into any space into which it is able to flow. Through its constant wanderings, water is one of the major forces that shapes our planet.

It was the arrival of water on our planet that allowed life to develop. Without water, there would be no life, and water quality has a great influence on the quality of life.

Water appears to occur in such abundance that it seems we have an unlimited supply available for human use. However, the amount of available fresh water is comparatively tiny; only about 1% of the world's water. ~~This activity will help students understand that only small amounts of water are available, and it will show them how much we depend on fresh water in our daily lives.~~

4. Knowing this, and estimates for the percent of water use by different categories, we can figure out about how many cups of water the average American uses for each of these activities each day (Table 1-1). Ask the students to compare the values that they predicted in their groups to professional estimates for each of the water uses. Most people greatly underestimate their water use.

Table 1-1. Water use by average American.

Water Use	Cups	Percent of Total Use
Washing/showering	865	27
Toilet flushing	769	24
Running washing machine	545	17
Doing dishes	449	14
Cooking/drinking	321	10
Gardening/washing cars	256	8

5. To give the students an idea of how much water this actually is, groups can fill garbage cans for each category by counting cups of water into them. The 769 cups of water for toilet flushing will nearly fill a 50-gallon garbage can. If you have a non-slippery outdoor area, you may choose to fill the cans by setting up a relay race.
6. Water use varies a great deal by country (Table 1-2). Ask the students to guess the top 10 countries for water usage, and rank them on their worksheet with the highest on top. Discuss the reasons why the United States uses so much water compared to other nations (habits, irrigated agriculture, technology to withdraw and deliver water, and industry).

Table 1-2. Water use by country.

Country	Amount of Water Used Daily (liters)
United States	6,320
Canada	4,130
Australia	3,320
Italy	2,960
Netherlands	2,730
Spain	2,650
Japan	2,530
Belgium	2,510
Finland	2,120
Germany	1,870
France	1,370
Norway	1,340
Sweden	1,310
New Zealand	1,050
United Kingdom	700
Denmark	650
Switzerland	290

7. You may want the students to find these countries on the map and write in how many liters of water each person uses per day in each country. Does this give some clues as to what types of countries are the big water users?

NAME _____

How many cups of water/day do you use while:

1. Washing/showering _____
2. Toilet flushing _____
3. Running washing machine _____
4. Doing dishes _____
5. Cooking/drinking _____
6. Gardening/washing cars _____

Usage of Water by Country (greatest usage on top)

RANK	ESTIMATE	ACTUAL
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____
8.	_____	_____
9.	_____	_____
10.	_____	_____

Figure 1-2. Data sheet, student water use.

Table 1-3. World's water supply relative to 1-liter total.

Source	Amount (ml)	Percent of Total
Oceans	973 or 4 cups	97 (approximately)
Icecaps/glaciers	21 or 1.5 tablespoons	2.1
Groundwater (down to 13,000 ft)	6.1 or .5 tablespoon	0.6
Saline lakes	0.08 or 2 drops	0.1
Freshwater lakes	0.09 or 2 drops	0.1
Soil moisture	0.05 or 1 drop	0.005
Atmosphere	0.01 or 1/5 drop	0.001
Rivers	not enough to be measured	0.0001

At this point, the original jar should be empty.

4. Ask the students to offer ideas about which of these are currently available as inexpensive sources of useable fresh water.
5. Turn the original jar around to show the "Currently Useable Fresh water" side. Add back the amounts of water that are currently useable by industry, including agriculture:

of the groundwater (the other is too salty),
nearly all of the freshwater lakes,
nearly all of the soil moisture,
nearly all of the river water.

Ask the students how much of this industrially useable water they think would be fit for drinking as it is. There are no accurate figures for this, but it could be about half.

6. Discuss with the class all of the uses that we have for water, and then compare it to the relatively small amount of fresh water that we actually have available.

Chapter 3 Water Pollution

In the past, scientists were concerned about visible forms of water pollution. Large quantities of raw sewage and hazardous wastes were dumped into our fresh water. Increased amounts of pollution in the water caused the water to become discolored and smelly and changed the water until some of it was dangerous to life. In extreme cases, fish died in large numbers.

