INDEPENDENT REMEDIAL ACTION REPORT

ENVIRONMENTAL SERVICES

Presented to :

U.S. NATIONAL BANK OF OREGON

For:

SPARKS AND BUTTERCUP LANDFILL
EASTERN STREET AND 12TH AVENUE
SPOKANE, WASHINGTON

KLEINFELDER, INC.
Specializing in Geoscience and Environmental Services

AUGUST 1994

KLEINFELDER INC.

INDEPENDENT REMEDIAL ACTION REPORT
SPARKS AND BUTTERCUP LANDFILL
EASTERN STREET AND 12th AVENUE
SPOKANE, WASHINGTON

A Report Prepared For:

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INDEPENDENT REMEDIAL ACTION REPORT
SPARKS AND BUTTERCUP SUBDIVISION
EASTERN STREET AND 12th AVENUE
SPOKANE, WASHINGTON

Kleinfelder Project Number 60-5035-03

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July 25, 1994

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1.0 INTRODUCTION

This report presents information on an Independent Remedial Action (IRA) performed by U.S. National Bank of Oregon (U.S. Bank) at a former unpermitted landfill site (Sparks and Buttercup Subdivision) in Spokane County, Washington (Figure 1). The purpose of the remedial action is to have the site removed from the Washington Department of Ecology (Ecology) Hazardous Site's List.

Site conditions and economic considerations precluded the implementation of permanent solution technologies such as reuse/recycling, destruction or detoxification, volume reduction, immobilization, and/or off-site disposal, as defined in the Model Toxics Control Act Cleanup Regulation (WAC 173-340-360). The selected remedial action consists of encapsulation, institutional controls, and compliance monitoring. This action provides an effective solution to cleanup issues in both the short and long term; addresses community concerns and provides a beneficial future use for the site; enhances the environment of the surrounding neighborhood; reduces the potential mobility of hazardous substances, and is protective of human health and the environment to the maximum extent practicable.

1.1 Background

The site is located south and east of Eastern Street and 12th Avenue in the southwest quarter of Section 24, Township 25 North, Range 43 East of the Willamette Meridian. The landfill was reportedly operated by East Spokane Township No. 49 (Spokane County) from as early as 1928 to as late as 1960. No other on-site activities are known to have pre-dated or post-dated landfilling operations.

The landfill occupies an area of 2.42 acres, and supports a vegetative cover of trees, grasses, and bushes, however the site does not meet the criteria for classification as a sensitive environment as per WAC 173-340-200. A soil cover from zero to two feet thick has been placed over some of the debris, while in other areas a thin soil horizon has developed. Landfill debris is also exposed at ground surface in several areas. Landfill debris includes scrap metal, glass, wood, concrete, rubber tires, and other forms of domestic refuse in varying states of decomposition. In recent years residential development has encroached on the site primarily from the north and south, however, with exception of a number of dirt roadways and trails, the site remains structurally unimproved.

Technical reports pertaining to previous site investigations are referenced in Section 7.0 of this report. The reader is directed to Kleinfelder Report Numbers 60-5035-01, dated July 7, 1993 (Kleinfelder, 1993a), and 60-5035-02, dated August 13, 1993 (Kleinfelder, 1993b), for information on the ground water investigation conducted for the subject site.

1.2 Site Geology

The site is situated on a north-facing bench cut into Columbia River basalt and granitic bedrock on the south side of a glacial valley (Spokane Valley). Site elevations range from approximately 2000 feet above mean sea level (msl) along the northern toe of the landfill to 2040 feet msl south of the landfill area.

The Spokane Valley was inundated with flood waters hundreds of feet deep from glacial Lake Missoula (Missoula Floods), which spilled out over this area and much of the Columbia Plateau during a time of catastrophic flooding between 16,000 and 22,000 years before present. The Purcell Lobe of the Cordilleran Ice Sheet was receeding northward at this time and the flooding is attributed to multiple failures of an ice dam which had dammed the Clark

Fork River as this lobe receeded. Many of the surface features and alluvial deposits present within the Spokane Valley today are attributed to this period of glaciation and flooding (Molenaar, 1988).

The site overlies one of these alluvial deposits, known as the Spokane Aquifer. These flood deposits consist of coarse-grained sands, gravels, cobbles and boulders that are very permeable by nature. Due to it's permeability, this geologic unit forms the major water supply source for the Spokane Valley and has been designated a "sole source aquifer" by the Environmental Protection Agency (EPA).

Subsurface soils can be characterized as relatively coarse-grained, unconsolidated sands ranging from approximately 35 to 50 feet in thickness, underlain by sands, gravels, cobbles and boulders with subordinate lenses of fine-grained silts and silty sands. Massive granitic boulders, with diameters of up to ten feet were encountered during drilling operations for monitoring wells MW01 and MW02 which were installed in May 1993 as a part of Kleinfelder's initial ground water investigation. Large basaltic boulders outcrop at the surface immediately south and east of the site and were encounted between 49 and 56 feet below surface grade during the installation of monitoring well MW03 (Figure 2). Penetration rates during boulder drilling were on the order of less than one foot per hour. Permeable alluvial deposits extend to the maximum depths of the boreholes drilled during the ground water investigation (83 to 145 feet), and are typical of glacial outwash and high energy depositional environments such as the Missoula Floods. Sediments above the water table are generally gray to grayish-brown in color, poor to moderately graded, slightly moist to moist, and dense to very dense. Glacial outwash and flood materials that comprise the Spokane Aquifer are similar in nature to the overlying unsaturated sediments. Soil boring logs are included for reference in Appendix B. Geologic cross-sections are illustrated on Figures 3A and 3B.

Surface and cross-sectional exposures appear to indicate that landfill debris is present at thicknesses ranging from approximately one to 20 feet. Based on topographic data, debris volumes have been estimated at between 30,000 and 62,500 cubic yards (CH2M-Hill, 1989a). A sandy soil and vegetative cover overlies the landfill debris which is inturn underlain by native alluvial deposits.

1.3 Site Hydrogeology

The Spokane Aquifer is an unconfined aquifer comprised of coarse sand, gravel, cobbles, and boulders deposited by the Missoula Floods (Molenaar, 1988). Site conditions do not satisfy this definition completely in that semi-confined/confined conditions appear to influence static water level elevations and the depths at which saturated thicknesses of the aquifer were encountered during Kleinfelder's Ground Water Investigation (May-July 1993).

Ground water was encountered at approximately 1890 feet, mean sea level (msl) in MW01 after drilling through a 15 foot thick horizon of granitic material. The water level stabilized in this well at approximately 1934 feet, msl, which corresponds to a rise in head of approximately 44 feet. Ground water was encountered at approximately 1899 feet, msl in MW02 after the boring penetrated a 19 foot thick horizon of dense, fine-grained silts and silty sands. The water level stabilized in this well at approximately 1995 feet, msl, which corresponds to a rise in head of approximately 96 feet. Two, relatively thin (<2 feet) perched water zones were also encountered in MW02 at approximately 2006 and 1935 feet, msl. In MW03, ground water was encountered at approximately 1973 feet, msl after drilling through seven feet of basaltic material. The water level stabilized in this well at approximately 1999 feet, msl, corresponding to a rise in head of approximately 26 feet.

The conditions under which ground water was encountered appear to indicate that confining layers of granitic, basaltic and fine-grained sediments are situated between the overlying sediments and landfill debris and the underlying Spokane Aquifer. These confining layers are thought to represent low permeability zones which inhibit the vertical movement of ground water between the base of the landfill debris and the Spokane Aquifer.

Based on ground water elevation data collected in May 1993, the direction of ground water movement appears to trend from south-southeast to north-northwest beneath the site, which corresponds to the regional ground water flow model for the aquifer (Molenaar, 1988). We understand an operating well field is located approximately 1/2-mile north of the site which may exert some influence on the direction of ground water flow in the area.

2.0 PREVIOUS INVESTIGATIONS

Historical reviews indicate that East Spokane Township No. 49 operated a landfill at the site from as early as 1928 to as late as 1960 (CH2M-Hill, 1989b). Prior to this, the site was vacant and undeveloped. During it's operational life, the landfill reportedly received domestic refuse, construction debris, scrap metal/glass, and other undocumented types of debris. No permits were apparently issued for the operation of this landfill. No on-site activities have reportedly taken place since landfill operations were discontinued (Century West Engineering, 1991). Kleinfelder understands Commerce Mortgage Corp., a U.S. Bancorp subsidiary, acquired the property through foreclosure of it's security interest in April 1981. The property was resold immediately but reaquired through foreclosure in June 1984. Spectrum Properties, another U.S. Bank subsidiary, assumed title in February 1987.

A Level II Environmental Assessment of the site was conducted by Century West Engineering (Report No 40174.005.01, January 31, 1991) in which potential contaminants were identified through the excavation of eight test pits and three soil borings. The maximum depth for these explorations was 15 feet below surface grade. Ten priority pollutant metals (antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, and zinc) exceeding Model Toxics Control Act (MTCA) Method A Cleanup Levels and/or EPA Action Levels were reportedly encountered in soils collected in localized areas within landfill debris and native soils underlying this material. In addition, the pesticide 4,4 DDT and a breakdown product (4,4 DDE) were also reported in soils above method detection limits, however these concentrations did not exceed MTCA Method A Cleanup Levels. Total petroleum hydrocarbons above MTCA Method A Cleanup Levels were also detected in one soil sample collected within landfill soils.

In May 1992, Ecology conducted a site hazard assessment for the purpose of ranking the site for Ecology's Hazardous Site List. The site was assigned a hazard ranking of 2 on a scale of 1 to 5 (1-higher relative risk vs. 5-lower relative risk) based on Ecology's assessment, previous investigations and an absence of ground water data underlying the site.

Kleinfelder conducted a subsurface investigation specifically to address the presence or absence of previously identified analytes in on-site soils and ground water through the drilling and installation of three ground water monitoring wells (Figure 2). Ground water was encountered under semi-confined/confined conditions at depths ranging from 56 to 121 feet below surface grade. Confining layers of granitic, basaltic and fine-grained sedimentary materials appear to represent low permeability horizons which separate the overlying landfill debris and alluvial sediments from the underlying Spokane Aquifer. Ground water elevation data indicates that the direction of ground water flow beneath the site trends from south-southeast to north-northwest, which is in general agreement with the regional ground water flow model for this area.

Arsenic, chromium and lead were detected above MTCA Method A Cleanup Levels in soil samples collected from the well borings between 24 and 29 feet below surface grade. However, these concentrations did not exceed their respective Human Health, Risk-Based Method B Cleanup Levels. It appears that these concentrations may represent background levels that occur naturally in soils within the Spokane Valley (Shacklette et al., 1984).

DDT and lead were detected in concentrations exceeding MTCA Method A Cleanup Levels and the Method B Cleanup Level for DDT, in a ground water sample collected from MW01. Arsenic, chromium, and lead were also detected in concentrations exceeding MTCA Method A and B Cleanup Levels in a ground water sample collected from MW03. The concentrations of DDT and metals are thought to represent background levels and may be attributed to the adsorbtion of these analytes to suspended, fine-grained sediments entrained within the ground water. Subsequent analyses of field filtered ground water samples collected in July 1993, did not detect the presence of volatile organic compounds, pesticides, PCBs, or priority pollutant metals above MTCA Method A Cleanup Levels, which supports this assumption.

Based on the soil and ground water data collected during Kleinfelder's Investigation, it appeared that the historic use of the landfill was primarily for the disposal of inert waste materials, although no inventory was available, and that the landfill debris had not resulted in adverse impacts to soil and ground water underlying the site.

Before proceeding with landfill closure, a screening level landfill gas survey was conducted by Kleinfelder to assess if combustible gas (methane) was present in the landfill and if there was evidence of lateral migration. Six landfill gas probes were installed in and around the landfill and sampled over a two day period (October 13 and 14, 1993). The results of this survey indicated that appreciable levels of combustible gas were not detected in either the landfill or in near-surface soils surrounding the landfill (Kleinfelder, 1993c). The landfill gas survey is included for reference in Appendix D following the text of this report.

Because the proposed remedial action would involve disturbing surface soils and debris during cap construction, a human health exposure assessment was conducted by Kleinfelder to evaluate potential chemical exposures from potential landfill gases and airborne dust during cap construction activities. The two population groups potentially exposed to airborne chemicals during excavation and grading work were on-site workers and nearby residents.

Soil data from the remedial investigations performed at the site were used as a basis for the exposure assessment. Assessment results concluded that adverse health effects during closure activities were very unlikely given that the permissible exposure levels of the compounds of concern (arsenic, chromium, lead, DDT) were orders of manitude larger than their on and off-site concentrations (Kleinfelder, 1993d). The exposure assessment report is included for reference in Appendix E.

3.0 SELECTION OF CLEANUP STANDARDS

Previous remedial investigations encountered landfill debris and soil that exhibited total petroleum hydrocarbon, 4,4-DDT, arsenic, antimony, barium, beryllium, cadmium, chromium, lead, mercury, nickel, and zinc concentrations above MTCA Method A cleanup levels at various exploration locations within the landfill. Concentrations exceeding the Method B cleanup level for antimony were also documented in one location (Century West Engineering, 1991). Native soil samples collected outside the footprint of the landfill exhibited arsenic and chromium concentrations which exceeded Method A cleanup levels

(Kleinfelder, 1993a) however, neither of these analytes exceeded their respective cleanup levels calculated using Method B (Century West Engineering, 1991).

Based upon the work conducted, it is Kleinfelder's opinion that the metals concentrations observed in native soils are indicative of natural background levels for soils within the Spokane Valley. This assumption is supported in literature regarding elemental concentrations in soils within the western United States (Shacklette et. al., 1984).

The cleanup action selected under WAC 173-340-360 involves containment of the landfill debris using a geomembrane liner and earth fill. As such, this remedial action does not specifically attain soil cleanup standards in those areas of the landfill where elevated concentrations have been documented, however this cleanup action is considered to have attained applicable soil cleanup standards under MTCA [WAC 173-340-700 (2)(c)].

The ground water underlying the subject site is thought to be directly associated with the Spokane Aquifer, which has been designated as a sole source aquifer by the EPA. In order to be protective of this water source, Method A cleanup levels have been established for this media. Three ground water monitoring wells are currently located on-site (Figure 2). These wells are located within the footprint of the landfill, up-gradient, and down-gradient and will serve as compliance monitoring points. Water samples will be evaluated based upon MTCA Method A ground water cleanup standards.

4.0 REMEDIAL ACTION

The remedial action implemented consisted of encapsulating the landfill with import soil and a 40-mil PVC liner. The surface of the landfill cap will be revegetated with grass, institutional controls imposed to limit site improvements within the footprint of the landfill, and the site converted to park greenspace.

4.1 Rationale for Selection

After evaluating soil and ground water data generated during the remedial investigations, it appears that the greatest risk posed by landfill debris is the physical hazards associated with direct human contact at the surface, and by the potential impact of leachate on the aquifer underlying the site.

The apparent absence of soil contamination outside the landfill debris area and the documented presence of unimpacted ground water beneath the site precludes consideration of many generally accepted remedial alternatives because site specific conditions do not warrant their implementation. Aside from the selected alternative of containment coupled with institutional controls and monitoring, excavation and disposal of landfill material at an engineered facility appeared to be the most viable option for addressing hazards posed by site conditions. However, the costs associated with implementing this option were estimated to be on the order of 3 to 5 million dollars thereby making this option economically prohibitive.

Construction of the landfill cap will not acheive the cleanup standards in those specific areas of the landfill where soil contamination exists, however, by encapsulating these materials the potential for leachate generation and adverse impacts to the Spokane Aquifer will be minimized. Construction of the landfill cap provides a long term, low maintenance solution to the environmental issues relavent to the site. Further remedial action aside from compliance monitoring is not anticipated.

Prior to initiating remedial construction activities in May 1994, a public forum was held for persons residing near the Sparks and Buttercup Landfill site. The proposed remedial alternative was presented and citizens were allowed to comment on the proposed remedial action and express any concerns. Overall, the public was very receptive to the proposed action and expressed only political concerns over the management of the greenspace after remedial activities were complete.

4.2 Landfill Cap Construction

Landfill cap construction was performed by Motley Motley, Inc. of Pullman, Washington. Construction activities involved cleaning and grubbing the landfill surface; regrading the surface; placement of the final cap (one foot foundation layer soil, 40 mil PVC geomembrane, 1.5 to 2 foot vegetative layer soil); drainage improvements; and retrofitting of one ground water monitoring well. Construction activities began on May 2, 1994 and were completed on June 3, 1994.

An as-built site plan of the completed cap is presented on Figure 4. Construction photographs are included in chronological order in Appendix F. A construction report which includes details on specific construction activities and quality assurance documentation is included in Appendix G.

4.3 Regulatory Records/Permits

In accordance with Washington State's Environmental Policy Act (SEPA), an environmental checklist for the proposed remedial action was completed and submitted to Spokane County on November 30, 1993. A determination of non-significance was issued by Spokane County on December 6, 1993, and the checklist circulated to nine other regulatory agencies for review and comment. At the end of the comment period (December 23, 1993), none of the agencies had contacted Spokane County or Kleinfelder regarding the proposed remedial activities. The SEPA checklist is included for reference in Appendix C.

Prior to initiating construction activities, a flood zone development permit was obtained from Spokane County. This was required because a portion of the landfill was within the 100-year floodplain. A cap and drainage design report was prepared by Kleinfelder which assessed the impact of constructing the landfill cap upon the capacity of the flood plain. The results of this assessment indicated that construction of the cap would not reduce the capacity of the flood plain or increase the 100-year flood elevation (Kleinfelder, 1993e). A copy of the floodplain development permit is included in Appendix C.

4.4 Ground Water Monitoring

In accordance with WAC 173-340-410, ground water compliance monitoring is proposed on a quarterly basis. The compliance monitoring program will involve sampling each of the three existing ground water monitoring wells for the presence of those analytes detected in soil samples within the landfill which exceed MTCA cleanup levels (petroleum hydrocarbons, 4,4-DDT, and priority pollutant metals. If compliance monitoring indicates concentrations of target analytes below MTCA Method A cleanup standards in two consective monitoring events, compliance monitoring will be discontinued.

Upon demonstrating compliance with applicable ground water cleanup standards, Ecology will be petitioned to remove the site from the Hazardous Sites List at the earliest date possible.

4.5 Institutional Controls

Deed restrictions are being prepared by counsel for U.S. National Bank of Oregon. Kleinfelder understands the restrictions will preclude construction of any buildings or improvements, both above and below ground for that area of the site which has been encapsulated.

5.0 CONCLUSIONS

The independent remedial action conducted by U.S. Bank has been performed in accordance with guidelines set forth in the Model Toxics Control Act Cleanup Regulation (WAC 173-340). It is Kleinfelder's opinion that the actions taken will provide a long term solution to the surficial presence of landfill debris at the Sparks and Buttercup site, and are protective of human health and the environment. Deed restrictions attached to the property will limit future use of the site. It is anticipated that future use will be recreational in nature.

Upon satisfactorily completing a compliance ground water monitoring program, Ecology should be petitioned to have the site removed from it's Hazardous Sites List. In the interim, U.S. Bank may wish to request a compliance letter from Ecology with regards to the work completed to date.

6.0 LIMITATIONS

Judgements leading to conclusions and recommendations are generally made with an incomplete knowledge of the subsurface and historical conditions applicable to the study area. This remedial action does not provide a quantification or a guarantee regarding the presence or absence of site soil or ground water contamination. More extensive studies including historical review, additional site exploration, soil and ground water sampling, and chemical analyses may be used to supplement the information presented in this report. Kleinfelder should be notified for additional consultation if U.S. Bank wishes to reduce uncertainties beyond the level associated with this assessment. Our conclusions with regards to the property may also change as new data becomes available during additional site exploration, remediation, or development.

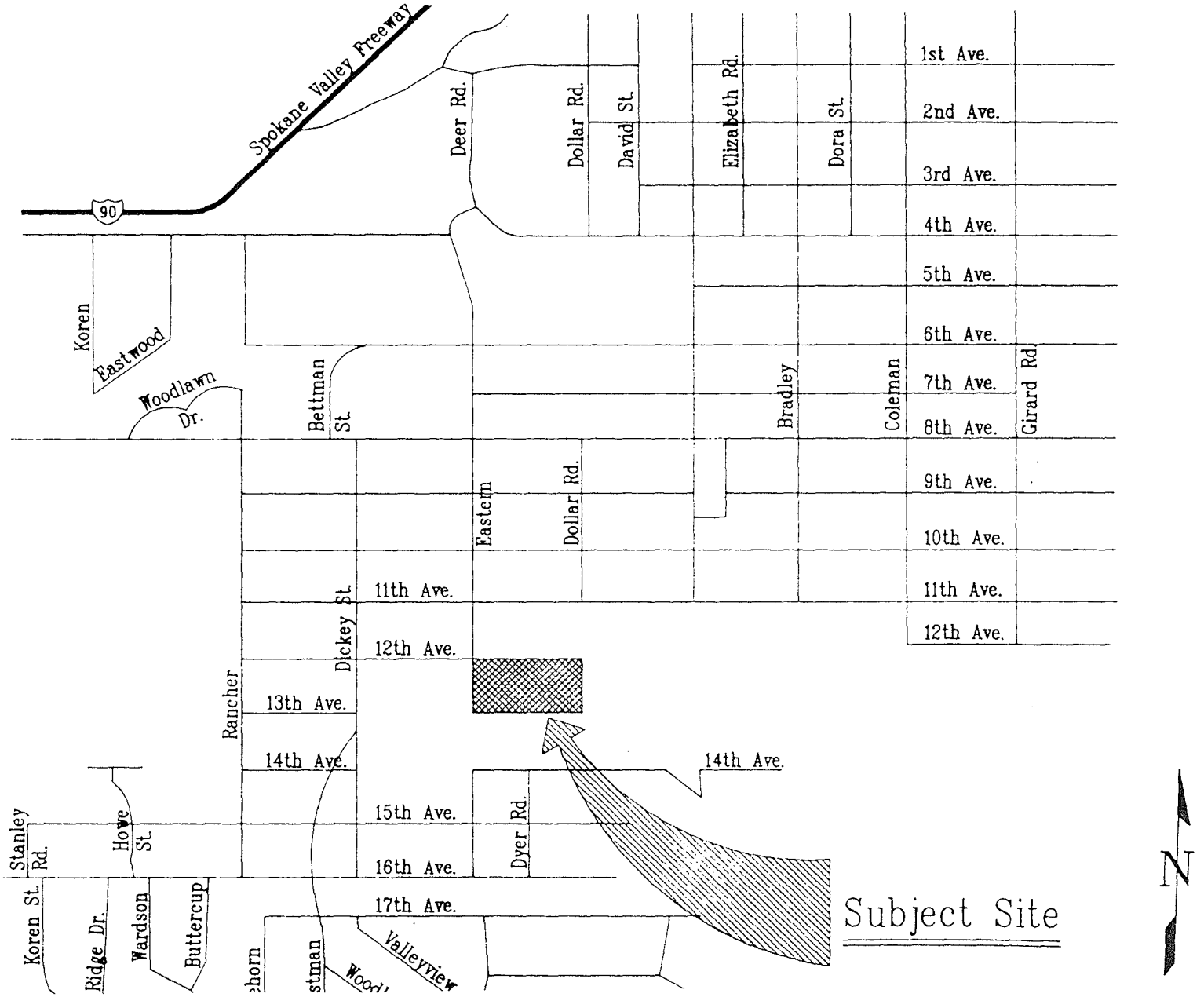
Since site activities and regulations beyond our control could change at any time after the completion of this report, our observations, findings, and opinions can be considered valid only as of the date of the report.

This report may be used only by the client and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on and off-site) or other factors may change over time, and additional work may be required with the passage of time. Any party other than U.S. Bank who wish to use this report shall notify Kleinfelder of such intended use by executing the "Application for Authorization to Use" which follows this document in Appendix H. Based on the intended use of the report, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the clients or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party.

No warranty, express or implied, is made.

7.0 REFERENCES

- Century West Engineering Corporation, January 31, 1991. Report of Findings, Sparks and Buttercup Subdivisions, Spokane, Washington. Project No. 40174.005.01.
- CH2M Hill, 1989a. Sparks and Buttercup Subdivisions-Phase I Environmental Assessment. Project No. PDX26915.NO. June 19, 1989.
- ----------, 1989b. Sparks and Buttercup Subdivsions-Phase IIA Environmental Assessment. Project No. SEA26915.N1. September 1, 1989.
- Kleinfelder, Inc., 1993a. Remedial Investigation Report, Sparks and Buttercup Subdivision, Spokane, Washington. Project No. 60-5035-01, July 7, 1993.
- ----------, 1993b. Ground Water Monitoring Data Summary Report, Sparks and Buttercup Subdivision, Spokane, Washington. August 13, 1993.
- ----------, 1993c. Sparks-Buttercup Landfill Gas Survey, Spokane, Washington. Memorandum dated November 9, 1993.
- ----------, 1993d. Human Health Exposure Assessment, Sparks-Buttercup Landfill Closure, Spokane, Washington. November 23, 1993.
- ----------, 1993e. Cap and Drainage Design, Sparks-Buttercup Landfill, Spokane, Washington. December 22, 1993.
- Molenaar, D., 1988. The Spokane Aquifer, Washington: It's Geologic Origin and Water-Bearing and Water-Quality Characteristics: U.S. Geological Survey Water Supply Paper 2265, 68 p.
- Shacklette, H.T. and Boerngen, J.G., 1984. Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States: U.S. Geological Survey Professional Paper 1270, 104 p.
- Washington Administrative Code, December 1993. The Model Toxics Control Act (MTCA) Cleanup Regulation, Chapter 173-340. Publication No. 94-06.