These obvious signs created much concern for environmentalists. Research studies showed the effects of pollution not only on fish, but also on various species throughout the food chain. In 1964, Rachel Carson reported much of this in a book called Silent Spring. This book attracted much public attention and pointed out the magnitude of the problem. People realized the need for action and figured out what needed to be done. Agencies were formed, rules were written and enforced, and water quality improved.

However, water pollution problems did not disappear. The water pollution problems we have today are terribly complex and difficult to study. These days, most water pollution is invisible. In addition to oil spills and toxic leaks, we must deal with less obvious pollutants. Thousands of chemicals are present in the water and sediments - some are toxic, some build up in the food chain and become toxic, and some are toxic only when combined with other chemicals. Many are present in such small amounts that they are hard to measure. Scientists must conduct experiments to test the nature of each potentially harmful chemical so standards can be set. This task is both time consuming and costly, but failure to address water pollution problems could result in disaster because the health of our planet, and all of us that live here, depends on the quality of our water. In this section, the lessons address the complexities of today's water pollution problems.

YOU ARE WHAT YOU EAT

Overview: Students experiment with fat-soluble versus water-soluble dyes as models for contaminants.

Objective: To demonstrate how a chemical can bioaccumulate in an organism.

Materials for 28 Students: Red food coloring; red oil-based artist's paint; 500 ml mineral oil or baby oil; water; 23 baby food jars; 14 pipets; two large paper fish cut-outs.

Teaching Time: 45-60 minutes.

Note: This activity is planned for 28 students working in 7 groups of 4. It can be easily modified for more or fewer students.

Teacher Instructions

A. Background information:

Many of our present water pollution problems result from very small amounts of many different kinds of chemicals in water. Some of these chemicals are considered toxic because they are poisonous in very small amounts (parts per million, billion, or trillion). One part per million is one drop in a swimming pool. The toxic nature of a chemical is determined through a test called a toxicity test. The discharge of chemicals with high toxicity into fresh water is regulated so the amount of chemical does not exceed the amount that will harm organisms.

→ NPDES Permits

A relatively new water pollution concern is that some chemicals have a tendency to bioaccumulate. Bioaccumulation is the "building-up" of a chemical to a toxic level in an organism's body. The chemical may occur in the water in such minute amounts that the water is not harmful. However, when the chemical is taken in by organisms, they may not be able to excrete it, and it builds up in their bodies. When these organisms are eaten by others higher on the food chain, they pass on their toxic dose more concentrated than before. The term bioaccumulation is often used interchangeably with the term bioconcentration (accumulation from water only) and biomagnification (accumulation through the food chain).

A chemical is more likely to bioaccumulate if it is not very water soluble (meaning that it will not dissolve easily in water). If it is not water soluble, it is probably fat soluble (will dissolve in fat). Small amounts of chemicals that are water soluble, even if they are toxic, may be taken into the digestive system of an animal, dissolve, and pass out again in the wastes of that animal. Likewise, chemicals that are fat soluble will also be taken into the digestive system. However, fat-soluble chemicals are often stored in the animal's fat and will not pass out of the organism's body until the fat has been used up. This is the problem of bioaccumulation. The chemicals accumulate in an organism, which in turn is eaten by a bigger organism, which receives a greater dose of the harmful chemical. Bioaccumulation can be a difficult concept to understand. An excellent lesson to use with this demonstration is found in WOW! The Wonders of Wetlands, "Marsh Mystery."

Rb
Hq

Table 3-1. Water pollution and its effects on fish.