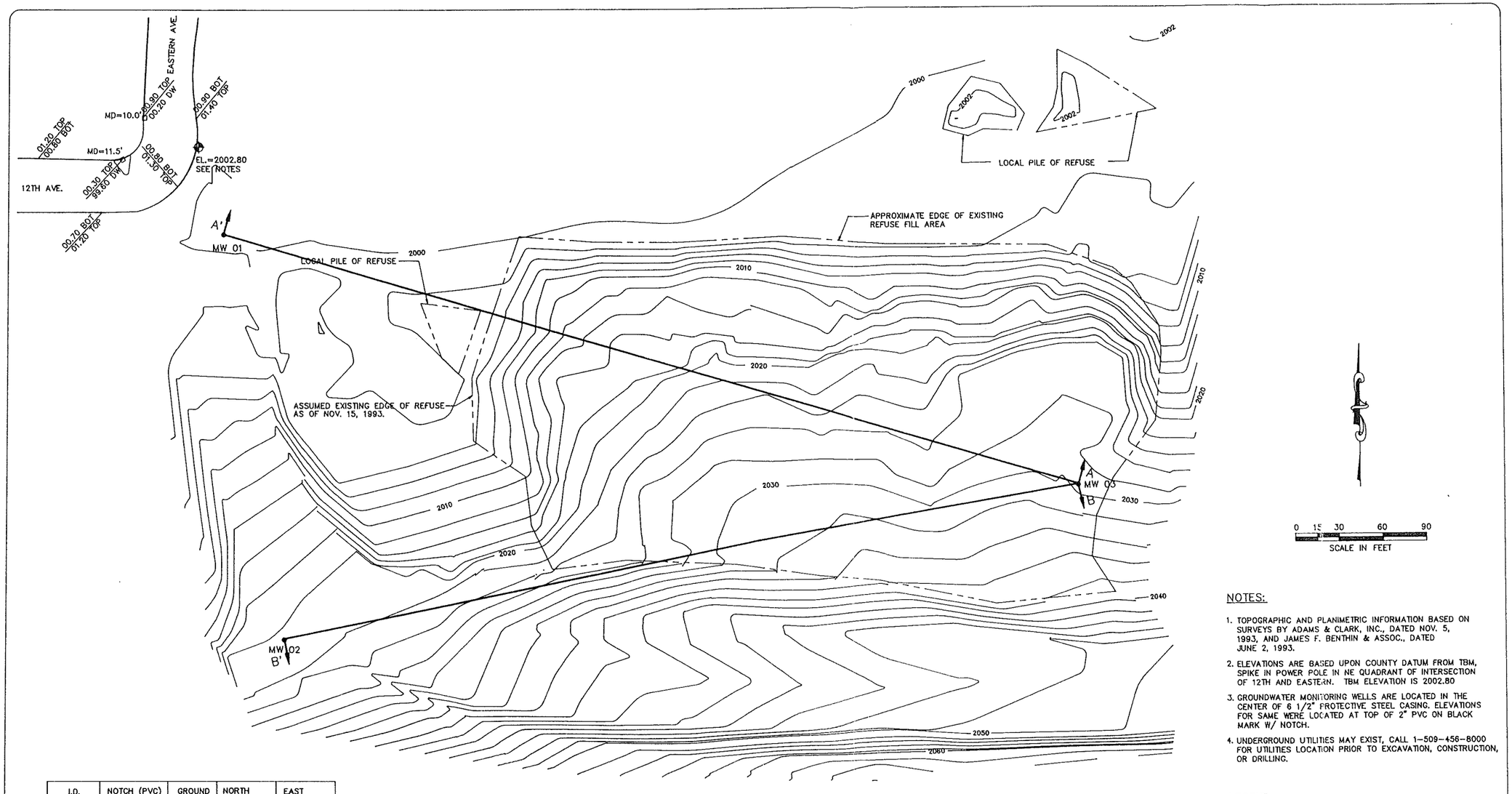
KLEINFELDER

5035F3A.CDR

SITE LOCATION MAP
SPARKS & BUTTERCUP LANDFILL
SPOKANE, WASHINGTON

Project # 60-5035-03

FIGURE 1



I.D.	NOTCH (PVC)	GROUND	NORTH	EAST
MW 01	2001.45	1999.4	5638.3233	4182.1748
MW 02	2021.23	2020.1	5366.8479	4223.8022
MW 03	2031.27	2029.4	5468.4316	4763.7710
NW PROP COR.			5840.0945	4175.6960
SW PROP COR.			5367.4890	4176.7041
SE PROP COR.			5364.0140	4780.5524

NOTES:

1. TOPOGRAPHIC AND PLANIMETRIC INFORMATION BASED ON SURVEYS BY ADAMS & CLARK, INC., DATED NOV. 5, 1993, AND JAMES F. BENTHIN & ASSOC., DATED JUNE 2, 1993.
2. ELEVATIONS ARE BASED UPON COUNTY DATUM FROM TBM, SPIKE IN POWER POLE IN NE QUADRANT OF INTERSECTION OF 12TH AND EASTERN. TBM ELEVATION IS 2002.80
3. GROUNDWATER MONITORING WELLS ARE LOCATED IN THE CENTER OF 6 1/2" PROTECTIVE STEEL CASING. ELEVATIONS FOR SAME WERE LOCATED AT TOP OF 2" PVC ON BLACK MARK W/ NOTCH.
4. UNDERGROUND UTILITIES MAY EXIST, CALL 1-509-456-8000 FOR UTILITIES LOCATION PRIOR TO EXCAVATION, CONSTRUCTION, OR DRILLING.

LEGEND:

- INDICATES TEMPORARY BENCH MARK
- INDICATES GROUNDWATER MONITORING WELL

REV.	DATE	DESCRIPTION	DWN.
0	12/01/93	INTERNAL REVIEW DRAFT	
1	12/16/93	FINAL	

APPROVED BY:

DATE

DESIGNED BY STEVE DURAN
DRAWN STEVE DURAN
CHECKED TIM CRANDALL
APPROVED SCOTT WALLACE
ENG. MGR.
DATE DEC 16, 1993

LOCATION
SPARKS - BUTTERCUP LANDFILL
Spokane, WA

KLEINFELDER
15050 S.W. Koll Parkway, Suite L
Beaverton, OR 97006
(503) 644-8447

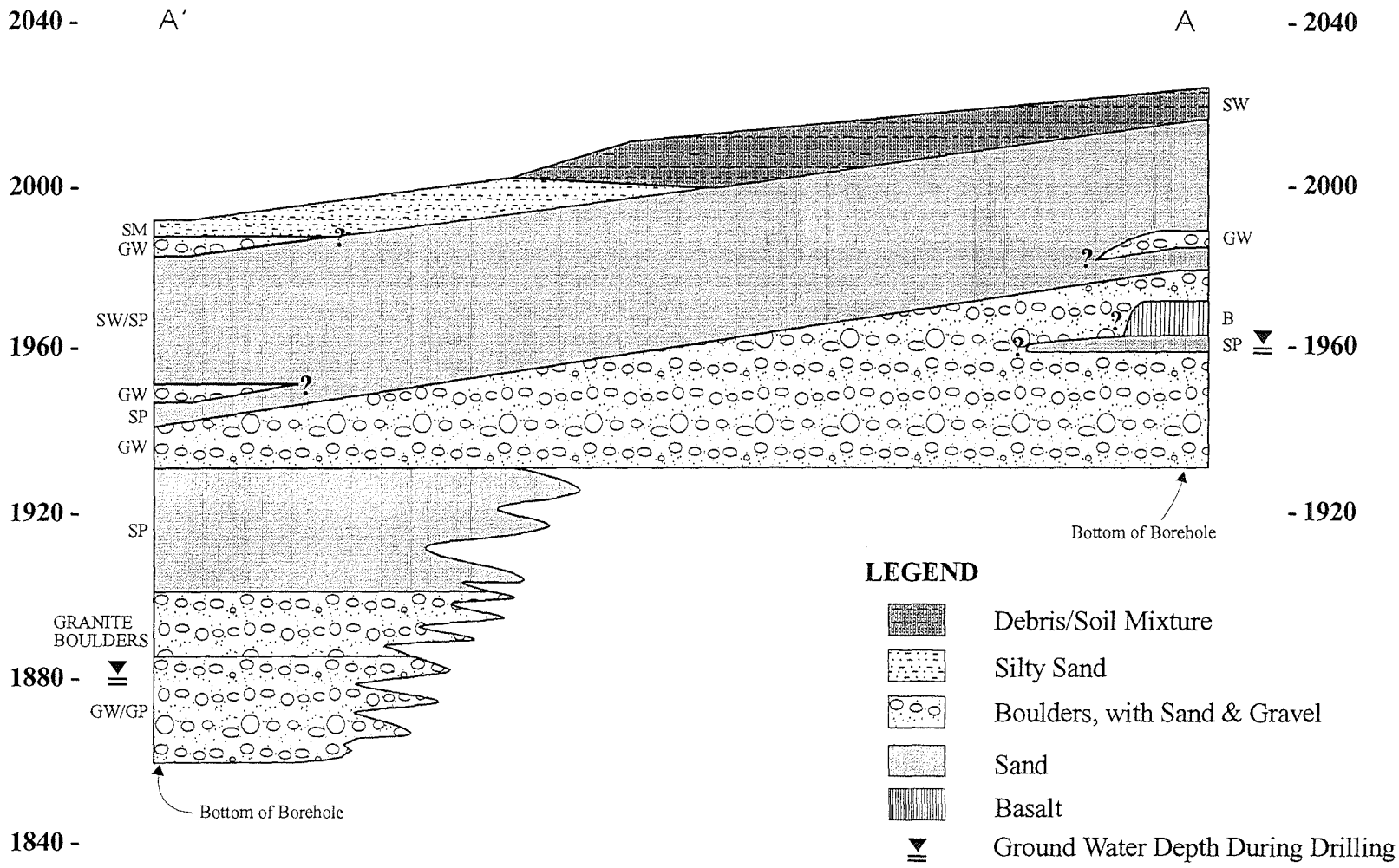
DESCRIPTION
SITE MAP

PROJ.NO.	FILED AS	DRAWING NO.
60-503503-C01	SPARKFIG2	503503F2

FIGURE 2

SHEET OF

MEAN SEA LEVEL ELEVATION



Horizontal Scale 1"=100'
Vertical Scale 1"=40'

KLEINFELDER

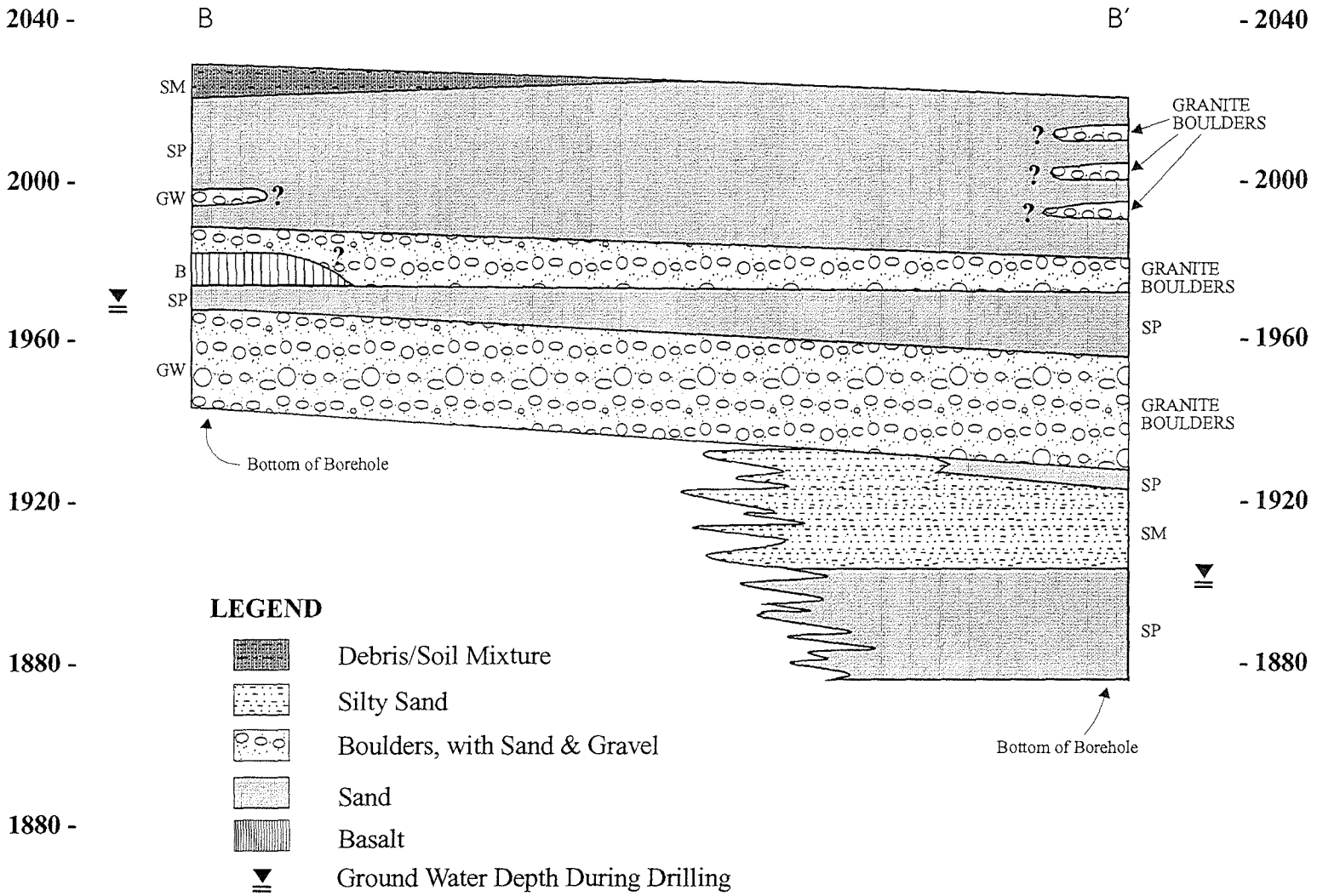
5035F3A.CDR

SPARKS & BUTTERCUP LANDFILL
GEOLOGIC CROSS-SECTION A-A'
SPOKANE, WASHINGTON

Project # 60-5035-03

FIGURE 3A

MEAN SEA LEVEL ELEVATION



Horizontal Scale 1"=100'
Vertical Scale 1"=40'

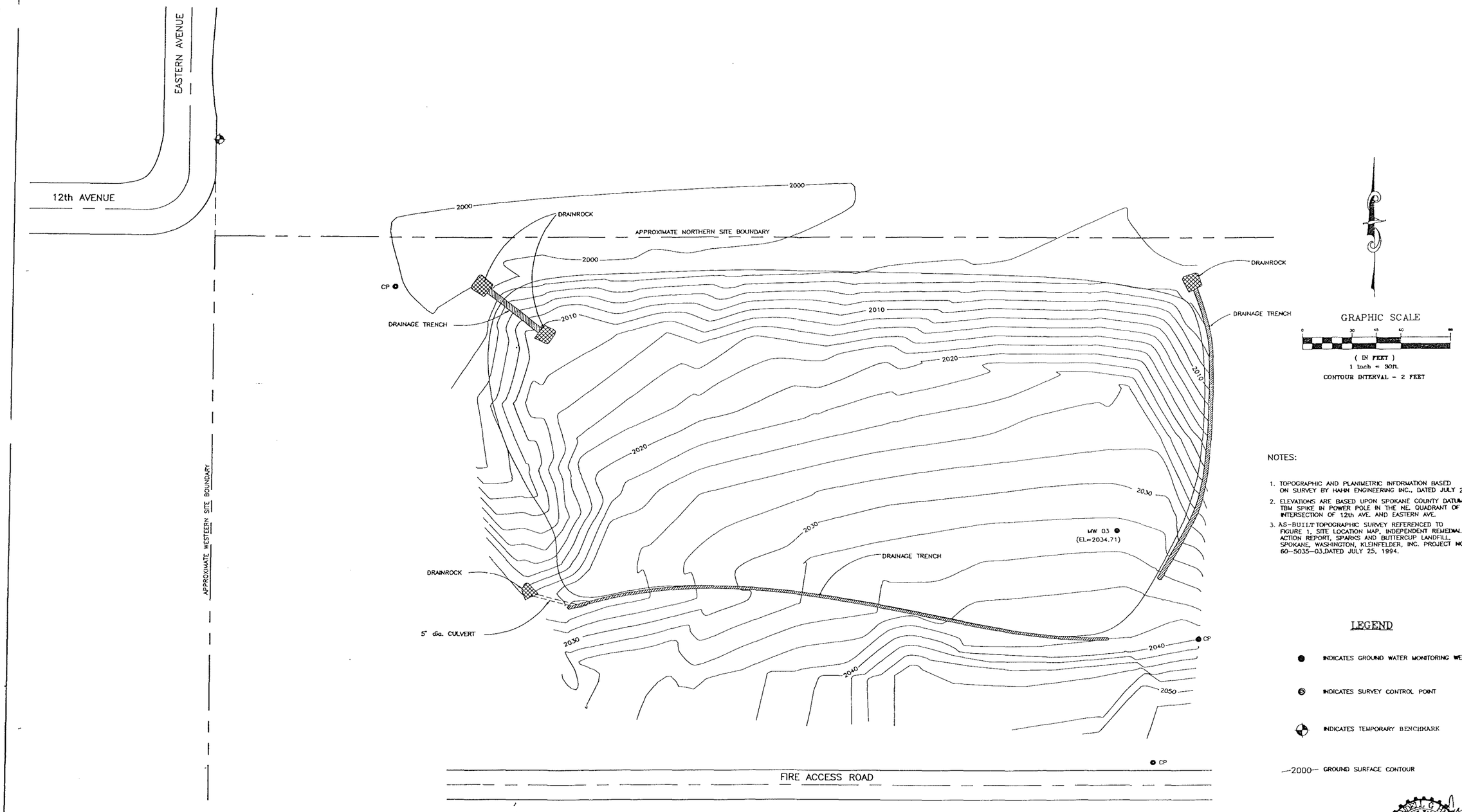
KLEINFELDER

5035F3B.CDR

SPARKS & BUTTERCUP LANDFILL
GEOLOGIC CROSS-SECTION B-B'
SPOKANE, WASHINGTON

Project # 60-5035-03

FIGURE 3B



NOTES:

1. TOPOGRAPHIC AND PLANIMETRIC INFORMATION BASED ON SURVEY BY HAHN ENGINEERING INC., DATED JULY 28 1994
2. ELEVATIONS ARE BASED UPON SPOKANE COUNTY DATUM FROM TBM SPIKE IN POWER POLE IN THE NE. QUADRANT OF INTERSECTION OF 12th AVE. AND EASTERN AVE.
3. AS-BUILT TOPOGRAPHIC SURVEY REFERENCED TO FIGURE 1, SITE LOCATION MAP, INDEPENDENT REMEDIAL ACTION REPORT, SPARKS AND BUTTERCUP LANDFILL, SPOKANE, WASHINGTON, KLEINFELDER, INC. PROJECT NO. 60-5035-03,DATED JULY 25, 1994.

LEGEND

- INDICATES GROUND WATER MONITORING WELL
- INDICATES SURVEY CONTROL POINT
- INDICATES TEMPORARY BENCHMARK
- —2000— GROUND SURFACE CONTOUR

RANDALL G. HAHN STATE OF WASHINGTON 18847 REGISTERED PROFESSIONAL ENGINEER

EXPIRES 12/15/94

REV	DESCRIPTION	BY	APP	DATE

REFERENCE DRAWINGS

HAHN ENGINEERING
NORTH 8623 B DIVISION
SPOKANE, WA. 99208
(509) 467-1550
FAX (509) 467-8189

SCALE:	1"=30'
DRAWN BY:	SM
CHECKED BY:	RH
APPROVED BY:	RH
DATE	8\2\94

CLIENT
MOTLEY-MOTLEY
P.O. BOX 421
PULLMAN, WASHINGTON 99163

PRJ. NAME
SPARKS-BUTTERCUP LANDFILL

TITLE
AS-BUILT TOPOGRAPHIC SURVEY

SHEET NO. 1 OF 1

CAD FILE
MOTLEY

PLATE
4

APPENDIX A

Independent Remedial Action Report Summary

APPENDIX B

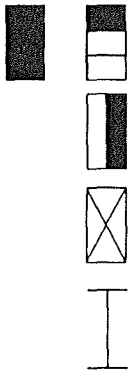
Soil Boring Logs

LOG LEGEND

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS		LTR	DESCRIPTION	MAJOR DIVISIONS		LTR	DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well graded gravels or gravel sand mixtures, little or no fines	FINE GRAINED SOILS	SILTS AND CLAYS LL < 50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity
		GP	Poorly graded gravels or gravel sand mixtures, little or no fines			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		GM	Silty gravels, gravel sand silt mixtures			OL	Organic silts and organic silt-clays of low plasticity
		GC	Clayey gravels, gravel sand clay mixtures		SILTS AND CLAYS LL > 50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	SAND AND SANDY SOILS	SW	Well graded sands or gravelly sands, little or no fines			CH	Inorganic clays of high plasticity, fat clays
		SP	Poorly graded sands or gravelly sands, little or no fines			OH	Organic clays of medium to high plasticity
		SM	Silty sands, poorly graded sand silt mixtures	HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils
		SC	Clayey sands, poorly graded sand clay mixtures				

SOIL SAMPLES



Modified California Sampler (Porter)

Standard penetration split spoon sample

No recovery

Shelby Tube sample

FIELD MEASUREMENTS

Water level observed during drilling

Water level observed after drilling

OVA — Organic Vapor Analyzer

PID — Photoionization Detector

ppmv — Parts Per Million by Volume

WELL CONSTRUCTION

Blank casing

Screened casing

Cement grout

Bentonite

Sand pack or gravel pack

Native material mixed with bentonite

Native backfill or cavings

Bentonite grout

ANALYTICAL RESULTS

ND ( )	Not Detected (Detection Limit)
NA	Not Analyzed
TPH	Total Petroleum Hydrocarbons
BTEX	Benzene, Toluene, Ethylbenzene, & Xylenes
Herb.	Herbicides, EPA Method 8150
Pest.	Pesticides, EPA Method 8080

Note: Blows per foot is the number of blows used to drive a sampler through the last 12 inches of an 18-inch sampling attempt. One blow is a 30-inch fall of a 140-pound hammer.

Note: The line separating strata on the logs represents approximate boundaries only. The actual transition may be gradual. No warranty is provided as to the continuity of the strata between borings. Logs represent the soil section observed at the boring location on the date of drilling only.

KLEINFELDER

LEGENDB1.DRW

Boring Log Legend

Plate B-1

DEPTH (feet)	WELL CONSTRUCTION	CHEMICAL ANALYSES: LABORATORY	CHEMICAL ANALYSES: PID (ppmv)	BLOWS/6 inches	SAMPLE: INTERVAL	SAMPLE: NUMBER	U.S.C.S. DESIGNATION	SOIL DESCRIPTION
0							SM	SILTY SAND, red-gray, medium dense, moist, fine to medium.
								Rock in sampler at 4'; no recovery.
				6 50			GW	SAND and GRAVEL, brown, dense-very dense, moist, coarse/fine-coarse gravels, well graded.
5								
							SP	SAND, grey-brown, slightly moist, medium dense, medium to coarse grained.
		*		1 6 20		MW01-9		
10			0					
		*		4 4 7		MW01-14		SAND, grey-brown, slightly moist, medium dense, coarse sand, poorly graded.
15			0					
				2 4 7		MW01-19		SAND, trace gravel, grey-brown, slightly moist, medium dense, poorly graded.
20			0					
							SW	SAND, trace gravel and cobbles, slightly moist, dense, well graded.
				8 50/4"		MW01-24		
25			0					

LOGGED BY: **DJL**
DATE DRILLED: **5/3-5/5/93**
CASING TYPE: **PVC**

SURFACE ELEVATION (feet): **1999.4**
TOTAL DEPTH (feet): **131**
DIAMETER OF BORING: **8" to 57', 4" to 130.5'**

DRILLING METHOD: **Percussion Hammer**
SCREEN SIZE: **0.02"**
CASING SIZE: **2"**

Comments: Well installed with above-ground monuments.

* Samples submitted for analyses.

KLEINFELDER

LOG OF GROUNDWATER WELL, MW01

SPARKS AND BUTTERCUP SUBDIVISION

CORNER OF EASTERN AND 13TH, SPOKANE, WASHINGTON

50351B2.DRW

Project # 60-5035-01

PLATE B-2

NOTE: Logs are to be used only for the designated purposes and in context with the attached report.

DEPTH (feet)	WELL CONSTRUCTION	CHEMICAL ANALYSES: LABORATORY	CHEMICAL ANALYSES: PID (ppmv)	BLOWS/6 inches	SAMPLE: INTERVAL	SAMPLE: NUMBER	U.S.C.S. DESIGNATION	SOIL DESCRIPTION
25							SW	25
							SP	SAND, brown, slightly moist, dense, fine to medium grained, poorly graded.
		*	0	7 50/5"		MW01-29		SAND, brown, slightly moist, dense, poorly graded.
30								30
							SW	SAND, brown, slightly moist, dense, well graded.
			0	50/3"		MW01-34		SAND, brown, very dense, slightly moist, well graded.
35								35
				50/3"		MW01-39		
40			0					40
							GW	SAND and GRAVEL, brown, slightly moist, dense, well graded.
				50				
45							SP	45 SAND, brown, slightly moist, very dense, fine grained sand, poorly graded, weathered rock fragments.
		*	0	50		MW01-49		SAND, brown, slightly moist, dense, fine grained, poorly graded, weathered granite fragments (mica, amphiboles).
50								50

LOGGED BY: **DJL**
DATE DRILLED: **5-5-93**
CASING TYPE: **PVC**

SURFACE ELEVATION (feet): **1999.4**
TOTAL DEPTH (feet): **131**
DIAMETER OF BORING: **8" to 57', 4" to 130.5'**

DRILLING METHOD: **Percussion Hammer**
SCREEN SIZE: **0.02"**
CASING SIZE: **2"**

Comments:

* Samples submitted for analyses.

KLEINFELDER

LOG OF GROUNDWATER WELL, MW01

SPARKS AND BUTTERCUP SUBDIVISIONS

CORNER OF EASTERN AND 13TH, SPOKANE, WASHINGTON

50351B2A.DRW

Project # 60-5035-01

PLATE B-2A

NOTE: Logs are to be used only for the designated purposes and in context with the attached report.

DEPTH (feet)	WELL CONSTRUCTION	CHEMICAL ANALYSES: LABORATORY	CHEMICAL ANALYSES: PID (ppmv)	BLOWS/6 inches	SAMPLE: INTERVAL	SAMPLE: NUMBER	U.S.C.S. DESIGNATION	SOIL DESCRIPTION
50							SP	Very hard drilling. Granite, boulder(s), very dense. Interstitial clays and sand.
55								Intersticial sands. Granite, boulder(s), very dense.
60								
							SP	
65 ▼								SAND, gray-brown, slightly moist, fine grained, poorly graded.
70								SAND, moderately indurated.
75								

LOGGED BY: **DJL**
DATE DRILLED: **5/3-5/5/93**
CASING TYPE: **PVC**

SURFACE ELEVATION (feet): **1999.4**
TOTAL DEPTH (feet): **131**
DIAMETER OF BORING: **8" to 57', 4" to 130.5',**

DRILLING METHOD: **Percussion Hammer**
SCREEN SIZE: **0.02"**
CASING SIZE: **2"**

Comments:

KLEINFELDER

LOG OF GROUNDWATER WELL, MW01

SPARKS AND BUTTERCUP SUBDIVISION
CORNER OF EASTERN AND 13TH, SPOKANE, WASHINGTON

50351B2B.DRW

Project # 60-5035-01

PLATE B-2B

NOTE: Logs are to be used only for the designated purposes and in context with the attached report.

DEPTH (feet)	WELL CONSTRUCTION	CHEMICAL ANALYSES: LABORATORY	CHEMICAL ANALYSES: PID (ppmv)	BLOWS/6 inches	SAMPLE: INTERVAL	SAMPLE: NUMBER	U.S.C.S. DESIGNATION	SOIL DESCRIPTION
75							SP	
80								
85								SAND, gray, weekly cemented, fine grained, trace coarse sands, poorly graded.
90								
								Granite, boulder(s), very dense.
95								
100								

LOGGED BY: **DJL**
DATE DRILLED: **5/3-5/5/93**
CASING TYPE: **PVC**

SURFACE ELEVATION (feet): **1999.4**
TOTAL DEPTH (feet): **131**
DIAMETER OF BORING: **8" to 57', 4" to 130.5'**

DRILLING METHOD: **Percussion Hammer**
SCREEN SIZE: **0.02"**
CASING SIZE: **2"**

Comments:

KLEINFELDER

LOG OF GROUNDWATER WELL, MW01
SPARKS AND BUTTERCUP SUBDIVISIONS
CORNER OF EASTERN AND 13TH, SPOKANE, WASHINGTON

50351B2C.DRW

Project # 60-5035-01

PLATE B-2C

NOTE: Logs are to be used only for the designated purposes and in context with the attached report.

DEPTH (feet)	WELL CONSTRUCTION	CHEMICAL ANALYSES: LABORATORY	CHEMICAL ANALYSES: PID (ppmv)	BLOWS/6 inches	SAMPLE: INTERVAL	SAMPLE: NUMBER	U.S.C.S. DESIGNATION	SOIL DESCRIPTION
100								
								Granite, very hard drilling.
105								
							GW/ GP	SAND and GRAVEL, with boulders, wet, dense, easier drilling.
▽								
110								
								Boulders and cobbles with interstitial sands.
115								
120								
125								

LOGGED BY: **DJL**
DATE DRILLED: **5/3-5/5/93**
CASING TYPE: **PVC**

SURFACE ELEVATION (feet): **1999.4**
TOTAL DEPTH (feet): **131**
DIAMETER OF BORING: **8" to 57', 4" to 130.5'**

DRILLING METHOD: **Percussion Hammer**
SCREEN SIZE: **0.02"**
CASING SIZE: **2"**

Comments:

KLEINFELDER

LOG OF GROUNDWATER WELL, MW01

SPARKS AND BUTTERCUP SUBDIVISIONS

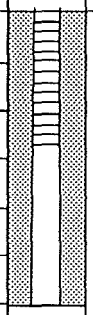
CORNER OF EASTERN AND 13TH, SPOKANE, WASHINGTON

50351B2D.DRW

Project # 60-5035-01

PLATE B-2D

NOTE: Logs are to be used only for the designated purposes and in context with the attached report.