Types of Pollution	Effects	Causes	Prevention/Treatment
Thermal	<ul style="list-style-type: none"> - Death - Deformities of heart - Deformities of the yolk sac of young fish 	<ul style="list-style-type: none"> - Waste heat from power generation - Clear cut of trees around the stream 	<ul style="list-style-type: none"> - Cool water with cooling tower - Leave strip of trees growing along banks
Heavy Metals	<ul style="list-style-type: none"> - Death - Thick gills - Internal bleeding - Slowed growth 	<ul style="list-style-type: none"> - Non-point sources - Point sources from industry & mining 	<ul style="list-style-type: none"> - Treatment at a sewage plant - Industrial water treatment
Organic Pollution	<ul style="list-style-type: none"> - Death - Build-up in tissues - Retardation of development (due to lowered oxygen levels, etc.) 	<ul style="list-style-type: none"> - Runoff from farms - Feed lots - Manufacturing wastes 	<ul style="list-style-type: none"> - Treatment at a sewage plant - Prevent runoff from farms - Recycle batteries
Pesticides (a type of organic pollution)	<ul style="list-style-type: none"> - Death - Fused vertebrae - Build-up in tissue - Fin erosion 	<ul style="list-style-type: none"> - Runoff from farms, lawns, golf courses, forests - Misuse of pesticides 	<ul style="list-style-type: none"> - Prevent runoff from farms - Don't overuse on lawns and farms - Use when dry weather
Erosion	<ul style="list-style-type: none"> - Eggs of larvae on the bottom of river may be covered and smother - Decreased food production at base of the food chain - Undesirable species take over 	<ul style="list-style-type: none"> - Road building - Forestry - Farming - Urban construction 	<ul style="list-style-type: none"> - Improved land-use practices
Acid Rain	<ul style="list-style-type: none"> - Death - Fish stop eating - Reduced ability to reproduce - Kills immature fish 	<ul style="list-style-type: none"> - Air pollution - Poorly buffered water 	<ul style="list-style-type: none"> - Control industrial pollution - Burn less fossil fuels in cars, etc.

Used motor oil is the largest single source of oil pollution in our lakes, streams and rivers. Americans spill 180 million gallons of used oil each year. This is 16 times the amount spilled by the Exxon Valdez in Alaska.



LET'S DO OUR PART TO PREVENT SPILLS!

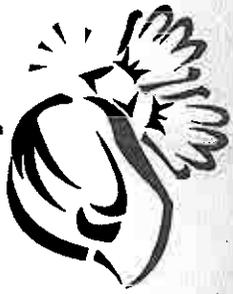
BBE

BROWNFIELD SAFETY TRAINING

IMPORTANCE OF SAFE BEHAVIOUR

- 1. Training**
- 2. Responsibility**
- 3. Future**
- 4. Employment**

Personal Protective Equipment (PPE)



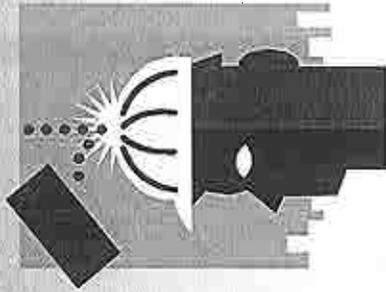
WEARING & CARE

1. Head Protection

a. Sun



b. Cold



Personal Protective Equipment (PPE)



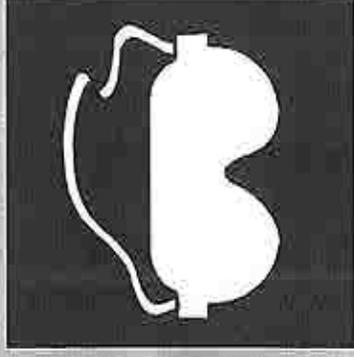
WEARING & CARE

2. Eye Protection



a. Wearing

b. Care



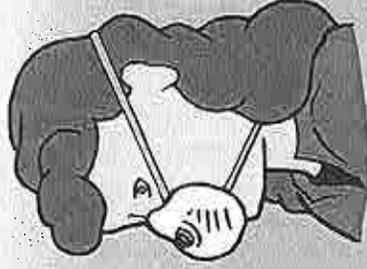
Personal Protective Equipment (PPE)



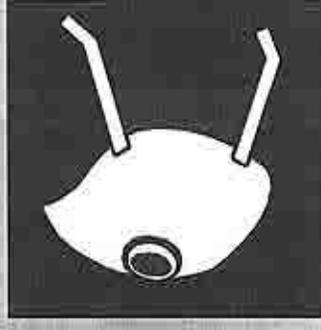
WEARING & CARE

3. Dust Masks

a. Wearing



b. Care (Keeping Clean)



Personal Protective Equipment (PPE)



WEARING & CARE

4. Gloves

a. Wearing



b. Care



Personal Protective Equipment (PPE)

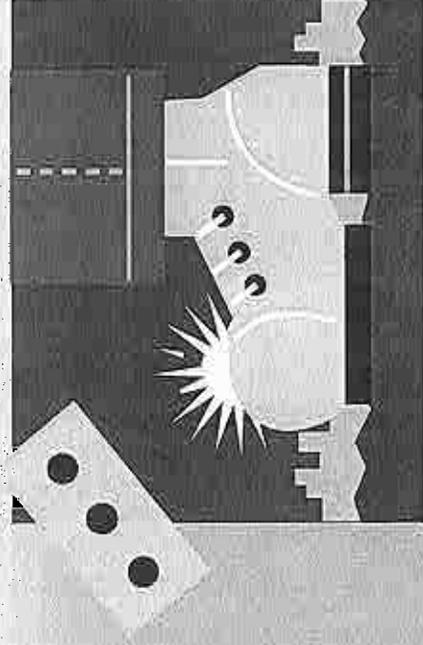


WEARING & CARE

5. Safety Shoes

a. Wearing

b. Care



Personal Protective Equipment (PPE)

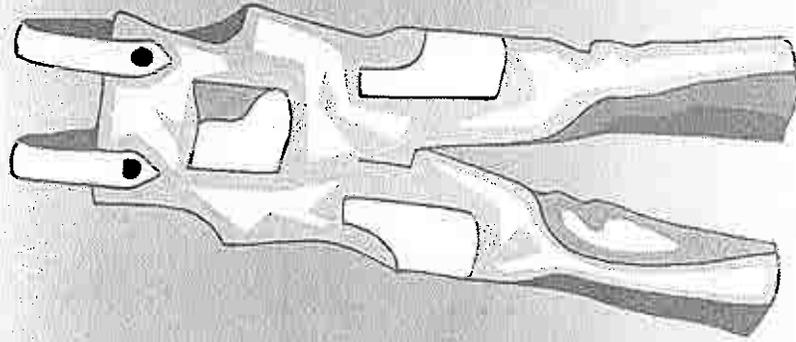


WEARING & CARE

6. Coveralls

a. Wearing

b. Care



Use of Tools

1. Shovels

a. Use



b. Care

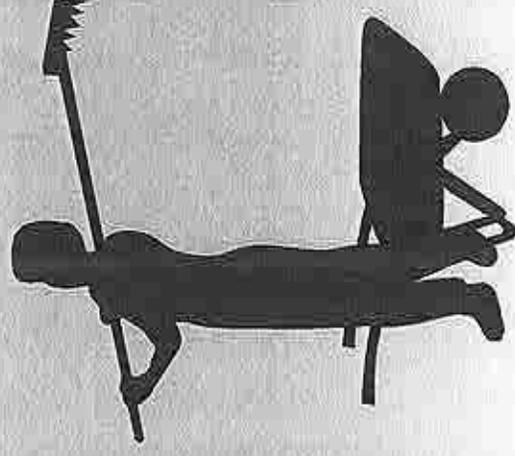


Use of Tools

2. Rakes

a. Use

b. Care

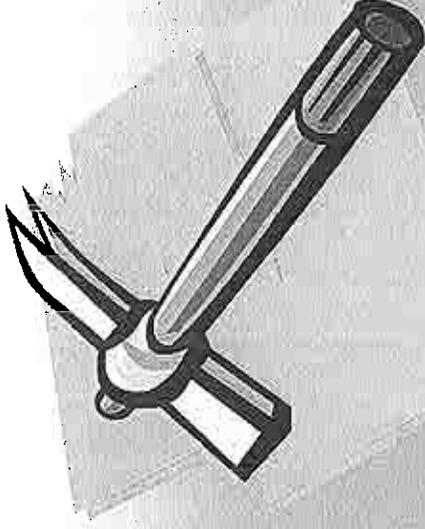


Use of Tools

3. Picks

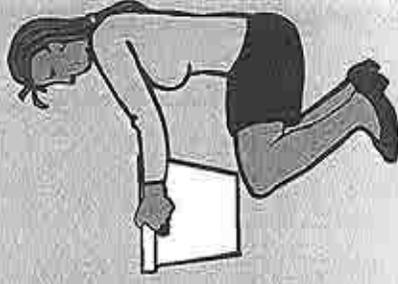
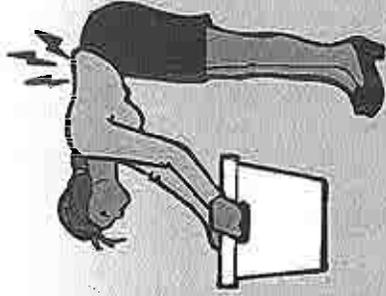
a. Use