DEPTH (feet)	WELL CONSTRUCTION	CHEMICAL ANALYSES: LABORATORY	CHEMICAL ANALYSES: PID (ppmv)	BLOWS/6 inches	SAMPLE: INTERVAL	SAMPLE: NUMBER	U.S.C.S. DESIGNATION	SOIL DESCRIPTION
125							GW/ GP	SAND and GRAVEL, with boulders, wet, dense.
130								Bottom of borehole: 131 feet. Bottom of well set: 131 feet.
135								
140								
145								
150								

LOGGED BY: **DJL**
DATE DRILLED: **5/3-5/5-93**
CASING TYPE: **PVC**

SURFACE ELEVATION (feet): **1999.4**
TOTAL DEPTH (feet): **131**
DIAMETER OF BORING: **8" to 57', 4" to 130.5',**

DRILLING METHOD: **Percussion Hammer**
SCREEN SIZE: **0.02"**
CASING SIZE: **2"**

Comments:

KLEINFELDER

LOG OF GROUNDWATER WELL, MW01

SPARKS AND BUTTERCUP SUBDIVISIONS

CORNER OF EASTERN AND 13TH, SPOKANE, WASHINGTON

50351B2E.DRW

Project # 60-5035-01

PLATE B-2E

NOTE: Logs are to be used only for the designated purposes and in context with the attached report.

DEPTH (feet)	WELL CONSTRUCTION	CHEMICAL ANALYSES: LABORATORY	CHEMICAL ANALYSES: PID (ppmv)	BLOWS/6 inches	SAMPLE: INTERVAL	SAMPLE: NUMBER	U.S.C.S. DESIGNATION	SOIL DESCRIPTION
0							SP	SAND, red-gray, slightly moist, fine, poorly graded.
		*	0	50/6"		MW02-4		SAND, trace gravels, red-brown, slightly moist, poorly graded, highly weathered rock fragments.
5								Granite boulders at 6', very dense.
							SP	SAND, light brown, slightly moist, very fine, poorly graded.
								Granite, boulder(s), weathered.
10							SP	SAND, brown, slightly moist, medium to fine, poorly graded.
▽								Granite boulders, highly weathered, perched water zone at 13.5'.
15		*	0	50/4"		MW02-17	SP	SAND, olive-brown, moist, very dense, fine to medium grained.
20								Granite, boulder(s), slow drilling.
								Hard drilling at 22', granite boulders, quartz fragments.
▼								Easier drilling at 24', highly weathered.
25								

LOGGED BY: **DJL**
DATE DRILLED: **5/6-5/8/93**
CASING TYPE: **PVC**

SURFACE ELEVATION (feet): **2020.1**
TOTAL DEPTH (feet): **145**
DIAMETER OF BORING: **8" to 78', 4" to 140'**

DRILLING METHOD: **Percussion Hammer**
SCREEN SIZE: **0.02"**
CASING SIZE: **2"**

Comments: Well installed with above-ground measurements.

* Samples submitted for analysis.

KLEINFELDER

LOG OF GROUNDWATER WELL, MW02

SPARKS AND BUTTERCUP SUBDIVISION

CORNER OF EASTERN AND 13TH, SPOKANE, WASHINGTON

50351B3.DRW

Project # 60-5035-01

PLATE B-3

NOTE: Logs are to be used only for the designated purposes and in context with the attached report.

DEPTH (feet)	WELL CONSTRUCTION	CHEMICAL ANALYSES: LABORATORY	CHEMICAL ANALYSES: PID (ppmv)	BLOWS/6 inches	SAMPLE: INTERVAL	SAMPLE: NUMBER	U.S.C.S. DESIGNATION	SOIL DESCRIPTION
25								25
							SP	SAND, red-gray, slightly moist, medium grained, poorly graded.
							SW	SAND, red-gray and olive-brown, slightly moist, medium to coarse, well graded, trace highly weathered rock.
30								30
								Easier drilling at 30'.
							SP	SAND, gray-brown, moist, medium, poorly graded.
								SAND, trace gravels, red-brown, moist, medium, poorly graded.
35								35
								Granite boulders, fragments highly to moderately weathered, very dense, hard drilling.
40								40
		*	0	50/6"		MW02-43	SM	SILTY SAND, trace gravel, gray-brown, slightly moist, very dense, very fine.
							SP	SAND, olive-brown, slightly moist, fine, poorly graded, trace highly weathered rock.
45								45
								Highly weathered granite boulder(s), very dense.
							SP	SAND, gray, moist, fine to medium, poorly graded, trace highly weathered rock fragments (black amphiboles and mica.
50								50

LOGGED BY: **DJL**
DATE DRILLED: **5/6-5/8/93**
CASING TYPE: **PVC**

SURFACE ELEVATION (feet): **2020.1**
TOTAL DEPTH (feet): **145**
DIAMETER OF BORING: **8" to 78', 4" to 140'**

DRILLING METHOD: **Percussion Hammer**
SCREEN SIZE: **0.02"**
CASING SIZE: **2"**

Comments:

* Samples submitted for analysis.

KLEINFELDER

LOG OF GROUNDWATER WELL, MW02
SPARKS AND BUTTERCUP SUBDIVISIONS
CORNER OF EASTERN AND 13TH, SPOKANE, WASHINGTON

50351B3A.DRW

Project # 60-5035-01

PLATE B-3A

NOTE: Logs are to be used only for the designated purposes and in context with the attached report.

DEPTH (feet)	WELL CONSTRUCTION	CHEMICAL ANALYSES: LABORATORY	CHEMICAL ANALYSES: PID (ppmv)	BLOWS/6 inches	SAMPLE: INTERVAL	SAMPLE: NUMBER	U.S.C.S. DESIGNATION	SOIL DESCRIPTION
50							SP	
								Softer at 53'.
55								SAND, trace gravels, olive-gray, moist, medium dense. 55
		*	0	50/6"		MW02-59	SP	SAND, some coarse gravels, gray-brown to light brown, slightly moist, very dense, fine grained. 60
60								
								Layer of decomposed granite at 63'.
							SP	SAND, yellow-brown, dry, fine to medium, highly weathered rock fragments. 65
65								
								Boulders with interstitial sand and micas, slightly moist.
70								70
							SP	SAND, gray-brown, moist, medium grained.
								Boulders with interstitial sands.
75								75

LOGGED BY: **DJL**
DATE DRILLED: **5/6-5/8/93**
CASING TYPE: **PVC**

SURFACE ELEVATION (feet): **2020.1**
TOTAL DEPTH (feet): **145**
DIAMETER OF BORING: **8" to 78', 4" to 140'**

DRILLING METHOD: **Percussion Hammer**
SCREEN SIZE: **0.02"**
CASING SIZE: **2"**

Comments:

* Samples submitted for analyses.

KLEINFELDER

LOG OF GROUNDWATER WELL, MW02

SPARKS AND BUTTERCUP SUBDIVISION
CORNER OF EASTERN AND 13TH, SPOKANE, WASHINGTON

50351B3B.DRW

Project # 60-5035-01

PLATE B-3B

NOTE: Logs are to be used only for the designated purposes and in context with the attached report.

DEPTH (feet)	WELL CONSTRUCTION	CHEMICAL ANALYSES: LABORATORY	CHEMICAL ANALYSES: PID (ppmv)	BLOWS/6 inches	SAMPLE: INTERVAL	SAMPLE: NUMBER	U.S.C.S. DESIGNATION	SOIL DESCRIPTION
75								Boulders.
80								
85 ▽								Perched water zone at 85-86'.
								Boulders.
90								
95							SP/ SM	SAND.
							SM	Softer drilling at 98'. SILTY SAND, yellow-brown, dry, fines, trace coarse sand.
100								

LOGGED BY: **DJL**
DATE DRILLED: **5/6-5/8/93**
CASING TYPE: **PVC**

SURFACE ELEVATION (feet): **2020.1**
TOTAL DEPTH (feet): **145**
DIAMETER OF BORING: **8" to 78', 4" to 140'**

DRILLING METHOD: **Percussion Hammer**
SCREEN SIZE: **0.02"**
CASING SIZE: **2"**

Comments:

KLEINFELDER

LOG OF GROUNDWATER WELL, MW02

SPARKS AND BUTTERCUP SUBDIVISIONS

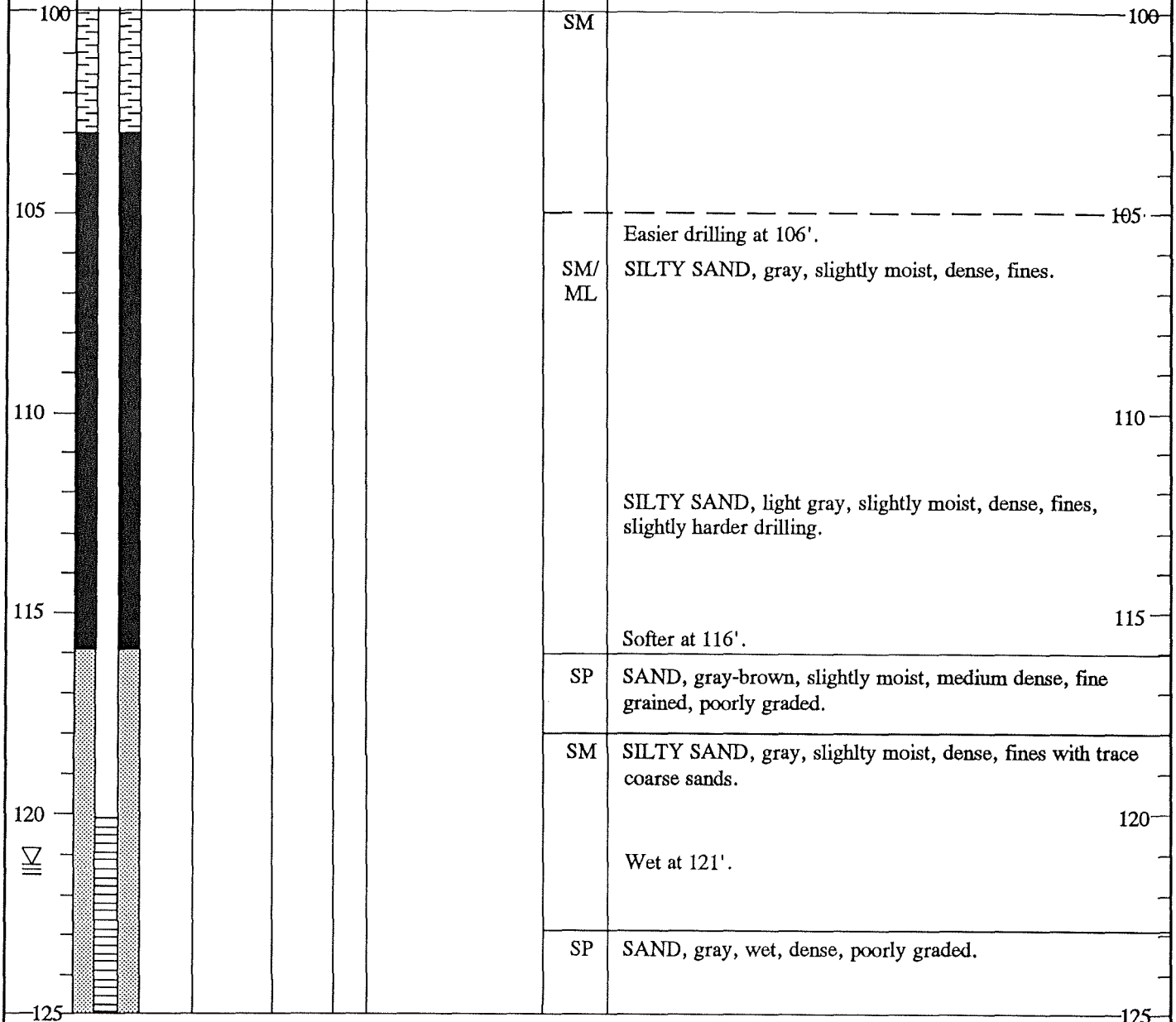
CORNER OF EASTERN AND 13TH, SPOKANE, WASHINGTON

50351B3C.DRW

Project # 60-5035-01

PLATE B-3C

NOTE: Logs are to be used only for the designated purposes and in context with the attached report.



LOGGED BY: **DJL**
DATE DRILLED: **5/6-5/8/93**
CASING TYPE: **PVC**

SURFACE ELEVATION (feet): **2020.1**
TOTAL DEPTH (feet): **145**
DIAMETER OF BORING: **8" to 78', 4" to 140'**

DRILLING METHOD: **Percussion Hammer**
SCREEN SIZE: **0.02"**
CASING SIZE: **2"**

Comments:

KLEINFELDER

50351B3D.DRW

LOG OF GROUNDWATER WELL, MW02

SPARKS AND BUTTERCUP SUBDIVISIONS

CORNER OF EASTERN AND 13TH, SPOKANE, WASHINGTON

Project # 60-5035-01

PLATE B-3D

NOTE: Logs are to be used only for the designated purposes and in context with the attached report.

DEPTH (feet)	WELL CONSTRUCTION	CHEMICAL ANALYSES: LABORATORY	CHEMICAL ANALYSES: PID (ppmv)	BLOWS/6 inches	SAMPLE: INTERVAL	SAMPLE: NUMBER	U.S.C.S. DESIGNATION	SOIL DESCRIPTION
125							SP	SAND, gray, wet, dense, poorly graded.
130								Harder drilling at 132'. Quartz fragments/interstitial sand.
135								
140								
145								Bottom of borehole: 145 feet. Bottom of well set: 140 feet.
150								

LOGGED BY: **DJL**
DATE DRILLED: **5/6-5/8/93**
CASING TYPE: **PVC**

SURFACE ELEVATION (feet): **2020.1**
TOTAL DEPTH (feet): **145**
DIAMETER OF BORING: **8" to 78', 4" to 140"**

DRILLING METHOD: **Percussion Hammer**
SCREEN SIZE: **0.02"**
CASING SIZE: **2"**

Comments:

KLEINFELDER

50351B3E.DRW

LOG OF GROUNDWATER WELL, MW02

SPARKS AND BUTTERCUP SUBDIVISIONS

CORNER OF EASTERN AND 13TH, SPOKANE, WASHINGTON

Project # 60-5035-01

PLATE B-3E

NOTE: Logs are to be used only for the designated purposes and in context with the attached report.

DEPTH (feet)	WELL CONSTRUCTION	CHEMICAL ANALYSES: LABORATORY	CHEMICAL ANALYSES: PID (ppmv)	BLOWS/6 inches	SAMPLE: INTERVAL	SAMPLE: NUMBER	U.S.C.S. DESIGNATION	SOIL DESCRIPTION
0								0
							SM	SILTY SAND, brown, slightly moist, medium dense, fines.
			0	5 5 11		MW03-4		
5								5
							SP	SAND, light brown, slightly moist, medium-coarse grained, poorly graded.
								Boulder(s), granite.
10							SP	SAND, light brown, slightly moist, medium dense, medium grained, poorly graded. 10
		*	0	30/6"		MW03-11		
15				50/3"				15
							SP	Grades to gray-brown/gray at 17'.
		*	0	50/5"		MW03-19		SAND, gray, slightly moist, dense, medium grained, poorly graded.
20								20
		*	0	70/12"		MW03-24		SAND, gray-brown, slightly moist, very dense, medium to fine grained.
25								25

LOGGED BY: **DJL**
DATE DRILLED: **5/10-5/11/93**
CASING TYPE: **PVC**

SURFACE ELEVATION (feet): **2029.4**
TOTAL DEPTH (feet): **83'**
DIAMETER OF BORING: **8" to 50', 4" to 83'**

DRILLING METHOD: **Percussion Hammer**
SCREEN SIZE: **0.02"**
CASING SIZE: **2"**

Comments: Well completed with above-ground monument.

* Samples submitted for analyses.

KLEINFELDER

LOG OF GROUNDWATER WELL, MW03

SPARKS AND BUTTERCUP SUBDIVISION

CORNER OF EASTERN AND 13TH, SPOKANE, WASHINGTON

50351B4.DRW

Project # 60-5035-01

PLATE B-4

NOTE: Logs are to be used only for the designated purposes and in context with the attached report.

DEPTH (feet)	WELL CONSTRUCTION	CHEMICAL ANALYSES: LABORATORY	CHEMICAL ANALYSES: PID (ppmv)	BLOWS/6 inches	SAMPLE: INTERVAL	SAMPLE: NUMBER	U.S.C.S. DESIGNATION	SOIL DESCRIPTION
25							SP	25
		*	0	50/6"		MW03-29	SP	SAND, gray-brown, slightly moist, dense, medium to fine, poorly graded.
30								30
								SAND, yellow-brown, slightly moist, medium grained, poorly graded.
								Boulders, weathered.
35								35
							SP	SAND, light brown, dry, fines with fine to coarse gravels.
								Boulder(s).
							GW	GRAVELS, dry, well graded, trace coarse sands.
			0	50/5"		MW03-39	SP	SAND, light brown, dry, dense, fine, poorly graded.
40								40
								Boulders with interstitial sand and gravel.
								Quartzite fragments, weathered.
				50/0"				
45								45
							SM	SILTY SAND, gray-brown, slightly moist, fine.
				60/0"				Basalt, black, very dense-hard.
50								50

LOGGED BY: **DJL**
DATE DRILLED: **5/10-5/11/93**
CASING TYPE: **PVC**

SURFACE ELEVATION (feet): **2029.4**
TOTAL DEPTH (feet): **83**
DIAMETER OF BORING: **8" to 50', 4" to 83'**

DRILLING METHOD: **Percussion Hammer**
SCREEN SIZE: **0.02"**
CASING SIZE: **2"**

Comments:

* Samples submitted for analyses.

KLEINFELDER

LOG OF GROUNDWATER WELL, MW03

SPARKS AND BUTTERCUP SUBDIVISIONS

CORNER OF EASTERN AND 13TH, SPOKANE, WASHINGTON

50351B3A.DRW

Project # 60-5035-01

PLATE B-4A

NOTE: Logs are to be used only for the designated purposes and in context with the attached report.

DEPTH (feet)	WELL CONSTRUCTION	CHEMICAL ANALYSES: LABORATORY	CHEMICAL ANALYSES: PID (ppmv)	BLOWS/6 inches	SAMPLE: INTERVAL	SAMPLE: NUMBER	U.S.C.S. DESIGNATION	SOIL DESCRIPTION
50								Basalt, black, very dense.
55 ▽							SP	SAND, gray-black, dense, wet.
60								Boulder(s) with interstitial sands, dense, wet.
65								
70								
75								

LOGGED BY: **DJL**
DATE DRILLED: **5/10-5/11/93**
CASING TYPE: **PVC**

SURFACE ELEVATION (feet): **2029.4**
TOTAL DEPTH (feet): **83**
DIAMETER OF BORING: **8" to 50', 4" to 83'**

DRILLING METHOD: **Percussion Hammer**
SCREEN SIZE: **0.02"**
CASING SIZE: **2"**

Comments:

KLEINFELDER

LOG OF GROUNDWATER WELL, MW03

SPARKS AND BUTTERCUP SUBDIVISIONS

CORNER OF EASTERN AND 13TH, SPOKANE, WASHINGTON

50351B4D.DRW

Project # 60-5035-01

PLATE B-4B

NOTE: Logs are to be used only for the designated purposes and in context with the attached report.

DEPTH (feet)	WELL CONSTRUCTION	CHEMICAL ANALYSES: LABORATORY	CHEMICAL ANALYSES: PID (ppmv)	BLOWS/6 inches	SAMPLE: INTERVAL	SAMPLE: NUMBER	U.S.C.S. DESIGNATION	SOIL DESCRIPTION
75								Boulder(s) with interstitial sands, dense, wet.
80								
								Bottom of borehole: 83 feet. Bottom of well set: 83 feet.
85								
90								
95								
100								

LOGGED BY: **DJL**
DATE DRILLED: **5/10-5/11/93**
CASING TYPE: **PVC**

SURFACE ELEVATION (feet): **2029.4**
TOTAL DEPTH (feet): **83**
DIAMETER OF BORING: **8" to 50', 4" to 83"**

DRILLING METHOD: **Percussion Hammer**
SCREEN SIZE: **0.02"**
CASING SIZE: **2"**

Comments:

KLEINFELDER

LOG OF GROUNDWATER WELL, MW03

SPARKS AND BUTTERCUP SUBDIVISIONS

CORNER OF EASTERN AND 13TH, SPOKANE, WASHINGTON

50351B4C.DRW

Project # 60-5035-01

PLATE B-4C

NOTE: Logs are to be used only for the designated purposes and in context with the attached report.

APPENDIX C

SEPA Checklist & Floodplain Development Permit

SPOKANE COUNTY

OFFICE OF THE COUNTY ENGINEER • A DIVISION OF THE PUBLIC WORKS DEPARTMENT
Ronald C. Hormann, P.E., County Engineer Dennis M. Scott, P.E., Director

MEMORANDUM

TO:

WA State Dept Of Ecology
ATTN: Barbara Ritchie
Mail Stop PV-11
Olympia, WA 98504-8711

Spokane County
Air Pollution Control Authority
(SEPA Review)

Spokane County Planning Dept.
(SEPA Review)

WA State Dept of Wildlife
Regional Office (SEPA Review)
N. 8702 Division
Spokane, WA 99218

Tim Erkel
U.S. Army Corps of Engineers
P.O. Box 1929
Airway Heights, WA 99001

U.S. Soil Conservation Service
U.S. Dept. of Agriculture
Rock Point Tower II
West 316 Boone Ave.
Spokane, WA 99201

Spokane County Conservation District
Agricultural Center Building
N. 222 Havana
Spokane, WA 99206
ATTN: Jud Melton,
District Conservationist

Historic Preservation Office
ATTN: Kit Garrett
W. 808 Spokane Falls Blvd., Rm 627
Spokane, WA 99201-3333

U.S. Fish and Wildlife
P.O. Box 1157
Moses Lake, WA 98837

FROM: Spokane County Engineer's Office
Tammie Williams, Environmental Programs Administrator

DATE: December 6, 1993

SUBJECT: Issuance of Determination of Nonsignificance for a landfill closure project.

The Spokane County Engineers Office has issued a Determination of Nonsignificance for a proposal to cap the Sparks and Buttercup Landfill, revegetate the site and convert the land to park space.

A copy of the State Environmental Policy Checklist is enclosed. If you have questions or need additional information please contact me.

Please send all comments on this project to the attention of Tammie Williams at Spokane County Engineer's Office.

Attach.

W. 1026 Broadway Ave. Spokane, WA 99260-0170 (509) 456-3600 FAX (509) 456-4715

File No. 12-23-93

SPOKANE ENVIRONMENTAL ORDINANCE

(WAC 197-11-970) Section 11.10.230(3) Determination of Nonsignificance (DNS)

DETERMINATION OF NONSIGNIFICANCE

Description of Proposal Project to cap the Sparks and Buttercup Landfill, revegetate the site and convert the land to park space.

Proponent Spectrum Properties, Inc.

Location of proposal, including street address, if any Sparks Addition - Blocks 11 & 12, South and East of the intersection of Eastern Street and 12th Avenue in Spokane County, in the SW¼ of Section 24, Township 25N, Range 43 E.W.M.

Lead agency Spokane County Engineer's Office

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An Environmental Impact Statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

[ ] There is no comment period for this DNS.

[X] This DNS is issued under 197-11-340(2); the lead agency will not act on this proposal for 15 days from the date below. Comments must be submitted by 5:00 p.m. December 23, 1993.

Responsible Official Ronald C. Hormann, ATTN: Tammie Williams

Position/Title County Engineer Phone (509) 456-3600

Address 1026 West Broadway Avenue, Spokane, WA 99260-0170

Date 12-7-93 Signature

You may appeal this determination to (name) Tammie Williams

at (location) Spokane County Engineer's Office

no later than (date) December 23, 1993

by (method) In writing

You should be prepared to make specific factual objections.

Contact Tammie Williams (509)456-3600 to read or ask about the procedures for SEPA appeals.

0004B

ENVIRONMENTAL CHECKLIST

SPOKANE ENVIRONMENTAL ORDINANCE SECTION 11.10.230 [1]

SPOKANE ENVIRONMENTAL ORDINANCE

(WAC 197-11-960) Section 11.10.230(1)

Environmental Checklist

File No. _____

Purpose of Checklist:

The State Environmental Policy Act (SEPA) chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An Environmental Impact Statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for Applicants:

This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply." Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Use of checklist for nonproject proposals:

Complete this checklist for nonproject proposals, even though questions may be answered "does not apply".
IN ADDITION, complete the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS(Part D).

For nonproject actions, the references in the checklist to the words "project," "applicant," and "property or site" should be read as "proposal," "proposer," and "affected geographic area," respectively.

A. BACKGROUND

1. Name of proposed project, if applicable: Sparks and Buttercup Landfill

2. Name of Applicant: Spectrum Properties Inc.

3. Address and phone number of applicant or contact person: P.O. Box 4412, Portland, Oregon 97208
(503) 275-6987

4. Date checklist prepared: November 29, 1993

5. Agency requesting checklist: Spokane County Engineering

6. Proposed timing or schedule (including phasing, if applicable):
Landfill Closure (Grading and Capping) December 1993 - January 1994.
Landfill Closure Design Report and Independent Remedial Action Report as per Department of Ecology MTCA Guidelines, January - March 1994.

7. a. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.
No.

b. Do you own or have options on land nearby or adjacent to this proposal? If yes, explain. Yes. Adjacent parcels within blocks 8,9,10,13 and 14 of Sparks addition.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.
Existing reports on file with Dept. of Ecology: 1) Report of Findings - Sparks and Buttercup Subdivision, Century West Engineering, January 31, 1991. 2) Remedial Investigation Report - Sparks and Buttercup Subdivision, Kleinfelder, Inc., July 7, 1993. 3) Ground Water Monitoring Data Summary Report - Sparks and Buttercup Subdivision, Kleinfelder, Inc., August 13, 1993. An Independent Remedial Action Report and Landfill Closure Design Report will be prepared and submitted to the Dept. of Ecology after completing Landfill closure activities.

(WAC 197-11-960) Section 11.10.230(1)

A. BACKGROUND (continued)

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

None pending.

10. List any government approvals or permits that will be needed for your proposal, if known. 100-year flood zone permit to be obtained from Spokane County Engineering Department.

11. Give a brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page.

An old unpermitted landfill operated by Spokane Township from the early 1900's through 1950's occupies approximately 2.2 acres of land owned by Spectrum Properties, Inc. Proposed activities involve capping the landfill with a synthetic liner and import soils, revegetating the site, and converting the land to parkspace for public use and enjoyment.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit application related to this checklist.

There is no specific street address for the site, however, it is situated immediately south and east of the intersection of Eastern Street and 12th Avenue in Spokane County, Washington. Legal description: SW ¼ of Section 24, Township 25 North, Range 43 East, Willamette Meridian. Sparks addition blocks 11 and 12.

13. Does the proposed action lie within the Aquifer Sensitive Area (ASA)? The General Sewer Service Area? The Priority Sewer Service Area? The City of Spokane? (See: Spokane County's ASA Overlay Zone Atlas for boundaries).

No.

TO BE COMPLETED BY APPLICANT

B. ENVIRONMENTAL ELEMENTS

Evaluation For Agency Use Only

1. EARTH

a. General description of the site (circle one): flat, rolling, (hilly) steep slopes, mountainous, other:

b. What is the steepest slope on the site (approximate percent slope)? 15%

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

Coarse-grained unconsolidated sands, gravels, cobbles and boulders.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

No.

B. ENVIRONMENTAL ELEMENTS(continued)

Evaluation For Agency Use Only

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill. Grading will be performed to establish a uniform surface on which to place the liner and fill soils (silts & sands). Anticipated quantity of fill material required to construct cap, approximately 10,000 cubic yards.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

No.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

100% of landfill will be covered with a synthetic liner overlain by 2 feet of vegetated fill material.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

The entire site will be seeded with grass to control erosion and reduce surface run-off following storm events.

2. AIR

a. What type of emissions to the air would result from the proposal (i.e., dust, automobile, odors industrial, wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantites if known. Insignificant quantities of dust may be generated during construction based on an exposure assessment performed in November 1993 by Kleinfelder, Inc.

No emissions will result after cap is installed.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

No.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

Addition of water, as necessary, to achieve optimum moisture content for fill soils and control potential dust emissions.

3. WATER

a. Surface:

(1) Is there any surface water body on or in the immediate vicinity of the site including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

No.

(2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

Not applicable.

B. ENVIRONMENTAL ELEMENTS (continued)

Evaluation For Agency Use Only

(3) Estimate the amount of fill and dredge material that would be placed in or removed from the surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

Not applicable.

(4) Will the proposal require surface water withdrawals or diversions? Give a general description, purpose, and approximate quantities, if known.

Not applicable.

(5) Does the proposal lie within a 100-year flood plain? If so, note location on the site plan.

Yes. See site map.

(6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No.

b. Ground:

(1) Will groundwater be withdrawn, or will water be discharged to groundwater? Give general description, purpose, and approximate quantities, if known.

No.

(2) Describe waste material that will be discharged into the ground from septic tanks or other sanitary waste treatment facility. Describe the general size of the system, the number of houses to be served (if applicable) or the number of persons the system(s) are expected to serve.

Not applicable.

(3) Describe any systems, other than those designed for the disposal of sanitary waste, installed for the purpose of discharging fluids below the ground surface (includes systems such as those for the disposal of storm water or drainage from floor drains). Describe the type of system, the amount of material to be disposed of through the system and the types of materials likely to be disposed of (including materials which may enter the system inadvertently through spills or as a result of firefighting activities).

Not applicable.

(4) Will any chemicals (especially organic solvents or petroleum fuels) be stored in above-ground or underground storage tanks? If so, what types and quantities of materials will be stored?

No.

B. ENVIRONMENTAL ELEMENTS (continued)

Evaluation For Agency Use Only

(5) What protective measures will be taken to insure that leaks or spills of any chemicals stored or used on site will not be allowed to percolate to groundwater (this includes measures to keep chemicals out of disposal systems described in 3b(2) and 3b(3))?

Not applicable.

c. Water Runoff (including storm water):
(1) Describe the source of runoff (including storm water) and method of collection and disposal if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe. Drainage features of the cap will direct storm water run-off to a vegetated area at the base of the landfill where it will infiltrate the native soils. This is the process which naturally takes place at the site.

(2) Will any chemicals be stored, handled or used on the site in a location where a spill or leak will drain to surface or groundwater or to a storm water disposal system discharging to surface or groundwater?

No.

(3) Could waste materials enter ground or surface waters? If so, generally describe.

No.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any (if the proposed action lies within the Aquifer Sensitive Area be especially clear on explanations relating to facilities concerning Sections 3b(4), 3b(5), and 3c(2) of this checklist):

Not applicable.

4. PLANTS

a. Check or circle type of vegetation found on the site:

X deciduous tree: alder, maple, aspen, other.

X evergreen tree: fir, cedar, pine, other.

____ shrubs.

X grass.

____ pasture.

____ crop or grain.

____ wet soil plants, cattail, buttercup, bullrush, skunk cabbage, other.

____ water plants: water lilly, eelgrass, milfoil, other.

____ other types of vegetation.

b. What kind and amount of vegetation will be removed or altered? Grasses and trees will be removed as necessary to grade the site in preparation for liner installation.

c. List threatened or endangered species known to be on or near the site. None.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Site will be reseeded with grass over it's entirety.

B. ENVIRONMENTAL ELEMENTS (continued)

Evaluation For Agency Use Only

5. ANIMALS

a. Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:

birds: hawk, heron, eagle, songbirds, other: None.

mammals: deer, bear, elk, beaver, other: None.

fish: bass, salmon, trout, herring, shellfish, other: None.

other: _____

b. List any threatened or endangered species known to be on or near the site.

None.

c. Is the site part of a migration route? If so, explain. No.

d. Proposed measures to preserve or enhance wildlife, if any: Not applicable.

6. ENERGY AND NATURAL RESOURCES

a. What kinds of energy (electric, natural gas, wood stove, solar) will be used to meet the the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Not applicable.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

Not applicable.

7. ENVIRONMENTAL HEALTH

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

No.

(1) Describe special emergency services that might be required.

Emergency medical service may be required during cap installation in the event of a mechanical accident.

B. ENVIRONMENTAL ELEMENTS (continued)

Evaluation For Agency Use Only

ENVIRONMENTAL HEALTH (continued)

(2) Proposed measures to reduce or control environmental health hazards, if any:

The purpose of this project is to isolate the landfill from human exposure. Installation of the cap will thereby reduce environmental health hazards from exposure to landfill debris.

b. Noise:

(1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

None.

(2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Short-term - Construction equipment and vehicles, less than 50 decibels, 8:00 am - 5:00 pm.

Long-term - None.

(3) Proposed measure to reduce or control noise impacts, if any:

None.

8. LAND AND SHORELINE USE

a. What is the current use of the site and adjacent properties? Undeveloped land and residential subdivisions.

b. Has the site been used for agriculture? If so, describe.

No.

c. Describe any structures on the site. None.

d. Will any structures be demolished? If so, which? No.

e. What is the current zoning classification of the site? U.R. 3.5 Urban Residential

f. What is the current comprehensive plan designation of the site? Unknown.

g. If applicable, what is the current shoreline master program designation of the site?

Not applicable.

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

No.

i. Approximately how many people would reside or work in the completed project? None.

B. ENVIRONMENTAL ELEMENTS (continued)

Evaluation For Agency Use Only

j. Approximately how many people would the completed project displace? None.

k. Proposed measures to avoid or reduce displacement impacts, if any: Not applicable.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:
Proposed post-closure land-use is parkspace. This land-use is acceptable for areas zoned U.R. (Urban Residential).

9. HOUSING

a. Approximately how many units would be provided, if any? Indicate whether high-, middle-, or low-income housing.
None.

b. Approximately how many units, if any, would be eliminated? Indicate whether high-, middle-, or low-income housing.
None.

c. Proposed measures to reduce or control housing impacts, if any: Not applicable.

10. AESTHETICS

a. What is the tallest height of any proposed structure(s), not including antennas? What is the principal exterior building material(s) proposed?
Not applicable.

b. What views in the immediate vicinity would be altered or obstructed?
None.

c. Proposed measures to reduce or control aesthetic impacts, if any:
Not applicable.

11. LIGHT AND GLARE

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?
None.

b. Could light or glare from the finished project be a safety hazard or interfere with views?
No.

c. What existing off-site sources of light or glare may affect your proposal?
None.

d. Proposed measures to reduce or control light and glare impacts, if any:
Not applicable.

B. ENVIRONMENTAL ELEMENTS (continued)

Evaluation For Agency Use Only

12. RECREATION

a. What designated and informal recreational opportunities are in the immediate vicinity?

Hiking.

b. Would the proposed project displace any existing recreational uses? If so, describe.

No.

c. Proposed measures to reduce or control impacts on recreation, including recreational opportunities to be provided by the project or applicant, if any:

Not applicable.

13. HISTORIC AND CULTURAL PRESERVATION

a. Are there any places or objects listed on or proposed for national, state or local preservation registers known to be on or next to the site? If so, generally describe.

No.

b. Generally describe any landmarks or evidence of historic archaeological, scientific or cultural importance known to be on or next to the site.

None.

c. Proposed measures to reduce or control impacts, if any:

Not applicable.

14. TRANSPORTATION

a. Identify public streets and highways serving the site and describe proposed access to the existing street system. Show on site plans, if any.

Indirect site access via 12th Avenue, Eastern Street, and Dollar Street.

No additional street improvements are planned to improve access to the site.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

Not applicable.

c. How many parking spaces would the completed project have? How many would the project eliminate?

None. / None.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets not including driveways? If so, generally describe (indicate whether public or private).

No.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

No.

B. ENVIRONMENTAL ELEMENTS (continued)

Evaluation For Agency Use Only

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak would occur.

None.

g. Proposed measures to reduce or control transportation impacts, if any:

Not applicable.

15. PUBLIC SERVICES

a. Would the project result in an increased need for public services (for example, fire protection, police protection, health care, schools, other)? If so, generally describe.

No.

b. Proposed measures to reduce or control direct impacts on public services, if any:

Not applicable.

16. UTILITIES

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

None.

b. Describe the utilities that are proposed for the project, the utility providing the service and the general construction activities on the site or in the immediate vicinity which might be needed.

Not applicable.

C. SIGNATURE

I, the undersigned, swear under the penalty of perjury that the above responses are made truthfully and to the best of my knowledge. I also understand that, should there be any willful misrepresentation or willful lack of full disclosure on my part, the agency may withdraw any determination of nonsignificance that it might issue in reliance upon this checklist.

Date: Dec 1, 1993 Proponent Spectrum Properties, Inc. (Please Print or Type)

Proponent: Elizabeth C. Hengeveld (Signature) Address: P.O. Box 4412

Phone: (503) 275-6987 Portland, Oregon 97208

Person completing form: R. Scott Wallace, Kleinfelder, Inc. Date: Nov 30, 1993

Phone: (503) 644-9447

FOR STAFF USE ONLY

Staff member(s) reviewing checklist: Jeannie Williams 12/1/93

Based on this staff review of the environmental checklist and other pertinent information, the staff:

A. X Concludes that there are no probable significant adverse impacts and recommends a determination of nonsignificance.

B. _____ Concludes that probable significant adverse environmental impacts do exist for the current proposal and recommends a mitigated determination of nonsignificance with conditions.

C. _____ Concludes that there are probable significant adverse environmental impacts and recommends a determination of significance.

FILING FEE - $75.00

NOTICE TO THE PUBLIC

DETERMINATION OF NONSIGNIFICANCE

Pursuant to WAC 197-11-340 (State Environmental Policy Act Rules) and Section 11.10.090 of the Spokane Environmental Ordinance, the Spokane County Engineers Office has issued a Determination of Nonsignificance (DNS) for the proposal described below:

Description of proposal: Project to cap the Sparks and Buttercup Landfill, revegetate the site and convert the land to park space.

Proponent: Spokane County

Location of proposal: Sparks Addition - Blocks 11 & 12, South and East of the intersection of Eastern Street and 12th Avenue in Spokane County, in the SW¼ of Section 24, Township 25N, Range 43 E.W.M.

Lead Agency: Spokane County Engineer's Office

The lead agency has determined that this proposal does not have a probably significant adverse impact on the environment. An Environmental Impact Statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

This DNS is issued under 197-11-340(2); the lead agency will not act on this proposal for 15 days from the dated issued (below), at which time it becomes final. Comments regarding this DNS must be submitted by December 23, 1993 if they are intended to alter the DNS.

Responsible Official: Ronald C. Hormann, County Engineer (509) 456-3600

Address: 1026 West Broadway Avenue, Spokane, WA 99260-0170

Date Issued: December 6, 1993

You may appeal this determination to: Tammie Williams, Environmental Programs Administrator

at: Spokane County Engineers Office, 1026 W. Broadway Ave., Spokane, WA 99260

no later than: 5:00 p.m., December 23, 1993

by: writing to the above person and address

Ronald C. Hormann, P.E.
Spokane County Engineer
ATTN: Tammie Williams

PUBLISH: SPOKESMAN REVIEW
December 9, 1993

FLOODPLAIN DEVELOPMENT PERMIT

Permit No. 94-JNA-002

1. Parcel Number: Range 43, Township 25, Sec 24, Qtr 3 (SW)
2. Property Address: Sparks Addition - Blocks 11 and 12 - Sparks/Buttercup Landfill
3. Applicant: Spectrum Properties
4. Phone Number: (503) 275-6987
5. Address: P.O. Box 4412, Portland, OR 97208
6. Type of Development (circle): (Excavation) Fill (Grading) Mobile Home
   Residential Structure Other Structure, specify Landfill Cap
7. Required lowest floor elevation (flood protection elevation):
   a. _____ Mean Sea Level (USGS datum)
   b. _____ Feet above highest adjacent grade
   c. Other: According to plans on file Spokane County Engineers ~~and~~
   d. Bench mark: _____
8. Conditions: Per SEPA documents
9. Comments: _____

I agree to provide an as-built certification by an engineer licensed in the State of Washington stating that the project has restored all floodplain areas to pre-project contours and that all spoil materials have been disposed of outside the flood zone. The certification shall be the original stamped one.

Applicant Acknowledgement: I understand that the issuance of this permit is contingent upon the above information being complete and that the plans and supporting data have been or shall be provided as required. I agree to comply with all applicable provisions of Chapter 3, Section 20 of the Spokane County Code and all other laws or ordinances affecting the proposed development.

Further, I also understand that compliance with the terms of this permit is no guarantee that the permitted structure/development will not flood. The information used to determine the base elevation for this permit is approximate. Larger floods may occur. This permit shall not create liability on the part of Spokane County or any officer or employee thereof for any flood damages.

X Applicant Signature R. Scott Williams for Kleinfelder X Date 1-11-94

Date of Issuance 3/10/94 By Tom Williams

Permit Fee Received $30.00 ck 2455 (Crompacker) Bond Amount $1000.00 (ck 24623 Kleinfelder)

Date by which as-built certification to be received 1/31/95

Spokane County Engineers
West 1026 Broadway Avenue
Spokane, WA 99260
(509) 456-3600

Stream	Applicant	Address	Parcel#	Action	Date	Visit	Permit#	Comments	Init.	Map

APPENDIX D

Landfill Gas Survey

KLEINFELDER MEMORANDUM

TO: Scott Wallace, Kleinfelder-Portland

FROM: Tim Crandall, Kleinfelder-Sacramento

DATE: November 9, 1993

RE: Sparks-Buttercup Landfill Gas Survey
60-503503-A01

Background

The Sparks-Buttercup Landfill is located in Spokane Washington and has been inactive for a number of years. The current landowner wishes to formally close the landfill. As a prelude to the closure, a screening level landfill combustible gas survey was conducted by Kleinfelder to assess if combustible gas (methane) was present in the landfill and if there is evidence of lateral migration. Landfill gas probes were installed and sampled over a two day period (October 13 and 14, 1993).

Sampling Equipment

Temporary gas sampling probes were used to collect subsurface gas samples from in and around the landfill. The probes were constructed of one half inch diameter galvanized steel pipe. The tip of the pipe was crimped to form a point and the bottom 18 inches was perforated with one quarter inch holes. The other end of the pipe was fitted with a barb fitting.

Landfill gas (methane) samples were measured with a combustible gas meter. The meter is the Digiflam 2000 made by Neotronics. Before mobilizing to the field, the meter was calibrated to methane gas (see attached calibration log).

Probe Installation

Six gas probes were installed on October 14, 1993 in and around the landfill. Figure 1 shows the location of each probe (GP-1 through GP-6). Each probe was driven into the ground using an electric jackhammer. The depth that the probes were driven was dependent of the hardness of the soil. In only two cases was the driving of probes terminated before meeting refusal, GP-2 and GP-6. In both these cases, a reasonable depth was reached relative to the anticipated depth of the waste in the landfill. Table 1 shows the depths and time of installation of each probe. Probes GP-1 and GP-2 are located in landfill waste. The remaining probes are in native soil surrounding the landfill.

Table 1

ProbeDepth	Time	Installed
GP-1	5'6"	2:20 pm
GP-2	7'3"	2:36 pm
GP-3	2'	3:05 pm
GP-4	1'11"	3:40 pm
GP-5	2'4"	3:57 pm
GP-6	6'6"	4:36 pm

Sample Collection and Measurement

Landfill gas measurements were made at each probe location on October 14, 1993 between 11:30am and 2:00pm using the Digiflam 2000. At the beginning of the sampling period the instrument was successfully passed through the autocalibration routine. The instrument was attached to each probe and measurements were taken after the reading had stabilized. In all cases, the readings were stable from time zero so at least 2 minutes were allowed to pass before taking a reading to purge the probe. Readings of oxygen were also taken as well as the ambient levels of combustible gas (the amount of gas in the air in the immediate vicinity of the probe). Table 2 summarizes the results of the probe measurements.

Table 2

Probe	Purge Time (Minutes)	Combustible Gas Probe (% LEL)	Combustible Gas Ambient (% LEL)	Oxygen (%)
GP-1	10	1.0	1.0	20.0
GP-2	10	1.0	1.0	20.1
GP-3	4	1.0	1.0	20.0
GP-4	4	1.5	1.5	20.6
GP-5	4	2	1.5	20.5
GP-6	2	1	0.0	20.3

LEL= Lower Explosive Limit. LEL for methane = 5.3 %

Conclusions

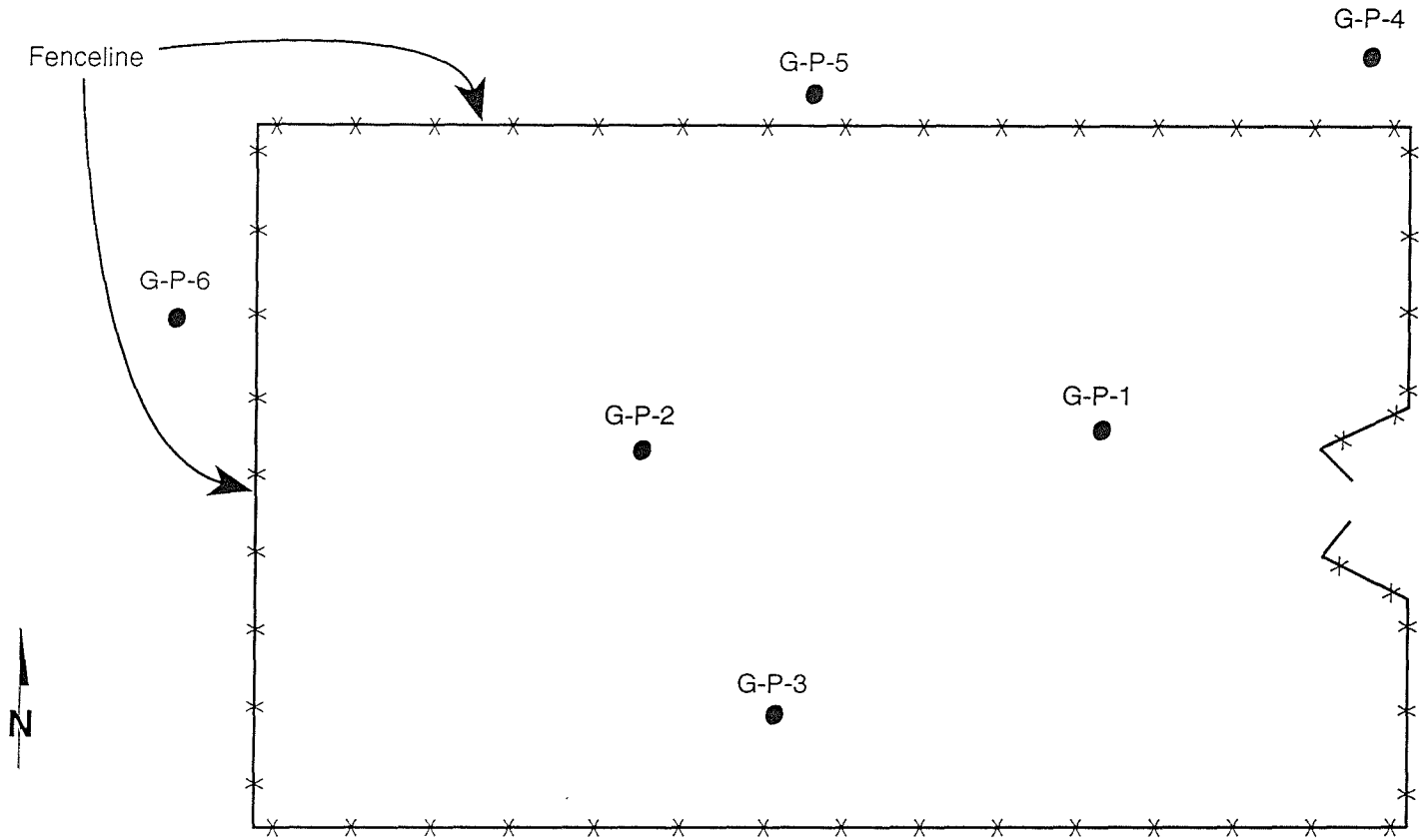
Appreciable levels of combustible gas were not detected in either the landfill or in near-surface soils surrounding the landfill using the temporary landfill gas monitoring probes. While this is a strong indication that there is little if any landfill gas present, permanent gas probes

completed at multiple depths would have to be installed and monitored periodically to validate this screening level assessment.

Limitations

The conclusions in this report are based on a screening level assessment using temporary landfill gas monitoring probes. This report was prepared in general accordance with the accepted standard of care which existed in Washington at the time the investigation was performed. It should be recognized that detection and measurement of combustible landfill gas is a difficult and inexact art. Judgments leading to conclusions are generally made with limited knowledge of the history of the landfill or subsurface conditions. No warranty, expressed or implied, is made.

This document may be used only by the client and only for the purpose stated, and within a reasonable time from its issuance. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. Any party other than the client who wishes to use this report shall notify Kleinfelder of such intended use. Based on the intended use of the report, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party.



EXPLANATION

● Probe Location

NOT TO SCALE

KLEINFELDER

DATE PRODUCED: 11/9/93 | DATE REVISED:

PROJECT NO. 60-503503-A01

Landfill Gas Survey Probe Locations
Sparks-Buttercup Landfill
Spokane, Washington

FIGURE 1

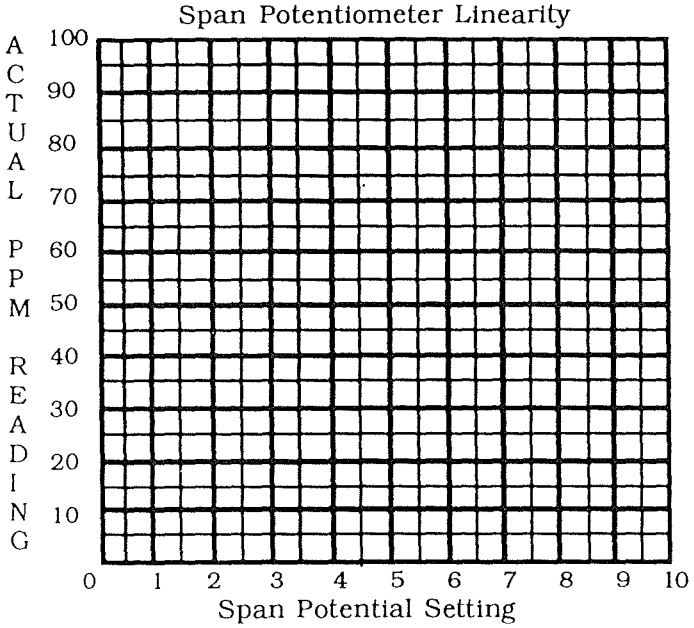
HAZCO Services, Inc.

Instrument Description DF2000

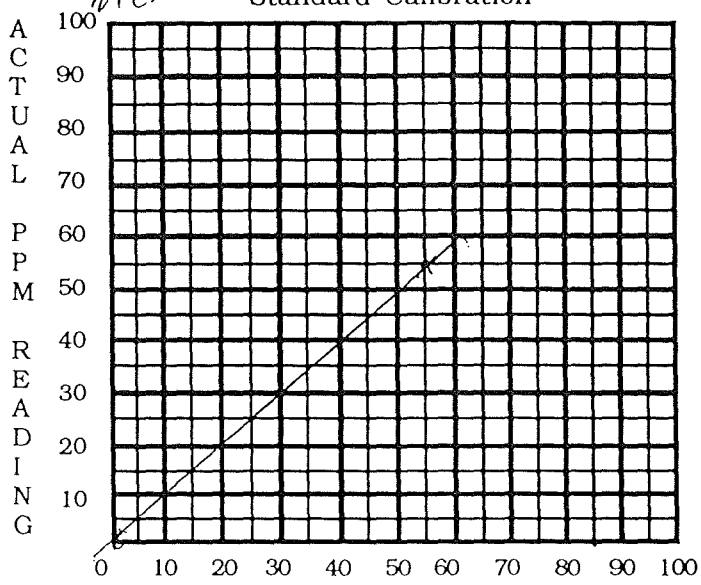
Mfg. Serial #: 0500953 Calibration Date: 10/21/93

HAZCO Serial #: 1948 Technician: DMS

Span Potentiometer Linearity



Methane Standard Calibration

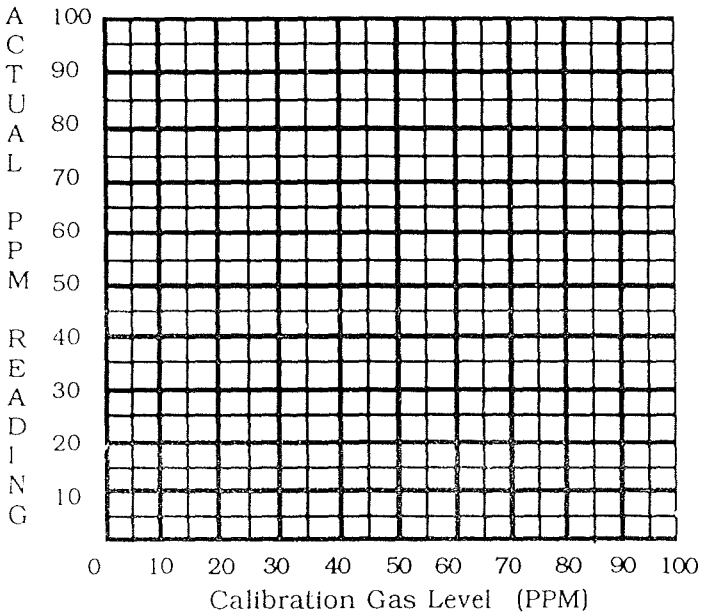


% Vol

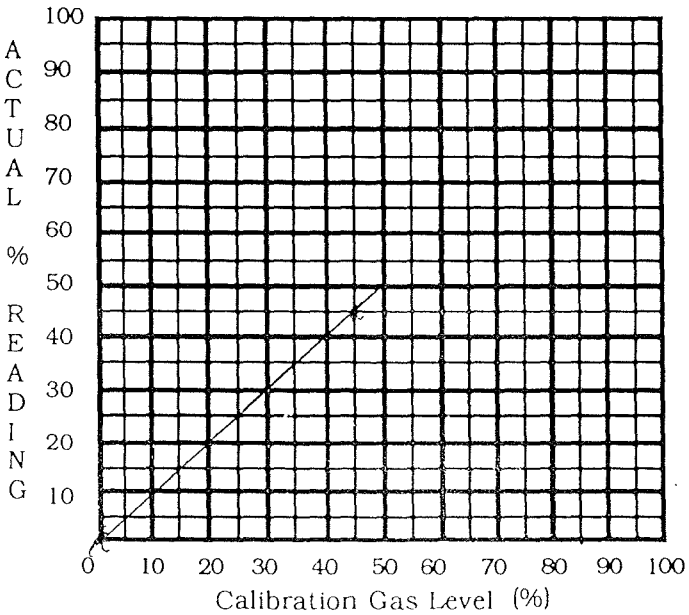
Calibration Points _____

Calibration Points 0-0'55-55

Standard Calibration



Methane Standard Calibration



Calibration Points _____

Calibration Points 0-0'45-45

Please Return Equipment To

- ☑ HAZCO Services, Inc., 2006 Springboro West, Dayton, OH 45439, 513-293-2700
- ☐ HAZCO Services, Inc., Windsor Industrial Park, Route 130, Building 12, Windsor, NJ 08561, 609-443-9350
- ☐ HAZCO Services, Inc., 15353 East Hinsdale Circle, Suite D, Englewood, CO 80112, 303-766-1501
- ☐ HAZCO Services, Inc., 1921 East Carnegie Ave, Building III, Suite O, Santa Ana, CA 92705, 714-263-1163
- ☐ HAZCO Services, Inc., 50 Campus Plaza, Edison, NJ 08837-3911, 908-417-0660
- ☐ HAZCO Services, Inc., 115-A Flint Road, Oak Ridge, TN 37830, 615-482-3940

APPENDIX E

Human Health Exposure Assessment

HUMAN HEALTH EXPOSURE ASSESSMENT SPARKS-BUTTERCUP LANDFILL CLOSURE SPOKANE, WASHINGTON

1.0 INTRODUCTION

The Sparks-Buttercup Landfill is an inactive landfill in Spokane, Washington. The landfill was operated from the 1920's through the 1950's and received primarily construction debris. Formal closure of the 2½ acre site is planned, and the site meets the criteria for an inert demolition waste landfill. Therefore, closure will involve minor excavation and grading of the site, followed by capping with an impermeable layer.

Previous investigations of the property indicated that several chemicals were present in landfill soil above Model Toxic Control Act (MTCA) Method A cleanup concentrations (WAC 173-340; Century West Engineering, 1991; Kleinfelder 1993b). In addition to the soils assessment, limited groundwater samples were collected, and a landfill gas survey was conducted to assess potential gas emissions (Kleinfelder, 1993a).