b. Care



Proper Lifting Behavior

1. Legs
2. Arms
3. Back
4. Twisting
5. Walking
6. Help



Appendix B

Health and Safety Plan

HEALTH AND SAFETY PLAN

Project No: 53675.01 Date: 2/7/05
Client: Nevada Division of Address: 333 West Nye Lane
Environmental Carson City, Nevada 89706
Protection
Client Contact: Scott Smale Client Phone No: (775) 687-4670
Site Contact: Don Orndorff
Job Location: Hawthorne, Nevada
Work Objectives: Consolidate surface debris at the former landfill site. Dispose of consolidated debris in new trench excavation.

Key Individuals

Project Manager: Josh Fortmann
Site Health and Safety: Josh Fortmann
Prepared By: Josh Fortmann Reviewer/Approver: Eric Hubbard
Hospital/Clinic: Mount Grant General Hospital
Phone No: 775-945-2461
Address: First and "A" Street, Hawthorne, Nevada, 89415
Paramedic 911 Fire Dept. 911 Police Dept: 911
Emergency/Contingency Plans: In case of injury, remove injured from life threatening situation, provide emergency first aid, call for emergency medical service.

15 Minute Eyewash: Optional Fire Extinguisher: Required First Aid Kit: Required

Site Control Measures: Field laborers will not work on or near heavy equipment. Field laborers will not collect surface debris that has been marked with orange flagging. Water will be used to control visible dust near working equipment as necessary.

Personal Decontamination Procedures: Wash hands thoroughly with soap and water prior to lunch or other food breaks.

CHEMICAL HAZARDS

Chemical Name	Expected Concentration	Health Hazards
Asbestos	Unknown	Chronic: mesothelioma A potential exists for the presence of asbestos containing building materials on the subject site.

PHYSICAL HAZARDS

<input checked="" type="checkbox"/> Heat (Seasonal)	<input checked="" type="checkbox"/> Slip, Trip, Fall	<input checked="" type="checkbox"/> Backhoe
<input checked="" type="checkbox"/> Cold (Seasonal)	<input type="checkbox"/> Noise	<input type="checkbox"/> Drill Rig
<input checked="" type="checkbox"/> Rain (Seasonal)	<input type="checkbox"/> Underground Hazards	<input checked="" type="checkbox"/> Excavations/Trench
<input type="checkbox"/> Overhead Hazards	<input type="checkbox"/>	<input type="checkbox"/> Fog (Seasonal)
<input type="checkbox"/> Traffic	<input type="checkbox"/> Other: _____	
<input type="checkbox"/> Landfill trucks		

PERSONAL PROTECTIVE EQUIPMENT

R = Required A = As Needed

<input checked="" type="checkbox"/> Hard Hat	<input checked="" type="checkbox"/> Safety Eyewear (Type): ANZI approved
<input checked="" type="checkbox"/> Safety Boots	<input type="checkbox"/> Respirator (Type):
<input checked="" type="checkbox"/> Orange Vest	<input type="checkbox"/> Respirator Filter Type:
<input checked="" type="checkbox"/> Hearing Protection	<input checked="" type="checkbox"/> Gloves (Type): non-specific material
<input type="checkbox"/> Tyvek Overalls	<input checked="" type="checkbox"/> Other: Dust mask
<input type="checkbox"/> 5-Minute Escape Respirator	

MONITORING EQUIPMENT

Organic Vapor Analyzer (FID):

PID with lamp of:

10.8mV

Oxygen Meter

Draeger Tube:

Combustible Gas Meter

Passive Dosimeter

H₂S Meter

Air Sampling Pump

W.B.G.T.