The purpose of this assessment is to evaluate potential chemical exposures from landfill gases and airborne dust during the approximately 20 days of closure activities. The two population groups potentially exposed to airborne chemicals during excavating and grading work are on-site workers and nearby residents. The following sections establish the chemicals that might be of health concern, estimate exposure concentrations for the potentially exposed populations, and compare site exposures to health-based concentration limits.

2.0 CHEMICALS OF CONCERN

The gas survey, soil, and groundwater sampling analysis results were reviewed to determine the chemicals that were identified at the site. From the identified chemicals, a list of chemicals of concern was selected by comparing site soil and groundwater concentrations to applicable regulatory standards. In the case of landfill gas, gas survey results were compared qualitatively to results reported for municipal waste landfills.

A chemical was selected as of potential concern if its concentrations in soil or groundwater samples exceeded MTCA Method A cleanup numbers. These are generally the most conservative cleanup concentrations, and are not necessarily health-based. Health-based Method B numbers were used to screen site soil concentrations if a chemical did not have a Method A number as allowed by the MTCA regulations. In addition, chemicals were also selected if their concentrations approached Method A or B cleanup concentrations, they had a high frequency of detection, and/or their toxicity warranted inclusion.

2.1 Gas Survey

A landfill gas survey was conducted to assess the potential for explosive levels of methane gas and methane migration off the property. The gas survey concluded that little if any landfill gas was likely to be present at the site (Kleinfelder, 1993a). Although only methane gas was surveyed, landfill gas composition is approximately 50 percent methane and 50 percent carbon dioxide, with less than one percent other types of organic compounds (U.S. EPA, 1991a). Therefore, because methane gas is present at the Sparks-Buttercup Landfill in relatively small amounts, other gases of potential health concern are very unlikely to be present at concentrations that could cause adverse health effects. Sampling and analysis at over 200 municipal waste landfills in California which generate high quantities of methane gas (>500,000 ppm), did not find ambient air concentrations of other gases of potential health concern (e.g., benzene, vinyl chloride) to be present above analysis method detection limits (California Air Resources Board, 1990). Thus landfill gases are not anticipated to be a significant health risk to either site workers or nearby residents, and are not evaluated further in this assessment.

2.2 Soil Sampling

During the 1991 investigation, soil samples were collected from three borings and eight test pits on the property and analyzed for a variety of potential contaminants including: priority pollutant metals, semi-volatile organic compounds, volatile organic compounds, pesticides, and polychlorinated biphenyls (Century West Engineering, 1991). Results indicated that arsenic, chromium, and lead were present above Method A soil cleanup concentrations.

In addition to the chemicals found to be above Method A concentrations, two other chemicals of potential health concern, di-n-butylphthalate and bis(2-ethylhexyl)phthalate were detected in 16 out of 17, and 15 out of 17 samples, respectively. Although concentrations for both chemicals were below Method B soil cleanup levels (no Method A numbers are available), concentrations approached Method B values for di-n-butylphthalate, and bis(2-ethylhexyl)phthalate is a suspect carcinogen. These chemicals, however, are common laboratory and sample contaminants.

In 1993, Kleinfelder installed three monitoring wells on the property (only one within the confines of the former landfill, the other two were on the perimeter of the landfill area), and collected additional soil and groundwater samples. Samples were analyzed for the same constituents as the 1991 investigation. Results indicated that arsenic, chromium, lead, and DDT were present above Method A groundwater cleanup levels (previous investigative work had identified DDT in soil, but at concentrations well below Method A levels). These concentrations are thought to be within background concentration ranges for the Spokane Aquifer (Kleinfelder, 1993b); however, DDT in soil was conservatively added to the list of chemicals of concern. Human contact with groundwater is not anticipated during closure activities.

Therefore, the following chemicals have been selected as of potential health concern to site workers and off-site residents during closure activities:

- Arsenic
- Chromium
- Lead
- DDT
- Di-n-butylphthalate
- Bis(2-ethylhexyl)phthalate

3.0 EXPOSURE

In order to evaluate potential health risks to site chemicals of concern the concentration of each chemical at the point of exposure must be estimated, and then compared to an applicable health-based standard (see Section 4.0). This section identifies the populations potentially exposed to chemicals at the site, determines the means by which exposure occurs, and the amount of each chemical at the point of exposure. The result of this process is an amount of chemical in an exposure media (e.g., air) at the point where the exposed populations would contact the chemical.

The potentially exposed populations during landfill closure activities will be on-site workers and nearby residents. The only residents within a ¼ mile of the property are located 200 to 250 feet north of the landfill. No commercial or industrial property is within a ¼ mile. Exposures will be of short duration occurring during the active soil disturbance phase of closure activities over a period of 20 working days (approximately one month). After that time, the landfill will be capped and further exposures are not anticipated.

Exposures to chemicals are anticipated to be primarily through inhalation. Excavating and grading work involve soil disturbance which will generate airborne dust containing the chemicals of concern. Workers will be exposed to airborne dust on-site, and the dust could potentially be transported off-site where it may be encountered by people in the residential area north of the property.

Other potential exposures to chemicals for site workers could be through incidental soil ingestion or skin contact. However, because the concentrations of all chemicals in the top five feet of soil (the anticipated depth of disturbance), are below health-based Method B levels, exposures from these other routes are unlikely to be significant. Therefore, on-site and off-site exposure concentrations were estimated for airborne metals and semi-volatile organic compounds adsorbed to dust (DDT, di-N-butylphthalate, and bis(2-ethylhexyl)phthalate are all considered semi-volatile compounds). No gaseous chemicals or volatile organic compounds are anticipated to be present at levels associated with adverse health effects.

3.1 Estimation of Particulate Emissions

Particulate concentrations for individual chemicals of concern were estimated using an algorithm for the on-site concentrations, and a computer model for the off-site concentrations. Both methods used EPA emission factors for the amount of dust anticipated to be generated during excavating and grading activities, and an arithmetic average of each chemical's concentration in soil. The goal of the methods is to arrive at an estimation of the concentration of each chemical in the "breathing zone" of an individual (this zone is 4 to 6 feet above ground surface).

3.1.1 On-Site Exposure Concentrations

Particulate emissions for on-site workers were estimated using standard EPA emission factors converted into emission rates (see detail calculation presented in Table 3 of Appendix A). Two different emission factors were used, one for grading and one for excavating activities (Appendix A). The emission rates were then incorporated into the box model equation. The algorithm for the box model is as follows (Hanna et al., 1982):

$$C = (\text{delta x})(Q)(1{,}000\ \text{mg/g})(10^6\ \text{cm}^3/\text{m}^3)/[(z)(u)]$$

where:

C	=	Particulate concentration in breathing zone (mg/m^3)
delta X	=	Length of box in direction of wind flow (m)
Q	=	Estimated emission rate (g/cm^2sec)
z	=	Mixing depth (cm)
u	=	Wind speed along x direction (m/sec)

The hypothetical box was assumed to be 101 m long and 10 m high. The length of the box, delta X, is therefore 101 m and the mixing depth, z, is 1000 cm. A wind speed, u, of 2.25 m/sec was used as the average wind speed. The result of the algorithm gives a total particulate concentration in the breathing zone of a hypothetical individual on-site during the activity associated with a particular emission rate.

Particulate concentrations for individual chemicals of concern were determined by multiplying the total particulate concentration by the chemical's soil concentration expressed as a unitless weight fraction (each chemical concentration was the arithmetic average of all detected soil samples). The results for grading activities and the chemicals weight fraction in soil are summarized in Table 1. Grading activities were found to emit the greatest amount of chemicals, and therefore represent worst-case conditions (see Appendix A for excavating concentrations).

3.1.2 Off-Site Exposure Concentrations

For off-site particulate emissions, EPA's computer model SCREEN2 Version 92245 was used to estimate the air concentrations of chemicals in the residential area to the north of the landfill. SCREEN2 uses a Gaussian plume model that incorporates

TABLE 1
SOIL AND AIR CONCENTRATIONS FOR CHEMICALS OF CONCERN

CHEMICAL	Weight Fraction of Chemical in Soil[a] unitless	Grading[b] On-site Air Concentration ug/m^3	Grading Off-site Air Concentration[c] ug/m^3
Arsenic	0.0000359	0.012	0.000846
Total Chromium	0.0000436	0.0145	0.00103
Lead	0.00116	0.385	0.0273
DDT	0.000000006	0.00000208	0.000000148
Di-N-butylphthalate	0.00000176	0.000585	0.0000415
Bis(2-ethylhexyl)phthalate	0.000000164	0.0000545	0.00000386

NOTES
[a]: Concentrations of all soil samples collected by Century West Engineering (1991) were averaged and then expressed as weight fractions (concentrations originally in ppm).
[b]: Grading emissions were higher than emissions for excavating activities therefore, grading air concentrations were used as a worst-case scenario.
[c]: Off-site air concentrations are expressed as annual concentrations. An annual concentration was obtained by multiplying a conversion factor of 0.07 by a maximum 1-hour concentration of 336.7 ug/m^3 (see Appendix A for details).

source-related factors and meteorological factors to estimate pollutant concentration from continuous sources (U.S. EPA, 1992a). Full meteorology, which examines all six stability classes and their associated wind speeds, were used in the model, so that modeling results identified a worst-case scenario. The area of emissions was assumed to be an area source. The inputs requested for area sources are as follows:

Area Source Inputs

Emission rate (g/s - m^2)
Source release height (m)
Length of side of the square area (m)
Receptor height above ground (m)
Urban/rural option

The emission rates for the model were based on the calculated particulate on-site emission rates. Furthermore, the source area was assumed to be approximately square in size. Therefore, the square root of the surface area was used as the source width in the modeling run. An assumption of 2 meters was used for the source release height. An EPA suggested value of 2.0 meters was used for the receptor height above ground and a conservative assumption was made in selecting the urban option.

To estimate the air concentrations of the individual chemicals of primary concern for the off-site receptors (residents), the laboratory analyzed chemical concentrations were expressed as a weight fraction of each chemical in the soil. This fraction was multiplied by the final air concentration of particulates from the SCREEN2 modeling to obtain the estimated air concentration of individual chemicals. The SCREEN2 modeling results are for maximum 1-hour concentration. A factor of 0.08 was multiplied to the maximum 1-hour concentration to obtain maximum annual concentration (U.S. EPA, 1992b). Details of calculations and computer runs are presented in Appendix A. The results for grading activities are summarized in Table 1.

4.0 HEALTH EVALUATION

The health evaluation compares estimated concentrations of chemicals at the exposure point (i.e., the air around workers and nearby residents) with health-based concentrations of the airborne chemicals of concern that can be breathed without adverse health effects. If site concentrations are below health-based concentrations, no adverse health effects are anticipated. If site concentrations are above health-based concentrations, then control measures need to be taken to reduce airborne chemicals. The derivation of applicable health-based concentrations, the assumptions and limitations of those concentrations, and the results of the comparison are discussed below by exposure group.

4.1 On-Site Workers

Washington State has work-place air concentration limits of many chemicals called Permissible Exposure Limits (PELs; Washington Administrative Code 296-62-07517).

These limits are derived from available occupational and scientific evidence as the concentrations that a healthy adult worker can safely breath eight hours a day, five days a week, for a working lifetime without adverse health effects. The on-site air concentrations for grading activities (the highest dust generating activity) were many orders of magnitude below PELs, and therefore workers would not be exposed to concentrations over regulatory limits during closure procedures. Bis(2-ethylhexyl)phthalate does not have a PEL, however, the chemical did not exceed the concentration limit for off-site residents (see below). Residential limits are typically much lower than PELs, and therefore bis(2-ethylhexyl)phthalate is not considered a significant health risk for on-site workers. On-site air concentrations and PELs are presented in Table 2.

4.2 Off-Site Residents

Health-based concentration limits for residential populations are generally more stringent than for worker populations because residential areas potentially contain sensitive subpopulations such as children, elderly, and sick individuals. U.S. EPA (1989b, 1991b,c,d) guidelines calculate concentration limits by defining risk goals for a particular population group and then solving the basic risk assessment equations for an air concentration associated with the risk goal. Different procedures are used depending on whether the chemical is considered a carcinogen (arsenic, chromium and bis(2-ethylhexyl)phthalate) or a noncarcinogen (DDT and di-N-butylphthalate)[1].

Air concentration limits for **noncarcinogens** are estimated using a goal of a hazard quotient of one. Noncarcinogenic effects are assumed to have a threshold dose below which no adverse effects are expected. The reference dose (RfD) represents this dose level with an adequate margin of safety for protection of sensitive subpopulations. A hazard quotient of unity (one) occurs at a maximum dose that is not associated with adverse health effects. The RfD's for DDT and di-N-butylphthalate are oral values obtained from EPA's on-line data base, Integrated Risk Information System (IRIS; U.S. EPA, 1993; presented in Table 2). The oral RfDs are usually derived from studies where the chemicals were ingested rather than inhaled (no inhalation values were available). Therefore, the use of oral criteria to assess inhalation exposure assumes that absorption and toxic effects will be the same if the compound is inhaled. An in-depth evaluation of the validity of these assumptions is outside the scope of this assessment. Off-site air concentrations for these compounds are well below estimated health-based concentration limits (see Table 2).

Unlike noncarcinogenic effects, **carcinogenic chemicals** are assumed to have no threshold dose. Cancer potency is therefore estimated by determining the upper 95 percent confidence limit of the slope of a line expressing chemical excess cancer risk as a function of dose. Cancer potency estimates (also called slope factors) were obtained from IRIS (U.S. EPA, 1993), and are presented in Table 2. For arsenic and chromium inhalation slope factors derived from inhalation exposures were available. For bis(2-

1: Lead is considered a suspect carcinogen, but a health-based concentration limit was not calculated. The limit for lead is taken from the federal National Ambient Air Quality Standard for Lead (U.S. EPA, 1986).

TABLE 2
ON– and OFF–SITE AIR CONCENTRATIONS COMPARED TO
APPLICABLE HEALTH–BASED CONCENTRATIONS

ON–SITE WORKERS: CHEMICAL	Grading[a] On–site Air Concentration ug/m^3	PEL[b] ug/m^3
Arsenic	0.012	200
Total Chromium	0.0145	50
Lead	0.385	15
DDT	0.00000208	1000
Di–N–butylphthalate	0.000585	5000
Bis(2–ethylhexyl)phthalate	0.0000545	none

OFF–SITE RESIDENTS: CHEMICAL	Grading[a] Off–site Air Concentration ug/m^3	Health–Based Concentration Limit ug/m^3	Toxicity Criteria[c]
Arsenic	0.000846	0.3[d]	15 kg/mg–day
Total Chromium	0.00103	0.1[d]	42 kg/mg–day (Chromium VI)
Lead	0.0273	1.5[e]	none used
DDT	0.00000014	2[f]	0.0005 mg/kg–day
Di–N–butylphthalate	0.0000415	350[f]	0.01 mg/kg–day
Bis(2–ethylhexyl)phthalate	0.00000386	320[d]	0.014 kg/mg–day

NOTES
[a]: Grading emissions were higher than emissions for excavating activities therefore, grading air concentrations were used as a worst–case scenario.
[b]: Permissable Exposure Limits (PELs) are obtained from WAC 296–62–07517.
[c]: Criteria were obtained from IRIS (U.S. EPA, 1993).
[d]: Value is calculated using the toxicity criteria and the formula for carcinogenic residential exposures (U.S. EPA, 1989b) modified to reflect an exposure frequency of 20 days (duration of exposure) at a lifetime 10^{-6} risk.
[e]: Value is from the National Ambient Air Quality Standard (NAAQS) for lead.
[f]: Value was calculated by converting an oral Reference Dose (RfD) obtained from IRIS (U.S. EPA, 1993) to an air concentration, assuming a 70 kg body weight and an inhalation rate of 20 m^3/day: 1000 ug/mg x [(RfD mg/kg–day) x 70 kg] / 20 m^3/day = ug/m^3

ethylhexyl)phthalate, only an oral slope factor was available, and therefore inhalation of the chemical assumes the same absorption rate and production of the same kind of cancer (liver) as ingestion of the chemical.

The cancer incidence observed at high doses in laboratory animals or from occupational studies is extrapolated using a mathematical model to low doses common to environmental exposures. The model is linear at low doses which assumes that no dose is without some risk of cancer incidence. Therefore, since zero risk cannot be achieved if any amount of chemical is present, EPA guidelines (U.S. EPA, 1990) recommend a carcinogenic risk of 10^{-6} to 10^{-4} (a one-in-a million to a one-in-ten thousand risk of developing cancer in a lifetime). The 10^{-6} was selected as an appropriate risk goal for the residential population in this assessment. The target risk associated with MTCA Method B cleanup levels is 10^{-6} for public exposures.

Health-based concentration limits for carcinogens assume chronic daily exposures averaged over a lifetime. For carcinogens a lifetime is considered to be 70 years. Calculations in this assessment assumed a 20-day exposure period averaged over 70 years. Concentration limits are presented in Table 2, and limits are much larger than any off-site air concentrations. Therefore, risks to off-site residents from exposures to carcinogens are unlikely to exceed a 10^{-6} risk.

5.0 CONCLUSIONS

Adverse health effects during closure activities are very unlikely given that the PELs of these compounds are many orders of magnitude larger than on- or off-site concentrations, that RfDs are based on chronic daily exposure over 30 years (exposure will only occur over a maximum of 20 days), and that very low levels of chemicals are present in the air.

6.0 LIMITATIONS

Calculations of health risks require making many assumptions and are therefore subject to the limitations imposed by scientific information available at the time of the assessment. This report was not designed to quantify or identify all potential risks to human health associated with landfill closure activities. This assessment also does not provide a guarantee regarding the amount of risk at the site. Risks that have been quantified reflect only the specific exposure scenarios identified in this report. In addition, risk quantifications may change as new scientific information becomes available that may modify exposure parameters and toxicity values.

This report may be used only for the purposes stated within a reasonable time from its issuance. Land or facility use, on and offsite conditions, or other factors may change over time, and additional work may thus be required. Any party other than the client who wishes to use this report shall notify Kleinfelder of such intended use. Based on the intended use of the report, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these

requirements will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party. No warranty, express or implied, is made.

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APPENDIX A

KLEINFELDER

SHEET _____ OF _____

PROJECT NO. _____

PROJECT _____ REVIEWED BY _____ DATE _____

SUBJECT _____ BY _____ DATE _____

Off-Site Particulate Concentration

Controlled

$$E.R._{exc} = 1.38 \times 10^{-9} \frac{g}{cm^2 \cdot sec} \times \frac{10^4 cm^2}{m^2} = 1.38 \times 10^{-5} \frac{g}{m^2 \cdot sec}$$

$$E.R._{grad} = 3.71 \times 10^{-9} \frac{g}{cm^2 \cdot sec} \times \frac{10^4 cm^2}{m^2} = 3.71 \times 10^{-5} \frac{g}{cm^2 \cdot sec}$$

Width = 101 m

Source Height = 2 m

Receptor height = 0

Urban

Discrete Receptors

61, 76 meter (200 & 250 ft)

11/02/93
18:12:57

*** SCREEN2 MODEL RUN ***
*** VERSION DATED 92245 ***

SPARKS AND BUTTERCUP OFFSITE PARTICULATE CONC. FOR EXCAVATION

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	AREA
EMISSION RATE (G/(S-M**2))	=	.138000E-04
SOURCE HEIGHT (M)	=	2.0000
LENGTH OF SIDE (M)	=	101.0000
RECEPTOR HEIGHT (M)	=	.0000
URBAN/RURAL OPTION	=	URBAN

BUOY. FLUX = .000 M**4/S**3; MOM. FLUX = .000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	0	.0	.0	.0	.00	.00	.00	
100.	92.62	5	1.0	1.0	10000.0	2.00	4.69	10.45	NO
200.	58.57	5	1.0	1.0	10000.0	2.00	15.30	16.70	NO
300.	42.79	5	1.0	1.0	10000.0	2.00	25.52	22.35	NO
400.	31.89	5	1.0	1.0	10000.0	2.00	35.38	27.52	NO
500.	24.23	5	1.0	1.0	10000.0	2.00	44.91	32.30	NO
600.	18.95	5	1.0	1.0	10000.0	2.00	54.14	36.74	NO
700.	15.24	5	1.0	1.0	10000.0	2.00	63.08	40.92	NO
800.	12.57	5	1.0	1.0	10000.0	2.00	71.76	44.85	NO
900.	10.59	5	1.0	1.0	10000.0	2.00	80.19	48.59	NO
1000.	9.083	5	1.0	1.0	10000.0	2.00	88.39	52.14	NO
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:									
58.	125.3	5	1.0	1.0	10000.0	2.00	.22	7.67	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SCREEN DISCRETE DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH

61.	122.1	5	1.0	1.0	10000.0	2.00	.44	7.81	NO
76.	108.7	5	1.0	1.0	10000.0	2.00	2.08	8.84	NO

)WASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	125.3	58.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

11/02/93
18:15:28

** SCREEN2 MODEL RUN ***
*** VERSION DATED 92245 ***

SPARKS AND BUTTERCUP OFFSITE PARTICULATE CONC. FOR GRADING

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	AREA
EMISSION RATE (G/(S-M**2))	=	.371000E-04
SOURCE HEIGHT (M)	=	2.0000
LENGTH OF SIDE (M)	=	101.0000
RECEPTOR HEIGHT (M)	=	.0000
URBAN/RURAL OPTION	=	URBAN

BUOY. FLUX = .000 M**4/S**3; MOM. FLUX = .000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	0	.0	.0	.0	.00	.00	.00	
100.	249.0	5	1.0	1.0	10000.0	2.00	4.69	10.45	NO
200.	157.5	5	1.0	1.0	10000.0	2.00	15.30	16.70	NO
300.	115.0	5	1.0	1.0	10000.0	2.00	25.52	22.35	NO
400.	85.72	5	1.0	1.0	10000.0	2.00	35.38	27.52	NO
500.	65.14	5	1.0	1.0	10000.0	2.00	44.91	32.30	NO
600.	50.94	5	1.0	1.0	10000.0	2.00	54.14	36.74	NO
700.	40.98	5	1.0	1.0	10000.0	2.00	63.08	40.92	NO
800.	33.80	5	1.0	1.0	10000.0	2.00	71.76	44.85	NO
900.	28.48	5	1.0	1.0	10000.0	2.00	80.19	48.59	NO
1000.	24.42	5	1.0	1.0	10000.0	2.00	88.39	52.14	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

58.	336.7	5	1.0	1.0	10000.0	2.00	.22	7.67	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SCREEN DISCRETE DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH

61.	328.4	5	1.0	1.0	10000.0	2.00	.44	7.81	NO
76.	292.2	5	1.0	1.0	10000.0	2.00	2.08	8.84	NO

)WASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	336.7	58.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

Particulate Excavation Emission Estimation

* $ER = 0.45 (S)^{1.5} (M)^{-1.4}$

E.R. = Emission rate for bulldozer (Kg/hr)
S = silt content, default value 0.18
M = moisture content, default value 0.10

$ER = 0.45 (.18)^{1.5} (.10)^{-1.4}$
$ER = 0.8632$ Kg/hr

Area Source = 2.5 acre = 1.01×10^{8} cm^2

$$\therefore E.R. = 0.8632 \frac{Kg}{hr} \times \frac{hr}{3600 sec} \times \frac{1000 g}{Kg} \times 1.01 \times 10^{8} cm^2$$

$$E.R. = 2.37 \times 10^{-9} \frac{g}{cm^2 \cdot sec}$$

Particulate Concentration Estimation

** $C = (\Delta x)(Q)(1000 \frac{mg}{g})(10^6 cm^3/m^3) / [(z)(u)]$

C = concentration in breathing zone (mg/m^3)
Δx = length of box in direction of wind flow (m)
Q = estimated emission rate (g/(cm^2·sec))
z = mixing height (cm)
u = wind speed along x direction (m/sec)

Assumptions
(same as VOC assumptions)

Δx = 101 m
z = 10 m = 1000 cm
u = 2.25 m/sec

$C = (10/m)\left(2.37 \times 10^{-9} \frac{g}{cm^2 \cdot sec}\right)\left(1000 \frac{mg}{g}\right)\left(10^6 \frac{cm^3}{m^3}\right) \Big/ (1000\ cm)(2.25\ m/s$

$C = 1.06 \times 10^{-1} \frac{mg}{m^3} = 1.06 \times 10^{2} \frac{\mu g}{m^3}$

Antimony

Soil concentration of antimony = 3.04 mg/kg

$3.04 \frac{mg}{kg} \times \frac{10^{-6} kg}{mg} = 3.04 \times 10^{-6}$ expressed as weight fraction of antimony in soil

$C = \left(1.06 \times 10^{2} \frac{\mu g}{m^3}\right)\left(3.04 \times 10^{-6}\right) = 3.22 \times 10^{-4} \frac{\mu g}{m^3}$ Antimony

* E.P.A. / SUPERFUND

** HANNA, S.R., G.A. Briggs, and R.P. Hosker, Jr., 1982, Handbook on Atmospheric Diffusion, U.S. Department of Energy, Washington, D.C., DOE/TIC-11223

United States Environmental Protection Agency
Office of Air Quality Planning and Standards Research Triangle Park NC 27711
EPA - 450/1-89-003 January 1989

Air/Superfund

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Volume III - Estimation of Air Emissions from Cleanup Activities at Superfund Sites

BRAHCE

Interim Final

TABLE 24. EMISSION RATE EQUATIONS FOR INHALABLE OR SMALLER PARTICULATES: EXCAVATION AND GRADING

Emission Category	Size Range	Emission Equation - Metric	Units	Emission Equation - English	Units
Excavation					
Bulldozer	<15 um	$0.45(s)^{1.5}(M)^{-1.4}$	kg/hr	$1.0(s)^{1.5}(M)^{-1.4}$	lb/hr
	<2.5 um	$(0.105)(2.6)(s)^{1.2}(M)^{-1.3}$	kg/hr	$(0.105)(5.7)(s)^{1.2}(M)^{-1.3}$	lb/hr
Dragline	<15 um	$(0.0029)(d)^{0.7}(M)^{-0.3}$	kg/m^3	$0.0021(d)^{0.7}(M)^{-0.3}$	lb/yd^3
	<2.5 um	$(0.017)(0.0046)(d)^{1.1}(M)^{-0.3}$	kg/m^3	$(0.017)(0.0021)(d)^{1.1}(M)^{-0.3}$	lb/yd^3
Scraper	<15 um	$(2.2x10^{-6})(s)^{1.4}(W)^{2.5}$	kg/VKT	$(6.2x10^{-6})(s)^{1.4}(W)^{2.5}$	lb/VMT
	<2.5 um	$0.026(9.6x10^{-6})(s)^{1.3}(W)^{2.4}$	kg/VKT	$0.026(2.7x10^{-5})(s)^{1.3}(W)^{2.4}$	lb/VMT
Grading	<15 um	$0.0056(S)^{2.0}$	kg/VKT	$0.051(S)^{2.0}$	lb/VMT
	<2.5 um	$0.031(0.0034)(S)^{2.5}$	kg/VKT	$0.031(0.040)(S)^{2.5}$	lb/VMT

NOTE: See Table 22 for units and explanation of symbols.

KLEINFELDER

SHEET 1 OF 1

PROJECT NO.

PROJECT REVIEWED BY DATE

SUBJECT BY DATE

Particulate Grading Emission Estimation

* ER = .03 - 5.4 Kg/hr

Assume mid-range

$$E.R. = 2.7 \frac{Kg}{hr} \times \frac{hr}{3600 sec} \times \frac{1000 g}{Kg} = 0.75 g/sec$$

Area Source = 2.5 acre = $1.01 \times 10^8 cm^2$

$$\therefore E.R. = 0.75 \frac{g}{sec} \Big/ 1.01 \times 10^8 cm^2$$

$$E.R. = 7.43 \times 10^{-9} \frac{g}{s \cdot cm^2}$$

Particulate Concentration Estimation

** $C = (\Delta x)(\theta)(1000 \frac{mg}{g})(10^6 cm^3/m^3) / [(z)(u)]$

$$C = (101 m)(7.43 \times 10^{-9} \frac{g}{cm^2 \cdot s})(1000 \frac{mg}{g})(10^6 cm^3/m^3) / (100 cm)(2.25 m/sec)$$

$$C = 3.33 \times 10^{-1} \frac{mg}{m^3} = 3.33 \times 10^{2} \frac{\mu g}{m^3}$$

Antimony

$$C = (3.04 \times 10^{-6})(3.33 \times 10^{+2} \frac{\mu g}{m^3}) = 1.01 \times 10^{-3} \frac{\mu g}{m^3}$$ Antimony

*
** } see excavation for particulate

United States Environmental Protection Agency
Office of Air Quality Planning and Standards Research Triangle Park NC 27711
EPA - 450/1-89-003 January 1989

Air/Superfund

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AIR / SUPERFUND NATIONAL TECHNICAL GUIDANCE STUDY SERIES

Volume III - Estimation of Air Emissions from Cleanup Activities at Superfund Sites

BRANCE

Interim Final

TABLE 1B. SUMMARY OF TYPICAL AIR EMISSION VALUES BY SOURCE TYPE

Remedial Option	Typical Operation Rate	Uncontrolled Emissions		Controlled Emissions	
		PM	VOC	PM	VOC
Incineration	650 m^3/min[a] 50,000,000 BTU/hr	0.5-23 g/m^3	0.1-500 ug/m^3	34-110 mg/m^3	-
Air Stripping	3500 L/min	0	5-50 kg/day[b]	0	50-100 ppm[c]
In-situ Ventilation	0.15-0.85 m^3/min[d]	0	1-110 kg/day	0	50-100 ppm[c]
Excavation					
Backhoe	900 m^3/day	0.002-0.22 kg/ metric ton	-	-[e]	-
Dragline	700 m^3/day	-	-	-	-
Scraper	340-610 m^3/day	-	-	-	-
Bulldozer	1100 m^3/day				-
Grading	-	0.03-5.4 kg/hr	-	-[e]	-
Transport					
Unpaved Roads	5 trucks/hr	1.3 kg/VKT	-	-[e]	-
Paved Roads	5 trucks/hr	0.022-0.15 kg/ VKT	-	-[e]	-
Dumping	24-270 m^3/day	0.005-0.16 kg/ metric ton	-	-[e]	-
Storage	-	0.39-1.5 g/m^2/ day	-	-[e]	-
Stabilization	-	0.31-0.41 kg/ metric ton	-	-[e]	-

[a] Exhaust gas rate.
[b] Assume 1-10 mg/L pollutant.
[c] 95-99% efficiency for gas streams of 1000-10,000 ppm VO. Multiple treatment units may feed a single control system.
[d] Exhaust gas rate per recovery well.
[e] Assume control efficiency of 50%.
Note: "-" implies insufficient data to generate typical value.

74 *

I probably used midpoint of this range LB

TABLE 3
Estimated On-Site Particulate Emission for Sparks and Buttercup Landfill

Activities	Equipment	Estimated Duration (days)	* Estimated Emission Factor	Units	Source Area (cm2)	Conversion Factors	Uncontrolled Emission Rates (gm/sec-cm2)	Potential Control Technology	* %Efficiency	Controlled Emission Rates (g/sec-cm2)	** Uncontrolled Particulate Concentration (ug/m3)	Controlled Particulate Concentration (ug/m3)
Excavation	Bulldozer	2	0.8632	kg/hr	1.01E+08	1 hour/3600 sec/ 1000 g/1 kg/ 1.01E+8 cm2	2.37E-09	Water	42	1.38E-09	1.07E+02	6.18E+01
Grading	Grader	2	2.7	kg/hr	1.01E+08	1 hour/3600 sec/ 1000 g/1 kg/ 1.01E+8 cm2	7.43E-09	Water	50	3.71E-09	3.33E+02	1.67E+02

* U.S. EPA, 1989. Air/Superfund National Technical Guidance Study Series. Volume III- Estimation of Air Emissions from Cleanup Activities at Superfund Sites. Interim Final. Office of Air Quality Planning and Standards. EPA-450/1-89-003

** CA EPA, 7/29/93. Preliminary Endangerment Assessment Guidance Manual. Draft. Department of Toxic Substances Control

TABLE 4.1
On–Site Air Concentration of Chemicals from the Sparks and Buttercup Landfill
For Excavating Activities

	* Controlled	* Uncontrolled	** Weight Fraction of
Total Particulate Concentration (ug/m3)	6.18E+01	1.07E+02	Chemical in Soil
Chemical (Metals)			
Antimony	1.88E–04	3.25E–04	3.04E–06
Arsenic	2.22E–03	3.84E–03	3.59E–05
Barium	1.27E–02	2.20E–02	2.06E–04
Beryllium	3.81E–05	6.59E–05	6.16E–07
Cadmium	2.01E–04	3.48E–04	3.25E–06
Total Chromium	2.69E–03	4.66E–03	4.36E–05
Copper	3.06E–02	5.30E–02	4.95E–04
Lead	7.15E–02	1.24E–01	1.16E–03
Mercury	7.73E–06	1.34E–05	1.25E–07
Nickel	2.35E–03	4.07E–03	3.80E–05
Silver	7.35E–05	1.27E–04	1.19E–06
Zinc	9.17E–02	1.59E–01	1.48E–03

* Controlled and uncontrolled emissions are calculated by multiplying the weight fraction by the total particulate concentrations of controlled and uncontrolled. Derivation of controlled and uncontrolled emission factors are shown in Table 3

** Concentrations are averaged and then expressed as weight fractions

TABLE 4.2
On–Site Air Concentration of Chemicals from the Sparks and Buttercup Landfill
For Grading Activities

Total Particulate Concentration (ug/m3)	* Controlled 1.67E+02	* Uncontrolled 3.33E+02	** Weight Fraction of Chemical in Soil
Chemical			
Antimony	5.08E–04	1.01E–03	3.04E–06
Arsenic	6.00E–03	1.20E–02	3.59E–05
Barium	3.43E–02	6.85E–02	2.06E–04
Beryllium	1.03E–04	2.05E–04	6.16E–07
Cadmium	5.43E–04	1.08E–03	3.25E–06
Total Chromium	7.28E–03	1.45E–02	4.36E–05
Copper	8.27E–02	1.65E–01	4.95E–04
Lead	1.93E–01	3.85E–01	1.16E–03
Mercury	2.09E–05	4.16E–05	1.25E–07
Nickel	6.35E–03	1.27E–02	3.80E–05
Silver	1.99E–04	3.96E–04	1.19E–06
Zinc	2.48E–01	4.94E–01	1.48E–03

* Controlled and uncontrolled emissions are calculated by multiplying the weight fraction by the total particulate concentrations of controlled and uncontrolled. Derivation of controlled and uncontrolled emission factors are shown in Table 3

** Concentrations are averaged and then expressed as weight fractions

TABLE 5.1
On–Site Air Concentration of Chemicals from the Sparks and Buttercup Landfill
For Excavating Activities

	* Controlled	* Uncontrolled	** Weight Fraction of
Total Particulate Concentration (ug/m3)	6.18E+01	1.07E+02	Chemical in Soil
Semi–Volatiles			
Di–n–Butylphthalate	1.09E–04	1.88E–04	1.76E–06
Butylbenzylphtalate	7.74E–06	1.34E–05	1.25E–07
Bis (2–ethylhexyl) phthalate	1.01E–05	1.75E–05	1.64E–07
Sulfur S7	6.86E–07	1.19E–06	1.11E–08
Sulfur S8	9.61E–06	1.66E–05	1.56E–07
2–Hexanol, 2–Methyl	2.13E–05	3.69E–05	3.44E–07
Propanoic Acid	2.53E–06	4.39E–06	4.10E–08
Pesticides			
4,4 – DDE	1.74E–07	3.02E–07	2.82E–09
4,4 – DDT	3.87E–07	6.70E–07	6.26E–09

* Controlled and uncontrolled emissions are calculated by multiplying the weight fraction by the total particulate concentrations of controlled and uncontrolled. Derivation of controlled and uncontrolled emission factors are shown in Table 3

** Concentrations are averaged and then expressed as weight fractions

TABLE 5.2
On–Site Air Concentration of Chemicals from the Sparks and Buttercup Landfill
For Grading Activities

	* Controlled	* Uncontrolled	** Weight Fraction of
Total Particulate Concentration (ug/m3)	1.67E+02	3.33E+02	Chemical in Soil
Semi–Volatiles			
Di–n–Butylphthalate	2.94E–04	5.86E–04	1.76E–06
Butylbenzylphtalate	2.09E–05	4.17E–05	1.25E–07
Bis (2–ethylhexyl) phthalate	2.73E–05	5.45E–05	1.64E–07
Sulfur S7	1.85E–06	3.70E–06	1.11E–08
Sulfur S8	2.60E–05	5.18E–05	1.56E–07
2–Hexanol, 2–Methyl	5.75E–05	1.15E–04	3.44E–07
Propanoic Acid	6.85E–06	1.37E–05	4.10E–08
Pesticides			
4,4 – DDE	4.71E–07	9.39E–07	2.82E–09
4,4 – DDT	1.05E–06	2.08E–06	6.26E–09

* Controlled and uncontrolled emissions are calculated by multiplying the weight fraction by the total particulate concentrations of controlled and uncontrolled. Derivation of controlled and uncontrolled emission factors are shown in Table 3

** Concentrations are averaged and then expressed as weight fractions

TABLE 6.1
Off–Site Air Concentration of Chemicals from the Sparks and Buttercup Landfill For Excavating Activities

	* Conversion Factor	** Max 1–hr Conc. (ug/m3)	*** Annual Conc. (ug/m3)	Weight Fraction of Chemical in Soil
	0.07	125.30	8.77	
	Metals			
	Antimony		2.67E–05	3.04E–06
X	Arsenic		3.15E–04	3.59E–05
	Barium		1.80E–03	2.06E–04
	Beryllium		5.40E–06	6.16E–07
	Cadmium		2.85E–05	3.25E–06
X	Total Chromium		3.82E–04	4.36E–05
	Copper		4.34E–03	4.95E–04
X	Lead		1.01E–02	1.16E–03
	Mercury		1.10E–06	1.25E–07
	Nickel		3.34E–04	3.80E–05
	Silver		1.04E–05	1.19E–06
	Zinc		1.30E–02	1.48E–03

* Conversion factor for max 1–hour to annual

** Max 1–hour concentration was obtained from SCREEN2 Modeling results (conservative assumption, used max value from SCREEN2 results)

*** Annual concentration was calculated by multiplying the conversion factor by the max 1–hr concentration

TABLE 6.2
Off-Site Air Concentration of Chemicals from the Sparks and Buttercup Landfill For Grading Activities

	* Conversion Factor	** Max 1-hr Conc. (ug/m3)	*** Annual Conc. (ug/m3)	Weight Fraction of Chemical in Soil
	0.07	336.70	23.57	
Metals				
Antimony			7.17E-05	3.04E-06
Arsenic			8.46E-04	3.59E-05
Barium			4.85E-03	2.06E-04
Beryllium			1.45E-05	6.16E-07
Cadmium			7.66E-05	3.25E-06
Total Chromium			1.03E-03	4.36E-05
Copper			1.17E-02	4.95E-04
Lead			2.73E-02	1.16E-03
Mercury			2.95E-06	1.25E-07
Nickel			8.96E-04	3.80E-05
Silver			2.80E-05	1.19E-06
Zinc			3.50E-02	1.48E-03

* Conversion factor for max 1-hour to annual

** Max 1-hour concentration was obtained from SCREEN2 Modeling results
(conservative assumption, used max value from SCREEN2 results)

*** Annual concentration was calculated by multiplying the conversion factor by the max 1-hr concentration

TABLE 6.3
Off–Site Air Concentration of Chemicals from the Sparks and Buttercup Landfill
For Excavating Activities

	* Conversion Factor	** Max 1–hr Conc. (ug/m3)	*** Annual Conc. (ug/m3)	Weight Fraction of Chemical in Soil
	0.07	125.30	8.77	
Semi–Volatiles				
Di–n–Butylphthalate			1.54E–05	1.76E–06
Butylbenzylphtalate			1.10E–06	1.25E–07
Bis (2–ethylhexyl) phthalate			1.43E–06	1.64E–07
Sulfur S7			9.73E–08	1.11E–08
Sulfur S8			1.36E–06	1.56E–07
2–Hexanol, 2–Methyl			3.02E–06	3.44E–07
Propanoic Acid			3.60E–07	4.10E–08
Pesticides				
4,4 – DDE			2.47E–08	2.82E–09
4,4 – DDT			5.49E–08	6.26E–09

* Conversion factor for max 1–hour to annual

** Max 1–hour concentration was obtained from SCREEN2 Modeling results
(conservative assumption, used max value from SCREEN2 results)

*** Annual concentration was calculated by multiplying the conversion factor by the max 1–hr concentration

TABLE 6.4
Off–Site Air Concentration of Chemicals from the Sparks and Buttercup Landfill For Grading Activities

	* Conversion Factor	** Max 1–hr Conc. (ug/m3)	*** Annual Conc. (ug/m3)	Weight Fraction of Chemical in Soil
	0.07	336.70	23.57	
Semi–Volatiles				
Di–n–Butylphthalate			4.15E–05	1.76E–06
Butylbenzylphtalate			2.95E–06	1.25E–07
Bis (2–ethylhexyl) phthalate			3.86E–06	1.64E–07
Sulfur S7			2.62E–07	1.11E–08
Sulfur S8			3.67E–06	1.56E–07
2–Hexanol, 2–Methyl			8.12E–06	3.44E–07
Propanoic Acid			9.66E–07	4.10E–08
Pesticides				
4,4 – DDE			6.65E–08	2.82E–09
4,4 – DDT			1.48E–07	6.26E–09

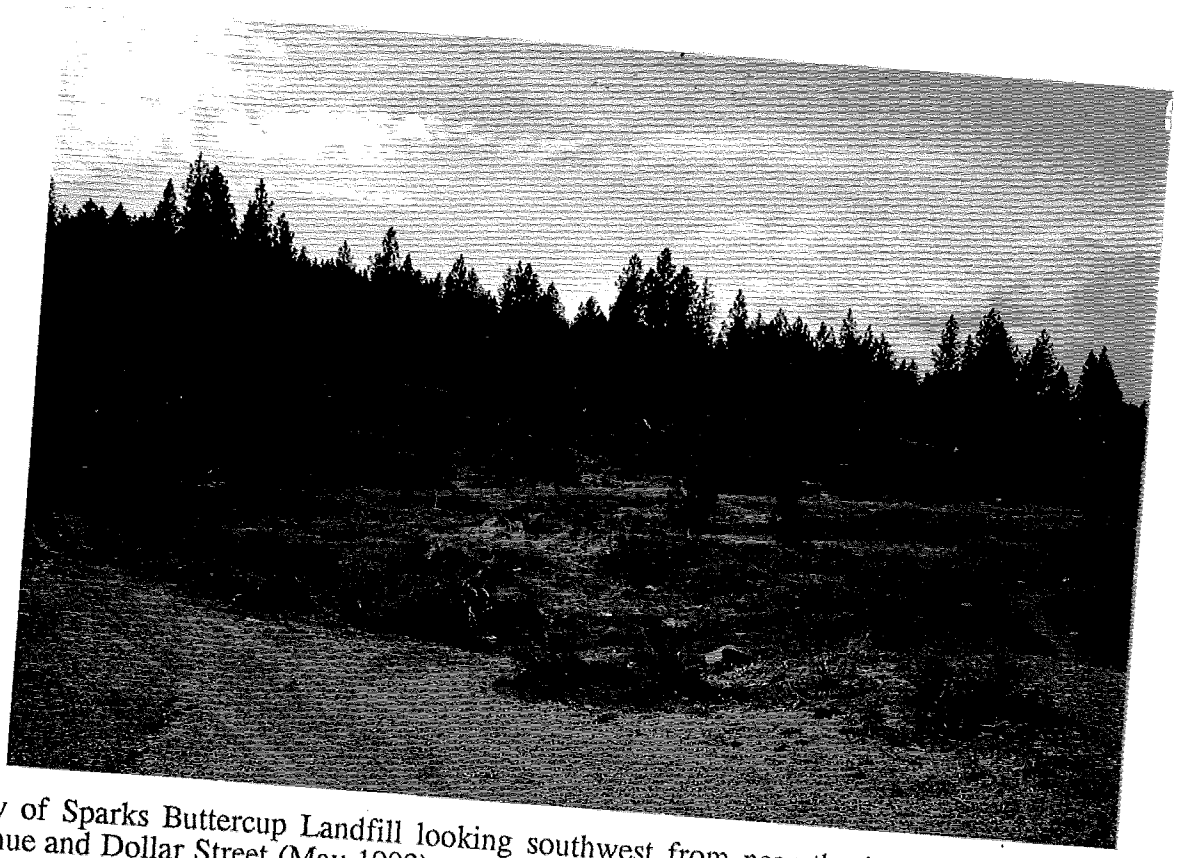
* Conversion factor for max 1–hour to annual

** Max 1–hour concentration was obtained from SCREEN2 Modeling results
(conservative assumption, used max value from SCREEN2 results)

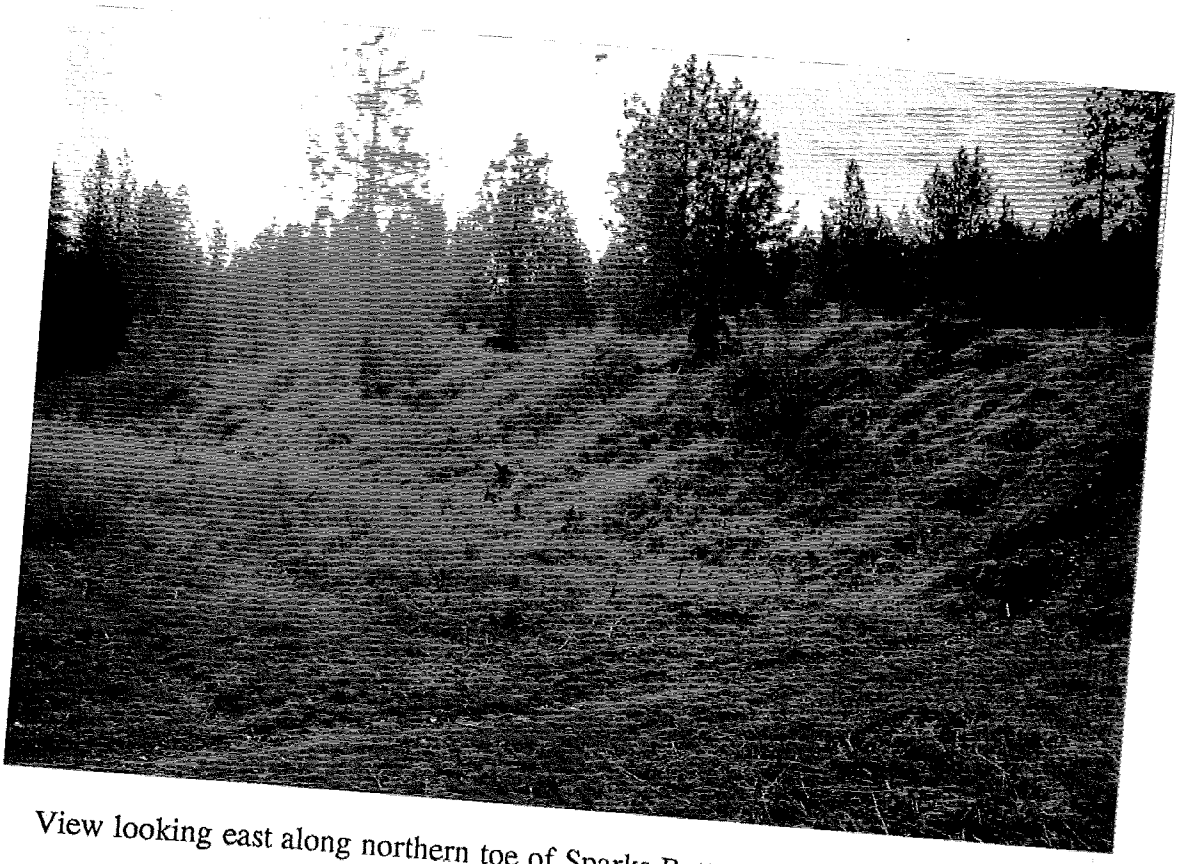
*** Annual concentration was calculated by multiplying the conversion factor by the max 1–hr concentration

APPENDIX F

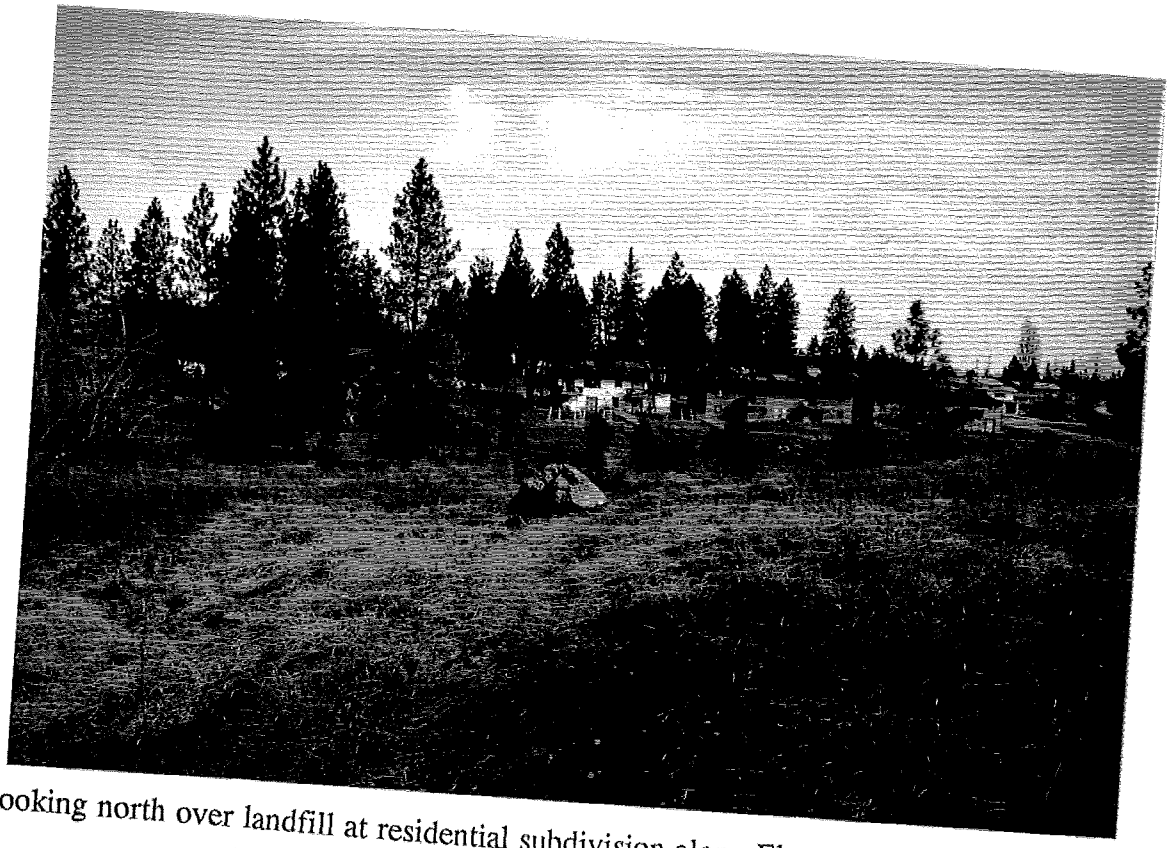
Construction Photographs



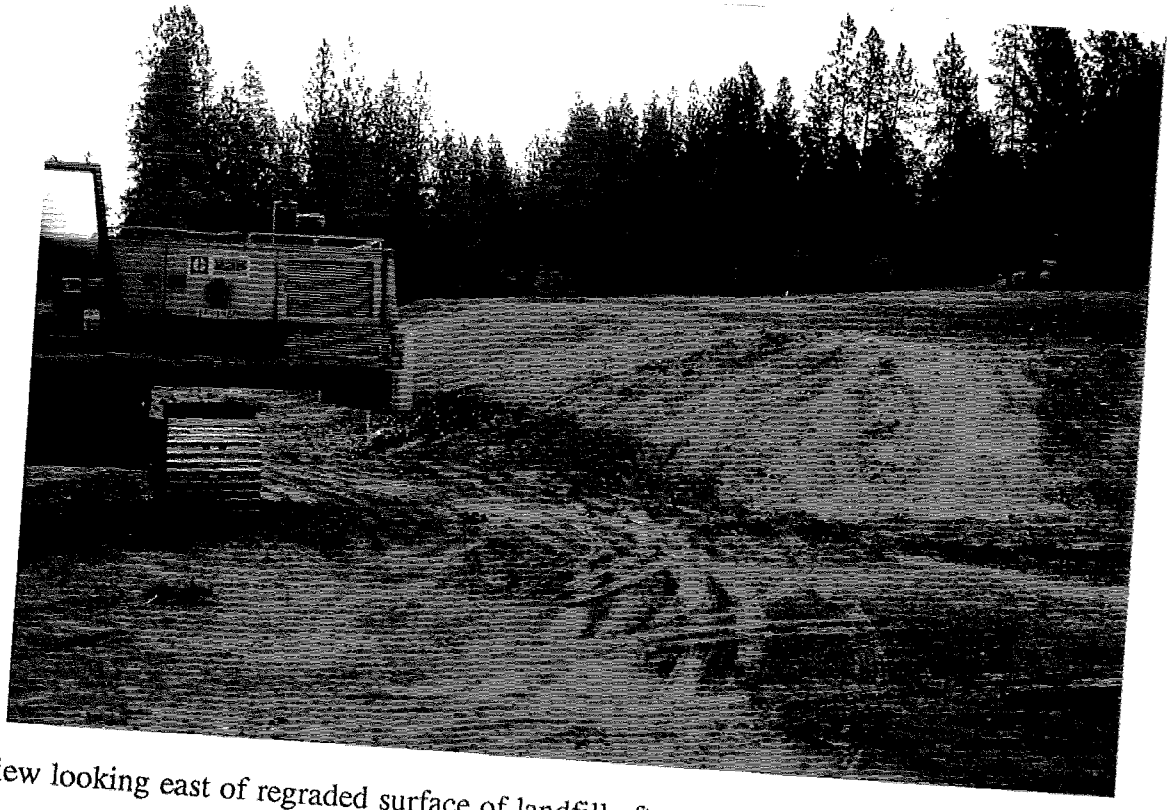
View of Sparks Buttercup Landfill looking southwest from near the intersection of Eleventh Avenue and Dollar Street (May 1993).



View looking east along northern toe of Sparks Buttercup Landfill (May 1993).



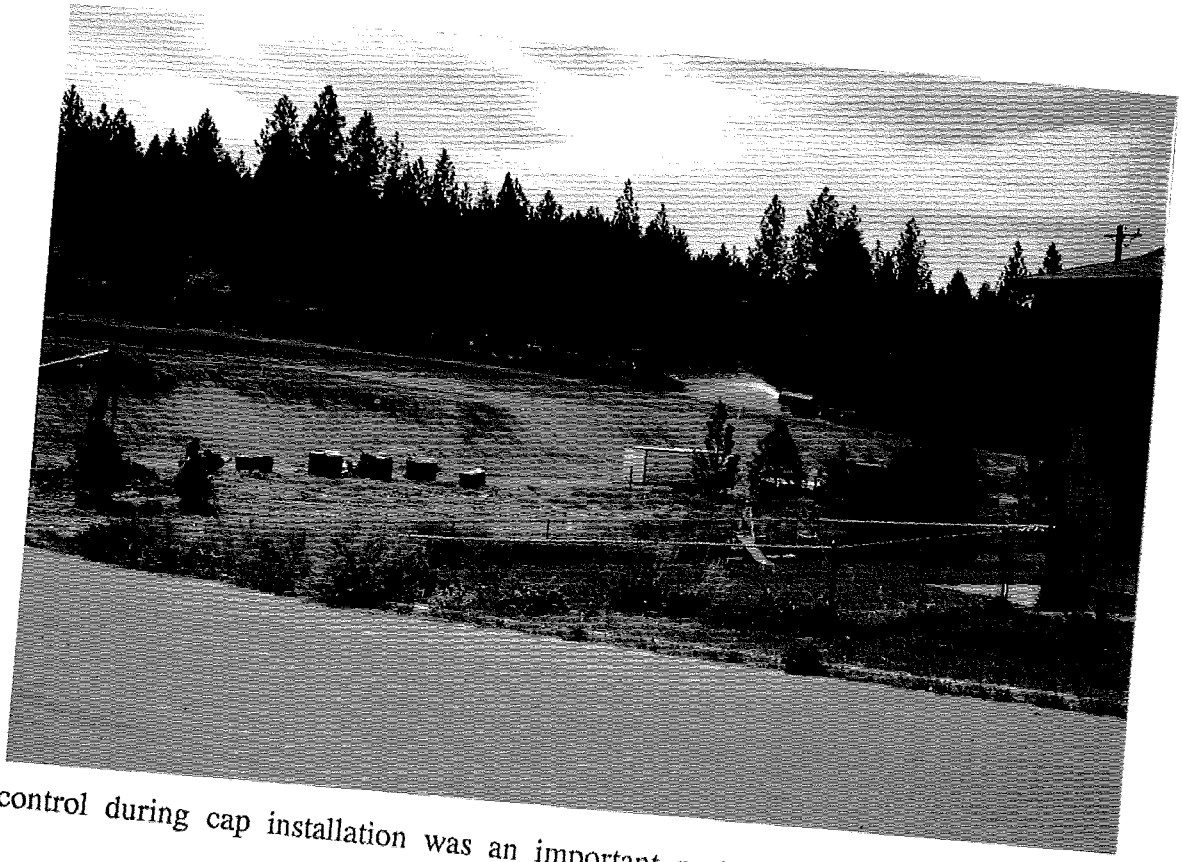
Looking north over landfill at residential subdivision along Eleventh Avenue (May 1993).