Filter Media:

Appendix C

Field Activity Documentation

Hawthorne Brownfields Work Schedule

Weekend overtime

- April 30 Dozer work to widen access roads from 5th St to Brownfields area. Water truck utilized
- May 1 Dozer work to design circular road path from areas of surface debris to trenches. Water truck utilized
- May 4 Grater work to widen Brownfields gateway entrance. Water truck utilized
- May 7 Dozer work to dig one of two trenches for surface debris consolidation to reduce travel distance and time for dump trucks. Water truck utilized
- May 15 Dozer work to dig the second of two trenches for surface debris consolidation to reduce travel distance and time for dump trucks. Water truck utilized
- June 4,5 Loaders, dump trucks, water truck utilized for surface debris transfer to newly constructed trenches and old trenches. North of metal field
- June 11,12 Loaders, dump trucks, water truck utilized for Surface debris transfer to newly constructed trenches and old trenches. Metal field
- June 18,19 Loader, dump truck, dozers transfer remaining surface debris in metal field. Cover material spread for newly constructed trenches and unfilled trenches to west and northwest of metal field
- June 25,26 Dozer work to cover main trench area and water truck dispersing water on trench cover

Trench identification: Fifteen trenches were positively identified in the Phase I area. At the southern edge of area in Phase I area

multiple trenches were located but individual identification was not possible.

Bobcat surface consolidation schedule

March 1, 2, 3, 4, 8, 10, 15, 18, 22, 23, 24, 28, 29, 30,

April 5, 6, 12, 13, 14, 18, 19, 20, 25, 26, 27

May 10, 11, 12, 18, 19, 24, 25, 30, 31

June 2, 4, 5, 8, 9, 11, 12

Thirty seven days at 3 hours per day were utilized with the bobcat to consolidated surface debris for transfer by loaders and dump trucks. Four eight hour days were utilized to assist transfer operations.

Brownfield Project - Field Report

02/10/05 1200 first aid & safety meeting
1300 arrive on site and orient 6 man crew
1330 start consolidating surface debris
1700 completed approximately 800±' of debris
consolidation on track #1 20hrs

02/11/05 1200 safety & first aid meeting
1300 arrive on site and orient 3 man crew 4.5
1330
1500-1600 haul bagged debris to central site 1 hr
1600 ~~5 hrs~~

02/12/05 1200 start 4 man crew
200' left on track #9
1700 finish 20 hrs

4 man hours

02-14-05 1200 6 man crew working Brought Forward 7/1 man hrs
1700 30 hrs

02-15-05 1200 3 man crew tracks 243 on
1600 12 hrs

02-16-05 1200 6 man crew 200± ft of tracks 243 left
1700 30 hrs

02-17-05 1200 Finish Tracks 243
1700 3 man crew Start Tracks 445 ± 300' done 15 hrs

02-18-05 1/2 hrs review & plant ID training

02-19-05 0800 3 man crew Did approx 600' Tracks 445 15 man hrs

1300 102

143 man hrs

11500

02-22-05 1200 To field & start consolidation Brought Forward 14 3/4 man hrs
2 man crew working on tracks 415 10 hrs
1700 cleaned \approx 500'

02-23-05 1200 To field & start cleanup of Dump Areas
6 man crew
3 hauling
3 picking \approx 150' of tracks 415 30 hrs
1700

02-24-05 1200 To field - start picking up trash
3 man crew picking & piling 13 1/2 hrs
1630 Finished tracks 415

02-25-05 1200 To field - start picking & hauling
3 man crew picking started tracks 617 30 hrs
3 man crew hauling \approx 450' of tracks 617
1700

02-26-05 0800 To field & started cleaning roadways
3 man crew hauling 5 hrs 15
2 man crew picking 3 1/2 7 22 hrs
1300 finished roadways cleaned \approx 100' of Tracks 617