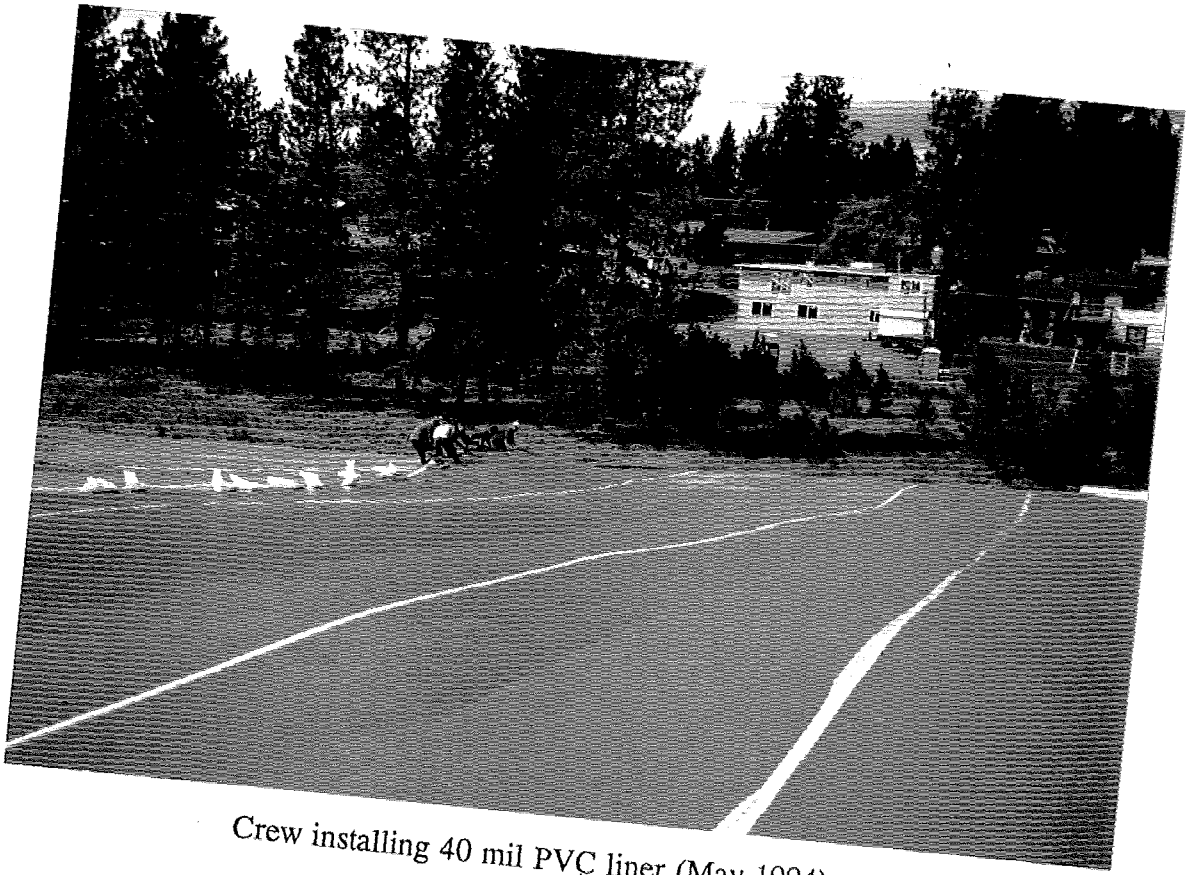
View looking east of regraded surface of landfill after removing vegetation (May 1994).

Placement of foundation layer fill material over regraded landfill surface (May 1994).

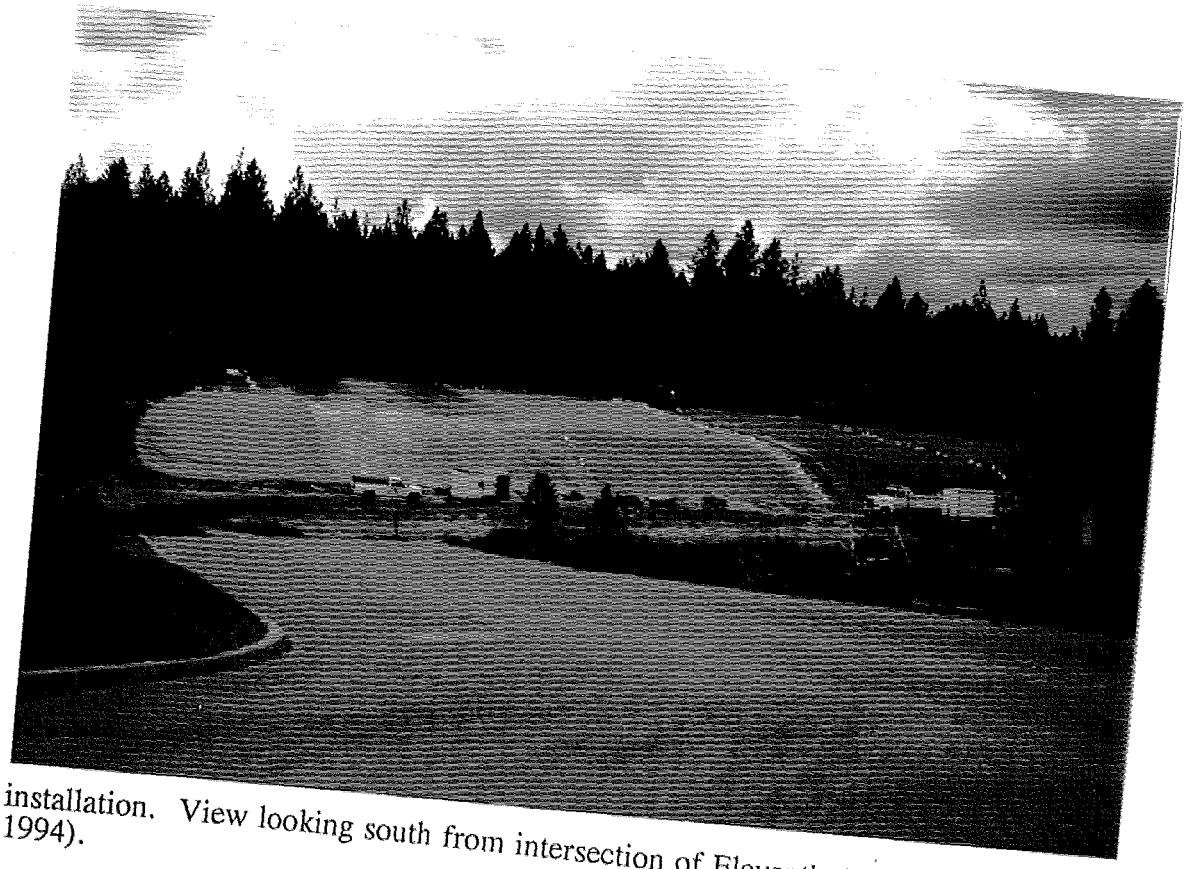
Grading of foundation layer fill material and construction of anchor trench for geomembrane liner (May 1994).



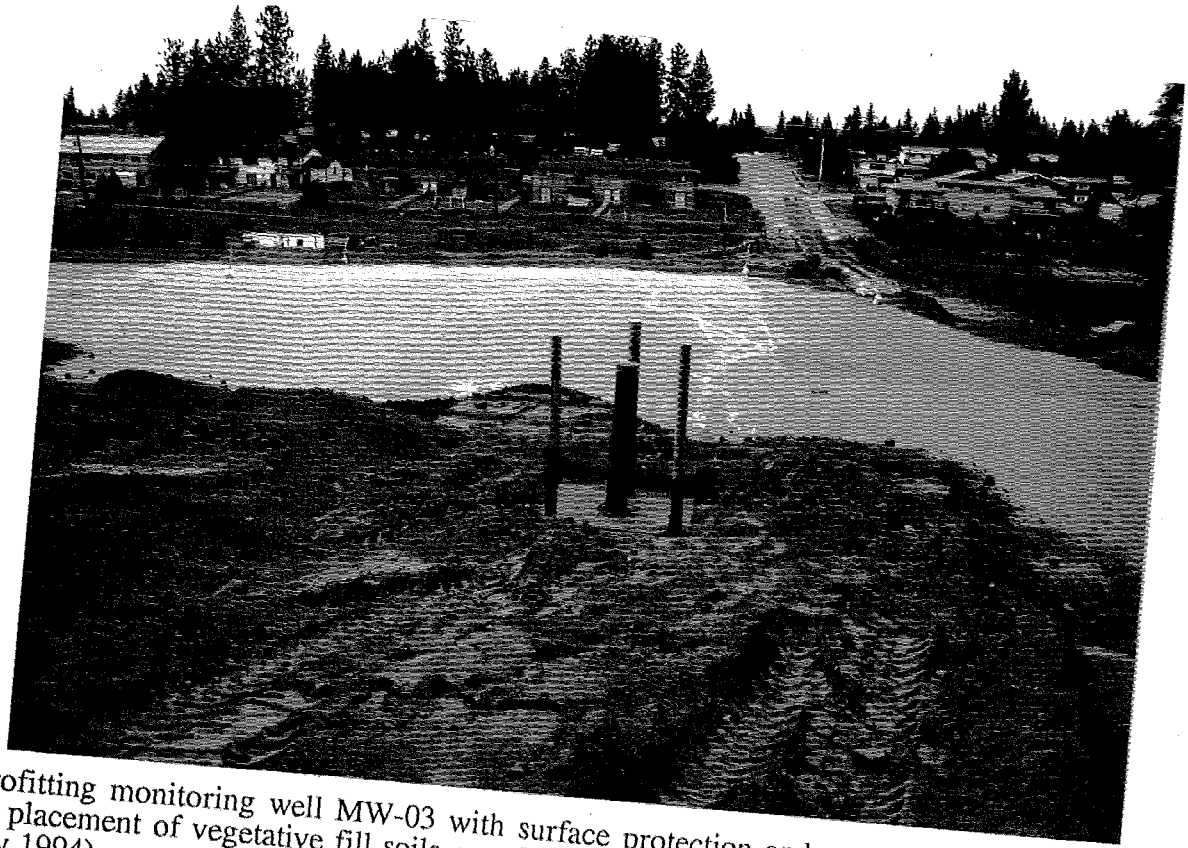
Dust control during cap installation was an important part of construction activities (May 1994).



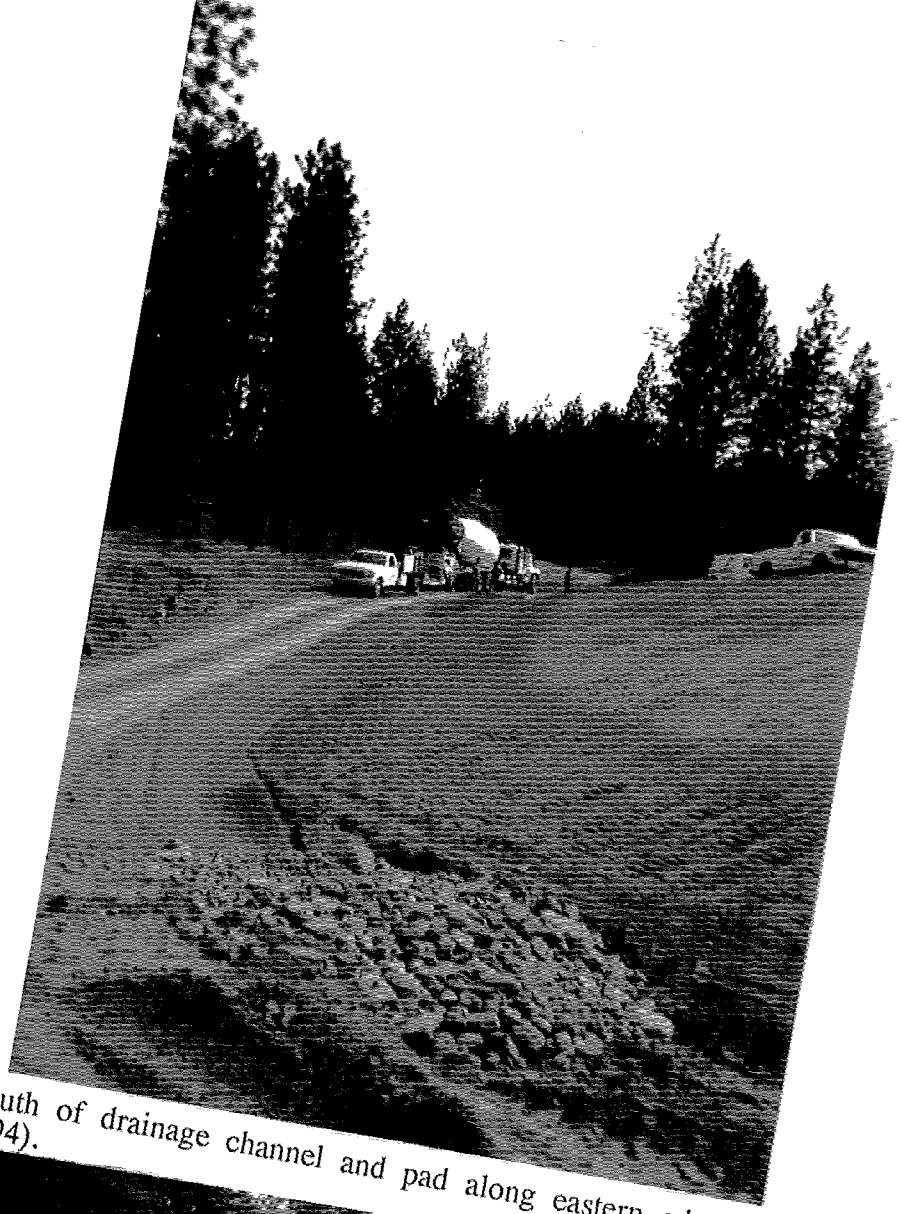
Crew installing 40 mil PVC liner (May 1994).



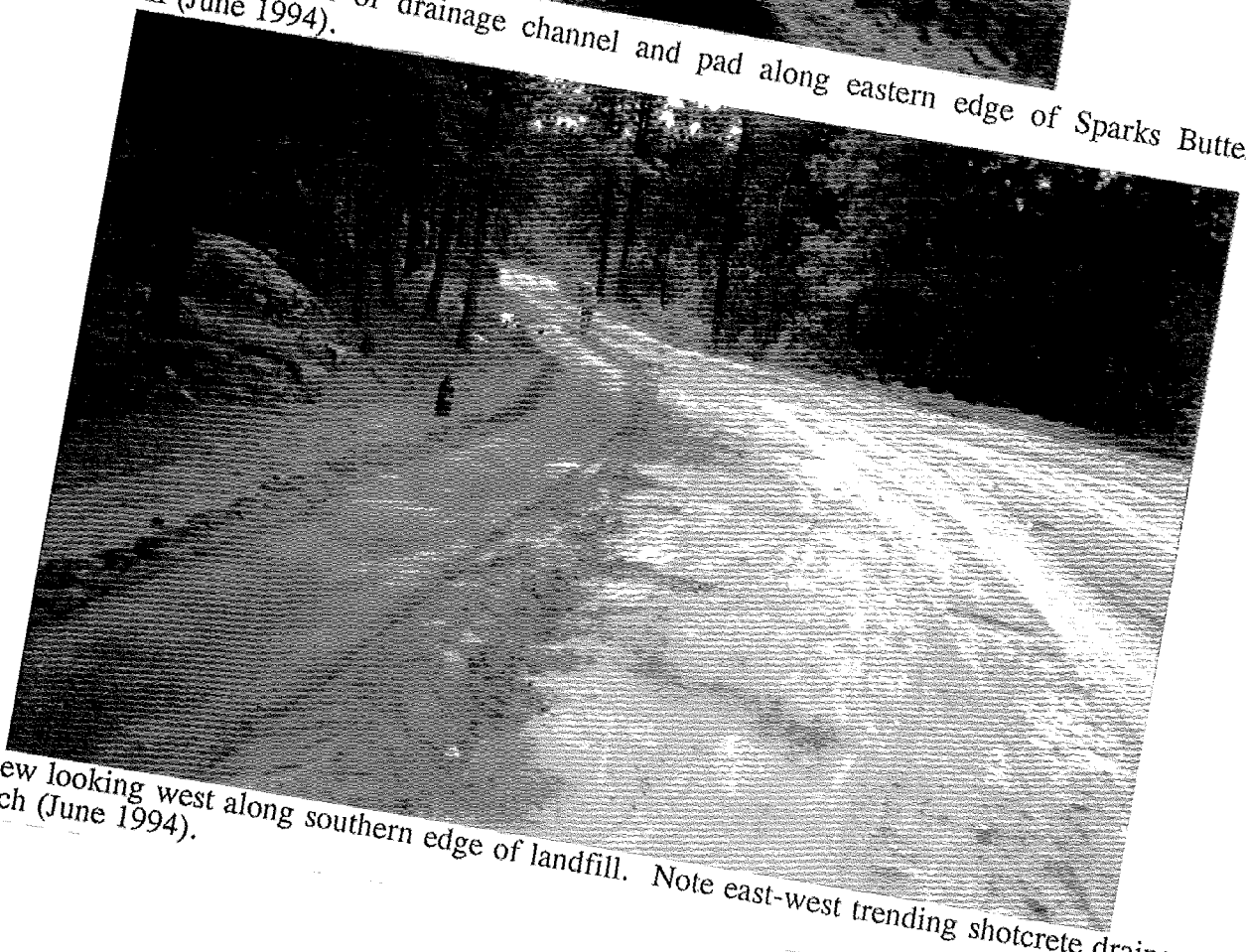
Liner installation. View looking south from intersection of Eleventh Avenue and Dollar Street (May 1994).



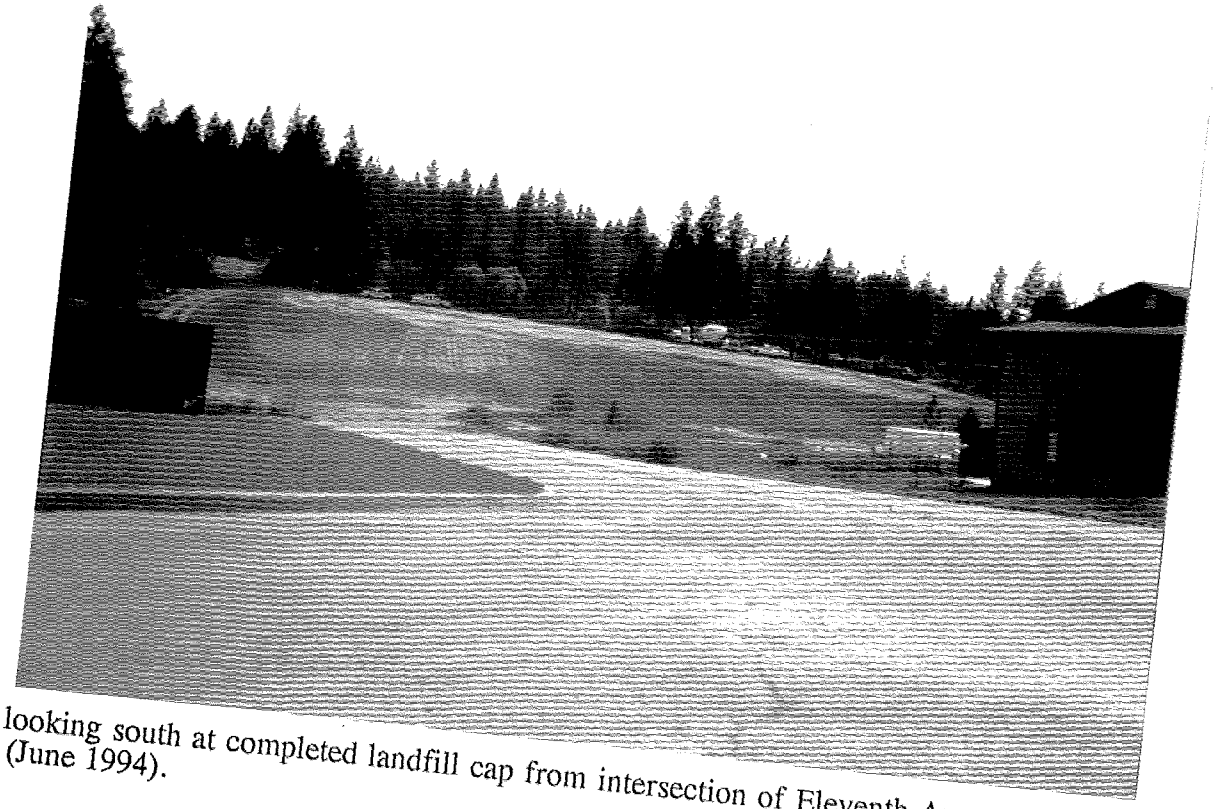
Retrofitting monitoring well MW-03 with surface protection and monument extension. Also note placement of vegetative fill soils over liner. View looking north from surface of landfill (May 1994).



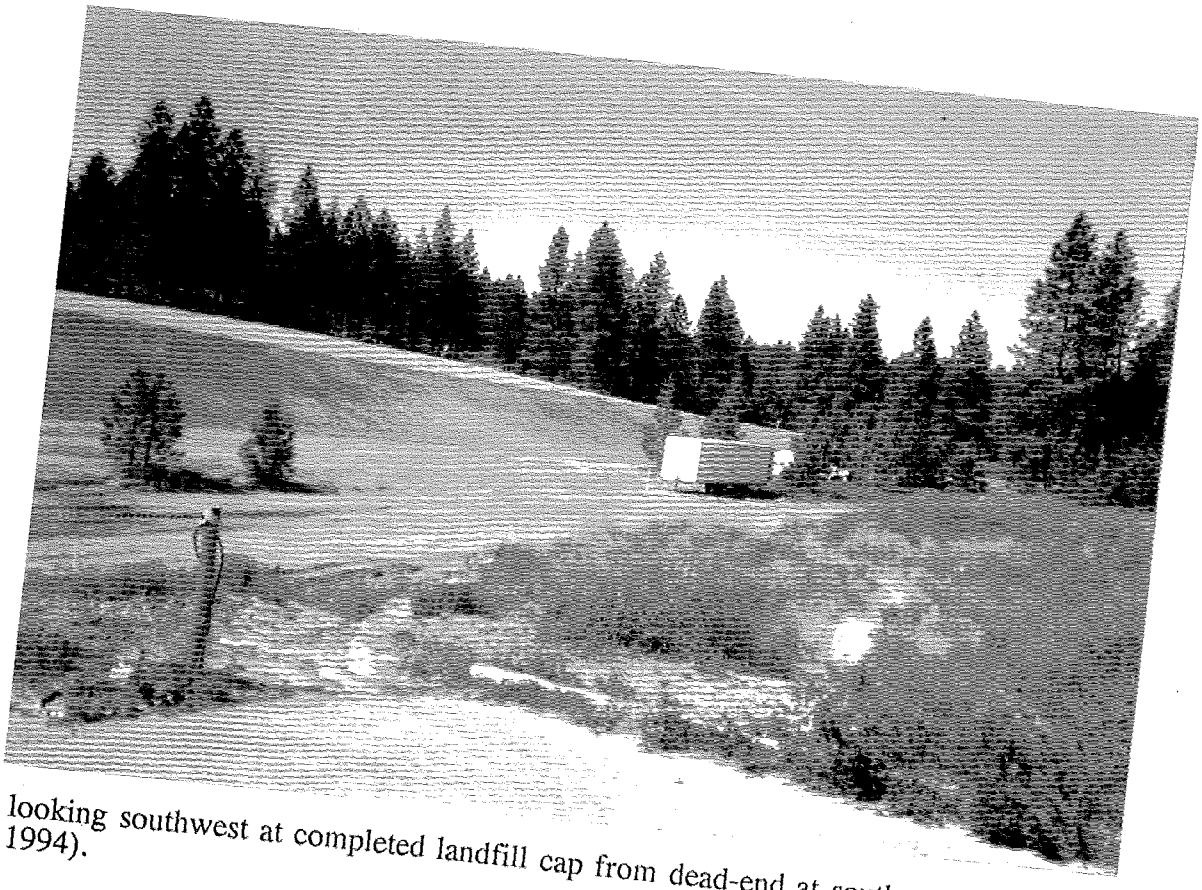
View looking south of drainage channel and pad along eastern edge of Sparks Buttercup Landfill (June 1994).



View looking west along southern edge of landfill. Note east-west trending shotcrete drainage ditch (June 1994).



View looking south at completed landfill cap from intersection of Eleventh Avenue and Dollar Street (June 1994).



View looking southwest at completed landfill cap from dead-end at south end of Dollar Street (June 1994).

APPENDIX G

Construction Report

KLEINFELDER INC.

CONSTRUCTION REPORT
INDEPENDENT REMEDIAL ACTION
SPARKS AND BUTTERCUP LANDFILL
EASTERN STREET AND 12th AVENUE
SPOKANE, WASHINGTON

A Report Prepared For:

Ms. Elizabeth C. Hengeveld
Special Assets Group
U.S. National Bank of Oregon
111 S.W. Fifth Avenue, Suite 850
Portland, Oregon 97208

CONSTRUCTION REPORT
INDEPENDENT REMEDIAL ACTION
SPARKS AND BUTTERCUP LANDFILL
EASTERN STREET AND 12th AVENUE
SPOKANE, WASHINGTON

Kleinfelder Project Number 60-5035-03

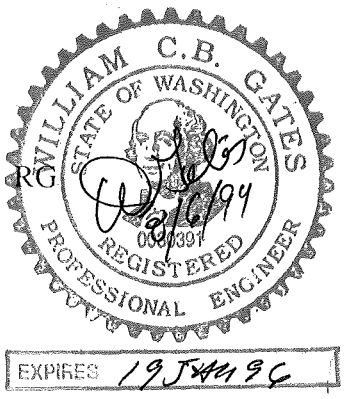
Prepared By:

James A. Sprott
Assistant Engineer

R. Scott Wallace, RG
Project Manager

Reviewed By:

William C.B. Gates, PhD, PE, RG
Senior Engineer



KLEINFELDER, INC.
15050 S.W. Koll Parkway, Suite L
Beaverton, Oregon 97006
Phone: (503) 644-9447

July 29, 1994

TABLE OF CONTENTS

1.0 SUMMARY

This report contains documentation on construction activities performed as part of an independent remedial action at the Sparks and Buttercup Landfill site in Spokane, Washington.

The landfill portion of the site occupies 2.4 acres. The purpose of the independent remedial action was two fold: Cover the landfill debris with an impermeable barrier that would be protective of human health and the environment; and convert the capped landfill to park/green space.

Kleinfelder's landfill engineering and design group in Sacramento, California was responsible for cap design, and preparation of project plans and specifications. Mr. Tim Crandall, P.E, and Mr. Mark Wicklein, P.E., were the project design engineers. Dr. William Gates, PhD., P.E., R.G., provided engineering design review. Construction quality assurance (CQA) personnel were also provided by Kleinfelder, Inc. Mr. Jim Sprott was the on-site CQA monitor over the duration of construction activities. Mr. Scott Wallace, R.G., was the project CQA officer. Motley Motley, Inc. of Pullman, Washington was the construction contractor for the project. Mr. Gerry Motley was the contractor's representative. Champion Concrete Pumping, Inc. of Spokane, Washington was the subcontractor retained by Motley Motley, Inc.for construction of the drainage channels. Mr. David M. Bertsch was the representative for Champion Concrete Pumping, Inc. Hahn Engineering of Spokane, Washington was retained by Motley Motley, Inc. to provide surveying services. Mr. Randell Hahn, R.L.S., P.E., was the representative for Hahn Engineering.