~~28 3/4~~
24 3/4

	1200	To field & start picking		24 1/2 hrs
02-28-05		3 man crew		
	1430	cleaned \approx 150' of tracks 6 & 7		7 1/2 hrs
	1200	To field - start picking & hauling		
		5 man crew		
03-01-05				25 hrs
	1700	cleaned \approx 200' of track 7		
	1200	To field & start picking & hauling		
03-03-05		6 man crew ^{3 hauling} _{3 picking}	cleaned \approx 200' of Track 6	30 hrs
	1700			
	1200	To field & start picking		
03-07-05		5 man crew	cleaned \approx 150' of Track 6 & 7	
	1430	quit for funeral		12 1/2 hrs
	1200	To field & start work		
03-09-05		5 man crew	cleaned \approx 250' of Tracks 6 & 7	25 hrs
	1700			
	1200	To field & start work		
03-11-05		6 man crew	^{3 hauling trash & metal} cleaned \approx 250' of Tracks 6 & 7	30 hrs
	1700			32 1/2 hrs

Brought Forward 371 man HRS

1200
03-12-05
4 man crew picking in tracks 647 $\approx 300'$ 20 HRS
1700

1200
03-15-05
3 man crew hauling
2 man crew picking in tracks 647 $\approx 150'$ 25 HRS
1700

1200
03-17-05
4 man crew picking finished tracks 647 started track 8 $\approx 100'$ 20 HRS
1700

1200
03-19-05
2 man crew hauling 10 HRS
1700

1200
03-21-05
4 man crew picking tracks 849 until 1500 12
1500 - 1700 1 man hauling $\approx 250'$ 2 14 HRS

1200
03-23-05
5 man crew picking tracks 849 $\approx 300'$ 35 HRS
2 man crew cleaning roads
1710 495 HRS

Brought Forward 495 MAN HRS

1200

2-1200-1500 4

03-25-05

1-1230-1700 11th. 211 picking in tracks 849 \approx 410 ft

25 1/2 HRS

3-1200-1700 15

1700

0800

03-28-05

crew of 4 all picking \approx 250' of tracks 849

16 HRS

1200

0800

03-30-05

crew of 3 picking \approx 150' tracks 849

15 HRS

1300

1200

04-05-05

crew of 4 picking \approx 300' of tracks 10, 11, 12, 13

20 HRS

1700

1200

04-07-05

crew of 7 picking

\approx 300' of Tracks 14, 15, 16, 17, 18

21

27 HRS

1500

crew of 3 picking

6

1700

04-11-05

1200

crew of 5 picking

\approx 200' of

Tracks ~~14, 15, 16, 17, 18~~ 6, 7, 8, 9, 10

25 HRS

1700

623 1/2

1300
04-13-05 crew of 3 picked \approx 250' of tracks 11 & 12
picking out cable in NE corner 6 23/4 MAN/HR
15 HRS
1700

1200
04-19-05 crew of 2 picked \approx 200' of tracks 13 & 14 10 HRS
1700

1200
04-21-05 crew of 3 picking \approx 200' of tracks 15 & 16 15 HRS
1700

1200
04-23-05 crew of 2 picking \approx 100' of tracks 15 & 16 10 HRS
1700

1200
04-25-05 crew of 4 picking \approx 250' of track 17 18 HRS
1430

1200
04-27-05 1500 crew of 5 picking = finished picking tracks 17 & 18 (15)

1700 crew of 3 picking up metal in trench areas (6) 21 HRS

1200
4-29-05 crew of 3 picking up metal in middle area
1500

1200
 05-03-05 crew of 5 picking metal in center 15
 1500 crew of 4 " " " " 4
 1600 crew of 3 " " " " 3 22 HRS
 1700

1200
 crew of 5 picking in metal field 20
 05-05-05 1600
 1700 crew of 4 " " " " 4 24 HRS

0800
 05-07-05 crew of 2 moving cables & pulling out car bodies 10 HRS
 1300

1200
 05/09/05 crew of 5 picking in metal field (20)
 1600 (4)
 1700 crew of 4 " " " " 24 HRS

1200
 05/11/05 crew of 4 picking in metal field 20 HRS
 1700

1200
 05/13/05 crew of 3 picking in metal field 15 HRS
 1700

1200
05-17-05 crew of 4 picking in metal field 16 HRS

1600

05-19-05 1200 crew of 4 picking in metal field 12 HRS

1500

05-23-05 1200 crew of 4 picking in metal field 12 HRS

1500

05-25-05 1200 crew of 3 picking in metal field 9 HRS

1500

05-27-05 1200 crew of 2 picking in metal field 5 HRS

1430

Danny Stewart 05-27-05