Field inspections and observations were performed by the CQA monitor and officer, one of which was on-site at all times over the duration of construction activities.

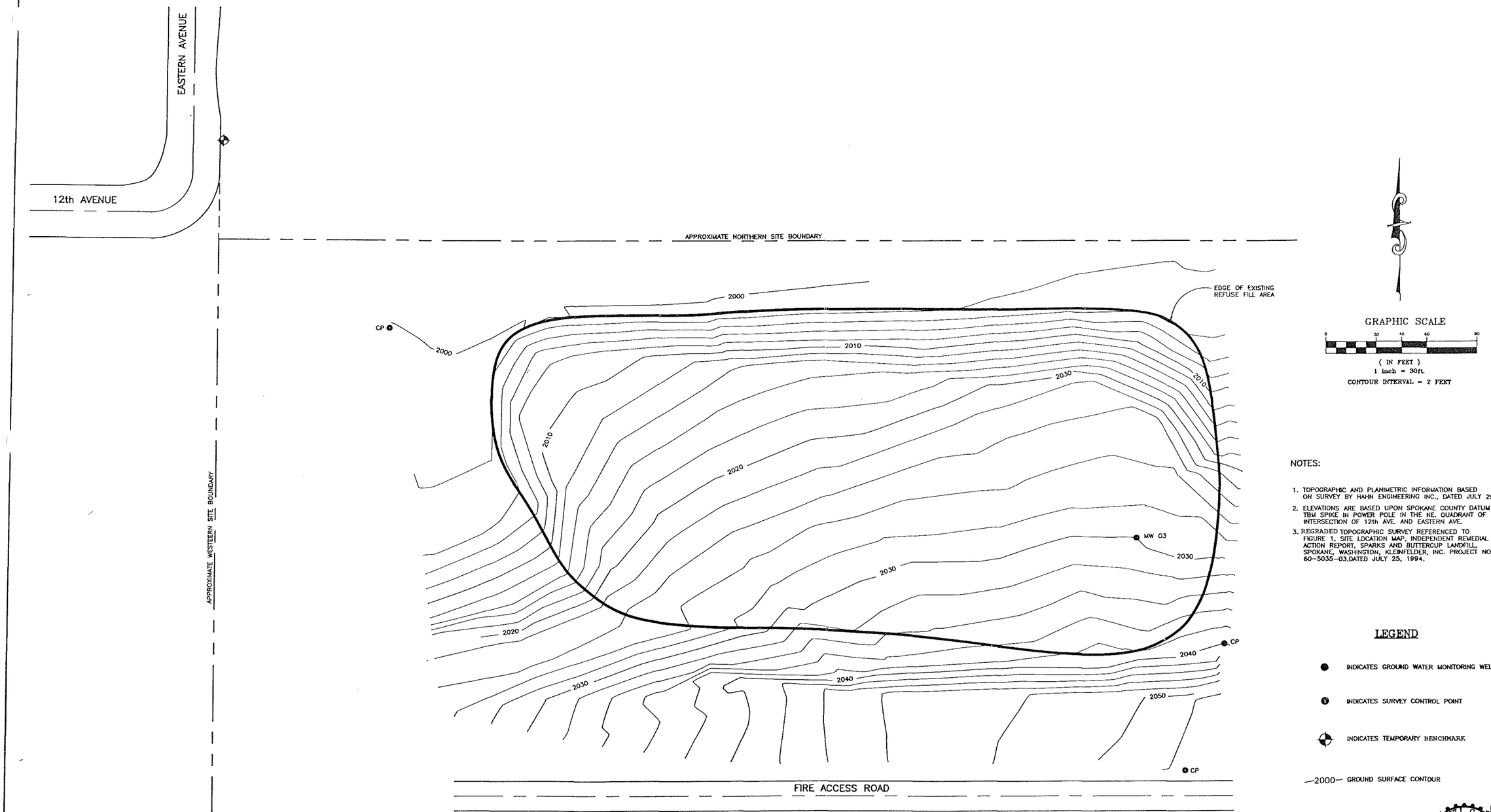
Weather conditions were generally favorable over the course of construction activities, however a one day delay was required during geomembrane installation due to rainfall.

Based upon survey data, field inspection reports, and material testing, 105,000 square feet of 40 mil PVC geomembrane were used in construction of the landfill cap. A total of 13,000 in-place cubic yards of fill material were used in construction of the foundation and vegetative layers. 610 linear feet of shotcrete drainage ditches were constructed. In addition, 30 linear feet of 8-inch outside diameter drainage culvert was installed beneath an access roadway in the southwestern corner of the landfill.

Based upon field observations and quality assurance testing, it is Kleinfelder's opinion that landfill cap construction was conducted in accordance with project plans, specifications, and approved addendums, and that the work was performed in accordance with the generally accepted standards of care that existed in the state of Washington at the time the work was performed.

KLEINFELDER, INC.

R. Scott Wallace, RG
CQA Officer/Project Manager



GRAPHIC SCALE

0 30 45 60 90

(IN FEET)
1 inch = 30ft.
CONTOUR INTERVAL = 2 FEET

NOTES:

1. TOPOGRAPHIC AND PLANIMETRIC INFORMATION BASED ON SURVEY BY HAHN ENGINEERING INC., DATED JULY 29, 1994
2. ELEVATIONS ARE BASED UPON SPOKANE COUNTY DATUM FROM TBM SPIKE IN POWER POLE IN THE NE. QUADRANT OF INTERSECTION OF 12th AVE. AND EASTERN AVE.
3. REGRADED TOPOGRAPHIC SURVEY REFERENCED TO FIGURE 1, SITE LOCATION MAP, INDEPENDENT REMEDIAL ACTION REPORT, SPARKS AND BUTTERCUP LANDFILL, SPOKANE, WASHINGTON, KLEINFELDER, INC. PROJECT NO. 60-5035-03,DATED JULY 25, 1994.

LEGEND

- INDICATES GROUND WATER MONITORING WELL
- INDICATES SURVEY CONTROL POINT
- INDICATES TEMPORARY BENCHMARK
- —2000— GROUND SURFACE CONTOUR

RANDALL G. HAHN — STATE OF WASHINGTON — 22847 — REGISTERED PROFESSIONAL ENGINEER

EXPIRES 12/15/94

REV	DESCRIPTION	BY	APP	DATE

REFERENCE DRAWINGS

HAHN ENGINEERING
NORTH 8623 B DIVISION
SPOKANE, WA. 99208
(509) 467-1550
FAX (509) 467-8189

SCALE:	1"=30'
DRAWN BY:	WRL
CHECKED BY:	RH
APPROVED BY:	RH
DATE	8/1/94

CLIENT
MOTLEY-MOTLEY, INC.
P.O. BOX 421
PULLMAN, WA. 99163

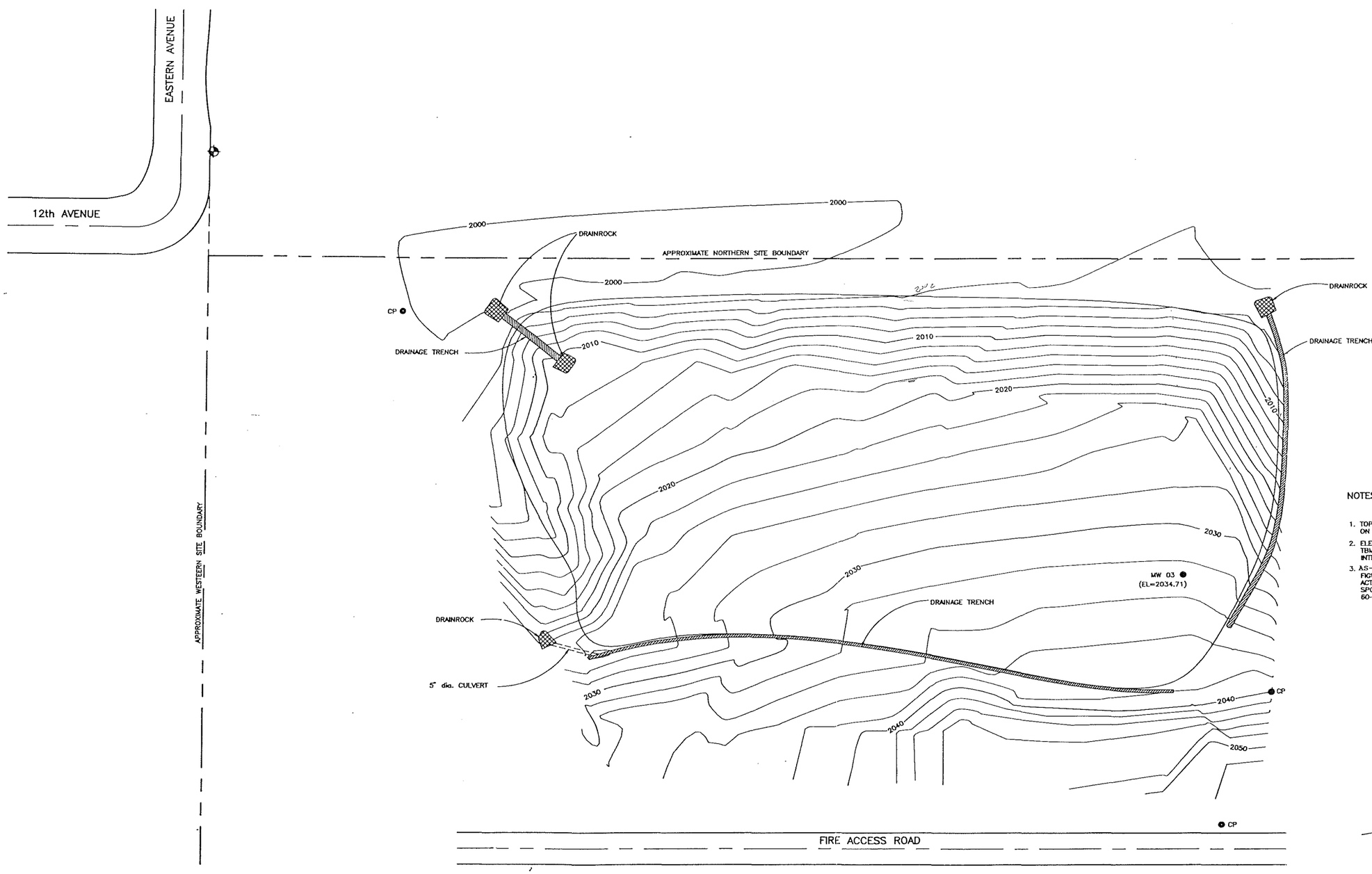
PRJ. NAME
SPARKS-BUTTERCUP LANDFILL

TITLE
REGRADED TOPOGRAPHIC SURVEY

SHEET NO.
1 OF 1

CAD FILE
LANDFILL.DWG

PLATE
1



GRAPHIC SCALE

0 30 45 60 90

(IN FEET)

1 inch = 30ft.

CONTOUR INTERVAL = 2 FEET

NOTES:

1. TOPOGRAPHIC AND PLANIMETRIC INFORMATION BASED ON SURVEY BY HAHN ENGINEERING INC., DATED JULY 29, 1994
2. ELEVATIONS ARE BASED UPON SPOKANE COUNTY DATUM FROM TBM SPIKE IN POWER POLE IN THE NE. QUADRANT OF INTERSECTION OF 12th AVE. AND EASTERN AVE.
3. AS-BUILT TOPOGRAPHIC SURVEY REFERENCED TO FIGURE 1, SITE LOCATION MAP, INDEPENDENT REMEDIAL ACTION REPORT, SPARKS AND BUTTERCUP LANDFILL, SPOKANE, WASHINGTON, KLEINFELDER, INC. PROJECT NO. 60-5035-03,DATED JULY 25, 1994.

LEGEND

- INDICATES GROUND WATER MONITORING WELL
- INDICATES SURVEY CONTROL POINT
- INDICATES TEMPORARY BENCHMARK
- —2000— GROUND SURFACE CONTOUR

RANDY L. C. HAHN — STATE OF WASHINGTON — 20847 — REGISTERED PROFESSIONAL ENGINEER

EXPIRES 12/15/94

REV	DESCRIPTION	BY	APP.	DATE

REFERENCE DRAWINGS

HAHN ENGINEERING
NORTH 8623 B DIVISION
SPOKANE, WA. 99208
(509) 467-1550
FAX (509) 467-8189

SCALE:	1"=30'
DRAWN BY:	SM
CHECKED BY:	RH
APPROVED BY:	RH
DATE	8\2\94

CLIENT
MOTLEY-MOTLEY
P.O. BOX 421
PULLMAN, WASHINGTON 99163

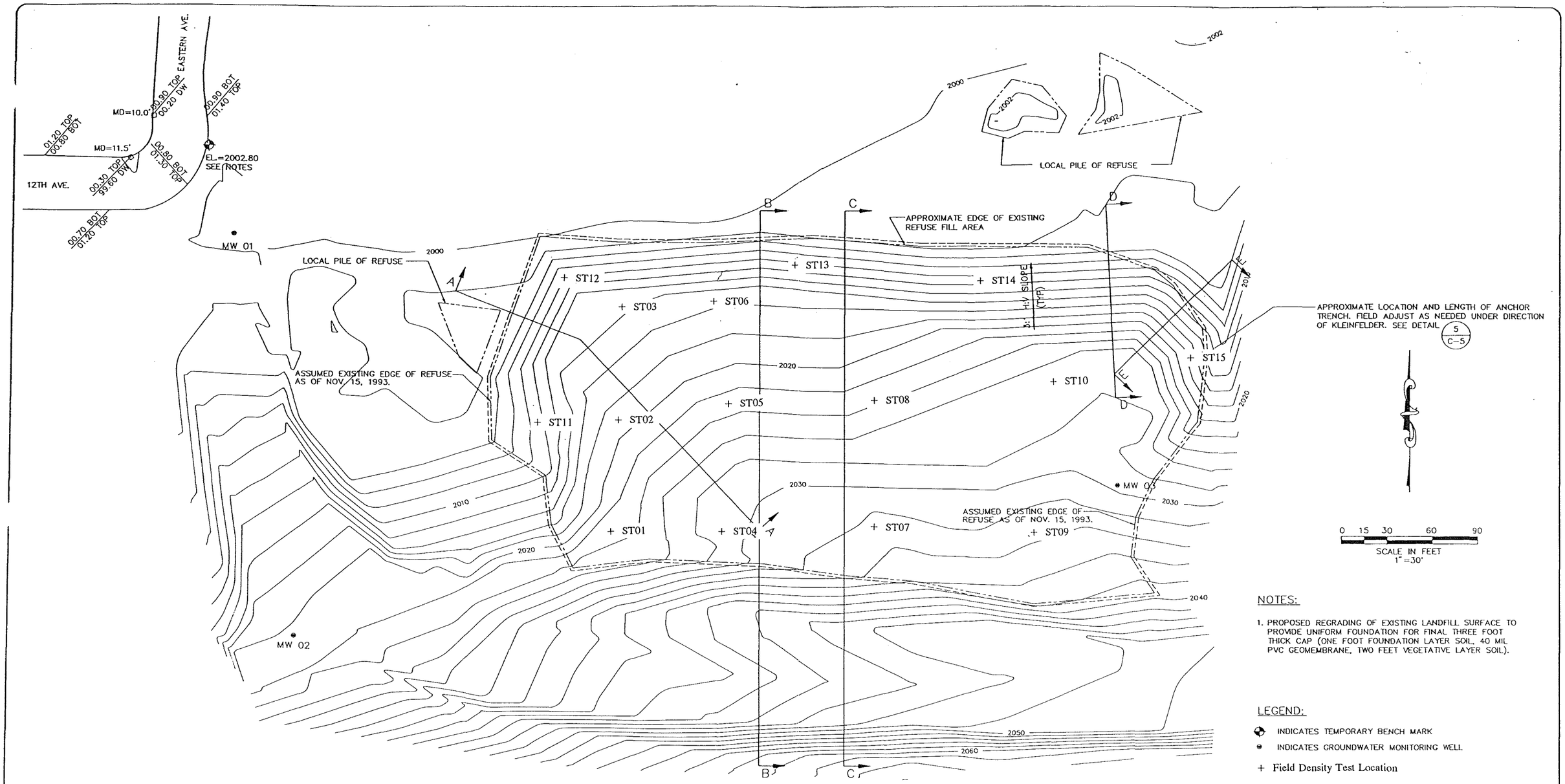
PRJ. NAME
SPARKS-BUTTERCUP LANDFILL

TITLE
AS-BUILT TOPOGRAPHIC SURVEY

SHEET NO.
1 OF 1

CAD FILE
MOTLEY

PLATE
2



NOTES:

1. PROPOSED REGRADING OF EXISTING LANDFILL SURFACE TO PROVIDE UNIFORM FOUNDATION FOR FINAL THREE FOOT THICK CAP (ONE FOOT FOUNDATION LAYER SOIL, 40 MIL PVC GEOMEMBRANE, TWO FEET VEGETATIVE LAYER SOIL).

LEGEND:

- INDICATES TEMPORARY BENCH MARK
- INDICATES GROUNDWATER MONITORING WELL
- \+ Field Density Test Location

REV.	DATE	DESCRIPTION	DWN.
0	12/01/93	INTERNAL REVIEW DRAFT	
1	12/16/93	FINAL	

APPROVED BY:

DATE

DESIGNED BY STEVE DURAN
DRAWN STEVE DURAN
CHECKED TIM CRANDALL
APPROVED SCOTT WALLACE
ENG. MGR.
DATE DEC 16, 1993

LOCATION
SPARKS - BUTTERCUP LANDFILL
Spokane, WA

KLEINFELDER
15050 S.W. Koll Parkway, Suite L
Beaverton, OR 97006
(503) 644-3447

DESCRIPTION

Field Density Test Locations
Sparks Buttercup Landfill
Spokane, Washington

PROJ. NO.	FILED AS	DRAWING NO.
60-503503-C01	SPARKC2	503503C2

Plate 3

SHEET 3 OF 6

APPENDIX A

Acceptance Reports

ACCEPTANCE REPORT
SPARKS AND BUTTERCUP LANDFILL
SPOKANE, WASHINGTON

Work Element: **Surface Grubbing and Regrading**

Date: May 9, 1994

CQA Officer: Scott Wallace, Kleinfelder

CQA officer met with field personnel from Motley Motley, Inc. to go over grubbing and regrading activities performed the week of May 2-6, 1994. Surface was cleared of vegetation and was uniform in appearance. Landfill surface topography appeared to meet the regraded contours outlined in the specifications. Had crew rework northern slope of landfill to reduce slope to approximately 3:1. Placement of foundation layer soils were authorized to begin on May 10, 1994.

ACCEPTANCE REPORT
SPARKS AND BUTTERCUP LANDFILL
SPOKANE, WASHINGTON

Work Element: **Foundation Layer**

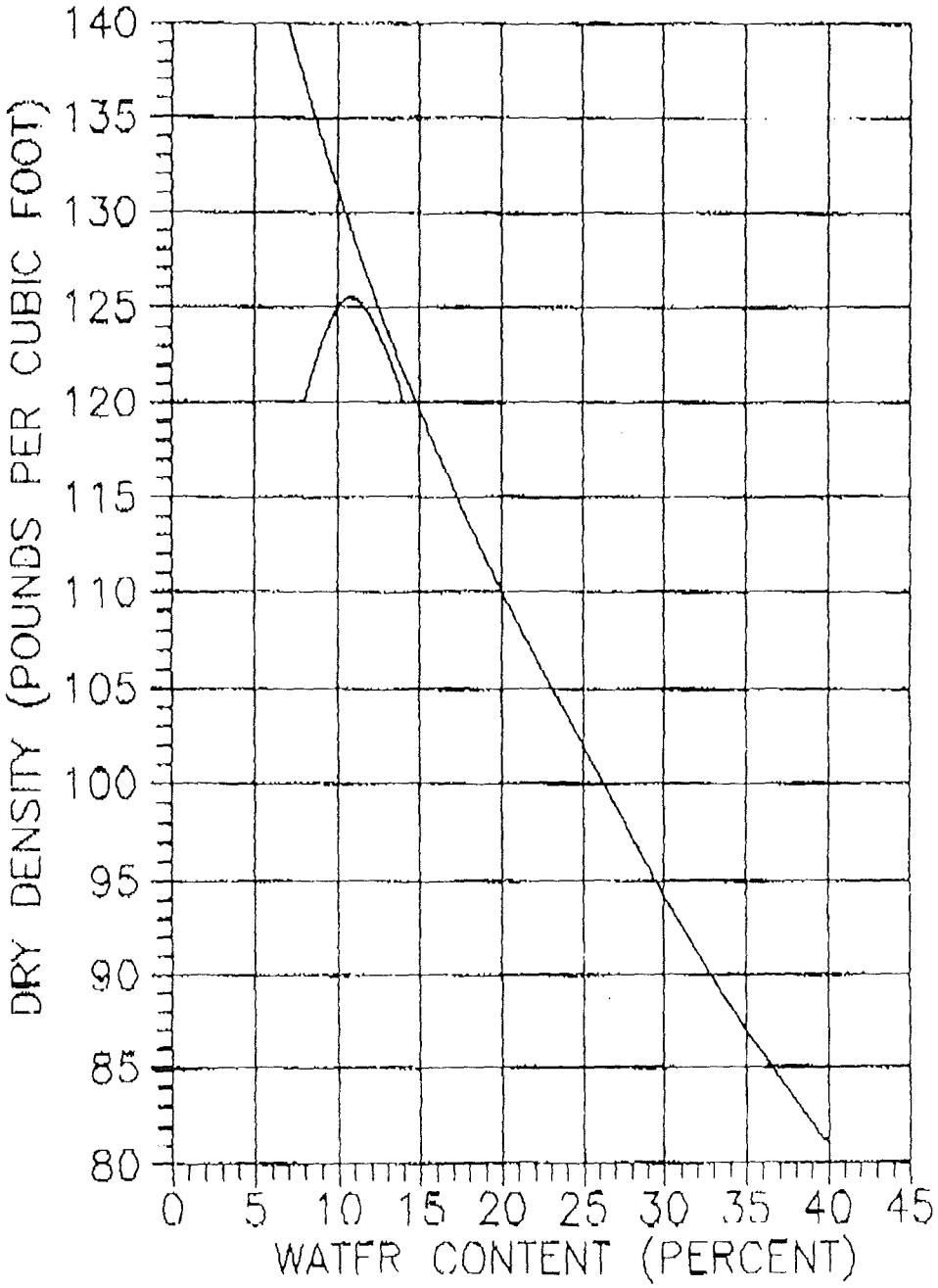
Date: May 13, 1994

CQA Officer: Scott Wallace, Kleinfelder

Foundation layer soils overlying landfill debris were placed in loose lifts using approved equipment as per project specifications. Minimum compacted thicknesses based on grade stake markers was one foot over the regraded landfill surface and one to two feet over the regraded 3:1 slopes on the landfill's north, east, and west sides. Field measurements and survey data indicate 4500 cubic yards of material was required to construct the foundation layer. Field density tests indicated that foundation layer soils were compacted to an average of 86.9% of their maximum dry density. Despite repeated efforts, average foundation layer soil compaction did not attain the project specification of 90% of maximum dry density. This deficientcy was attributed to density limitations imposed by the underlying landfill material itself. Kleinfelder project engineers and the CQA Officer evaluated the requirements for placement of the overlying geomembrane liner and vegetative layer soils, and ammended the project specification for compaction of foundation layer soils to 85% of maximum dry density. It was the opinion of Kleinfelder engineers that the level of foundation layer compaction achieved (86.9%) would provide a suitable base for overlying landfill cap materials and proposed future site use.

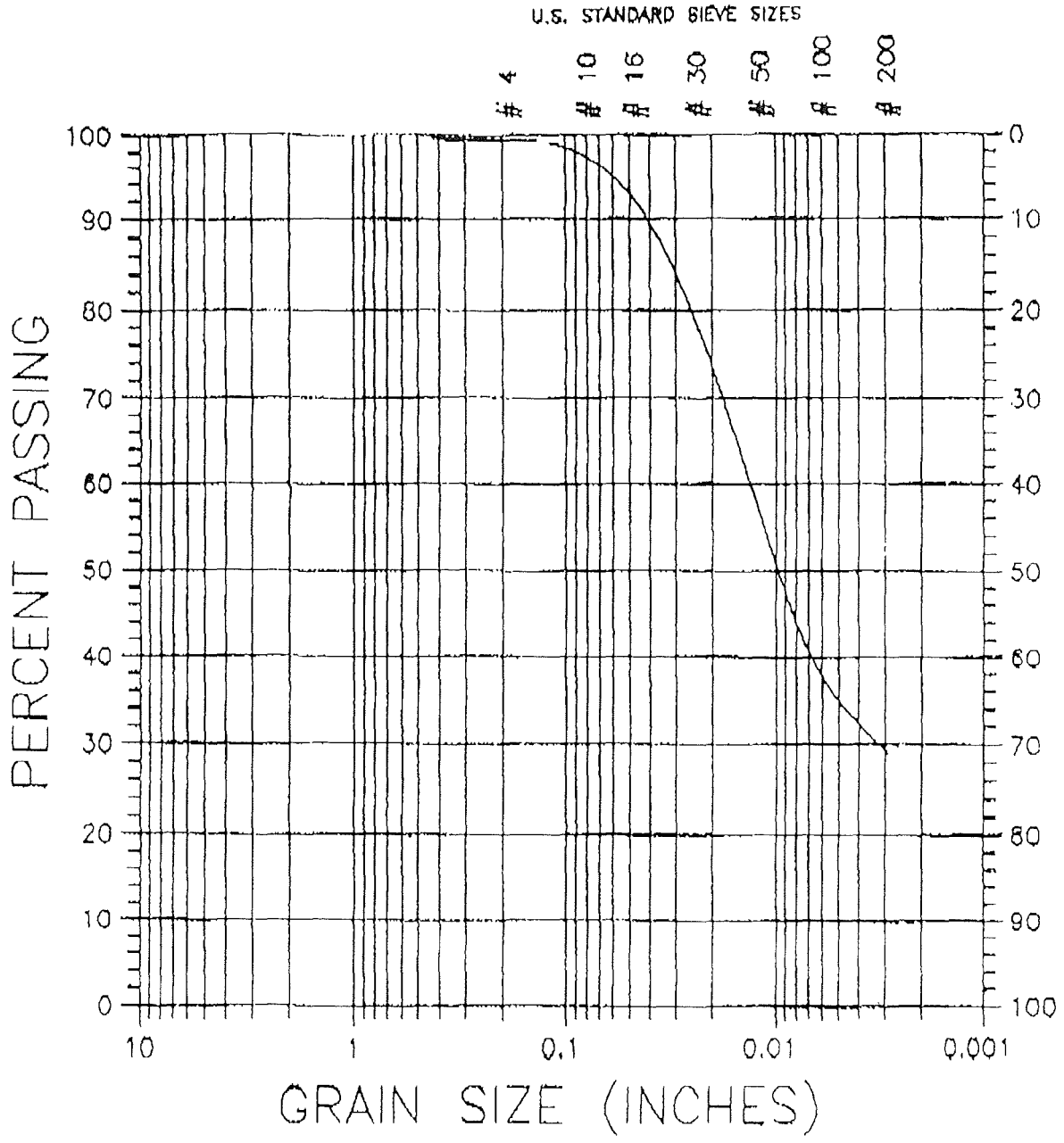
Approval was issued for installation of the geomembrane over the foundation layer on May 13, 1994.

REVISIONS BY DATE
FILE
CHECKED BY DATE
BY



PROJECT NAME: Sparks-Buttercup Landfill
PROJECT NUMBER: S0318-0110
DATE: April 14, 1994
SAMPLE LOCATION: Borrow Area
SAMPLE DESCRIPTION: Dark Brown Grey Sandy SILT with Organics
TEST METHOD: ASTM D-1557
MOISTURE CONTENT: 10.8% ←
DRY DENSITY: 128.5% PCF
REFERENCE NO.:

PROCTOR TEST RESULTS

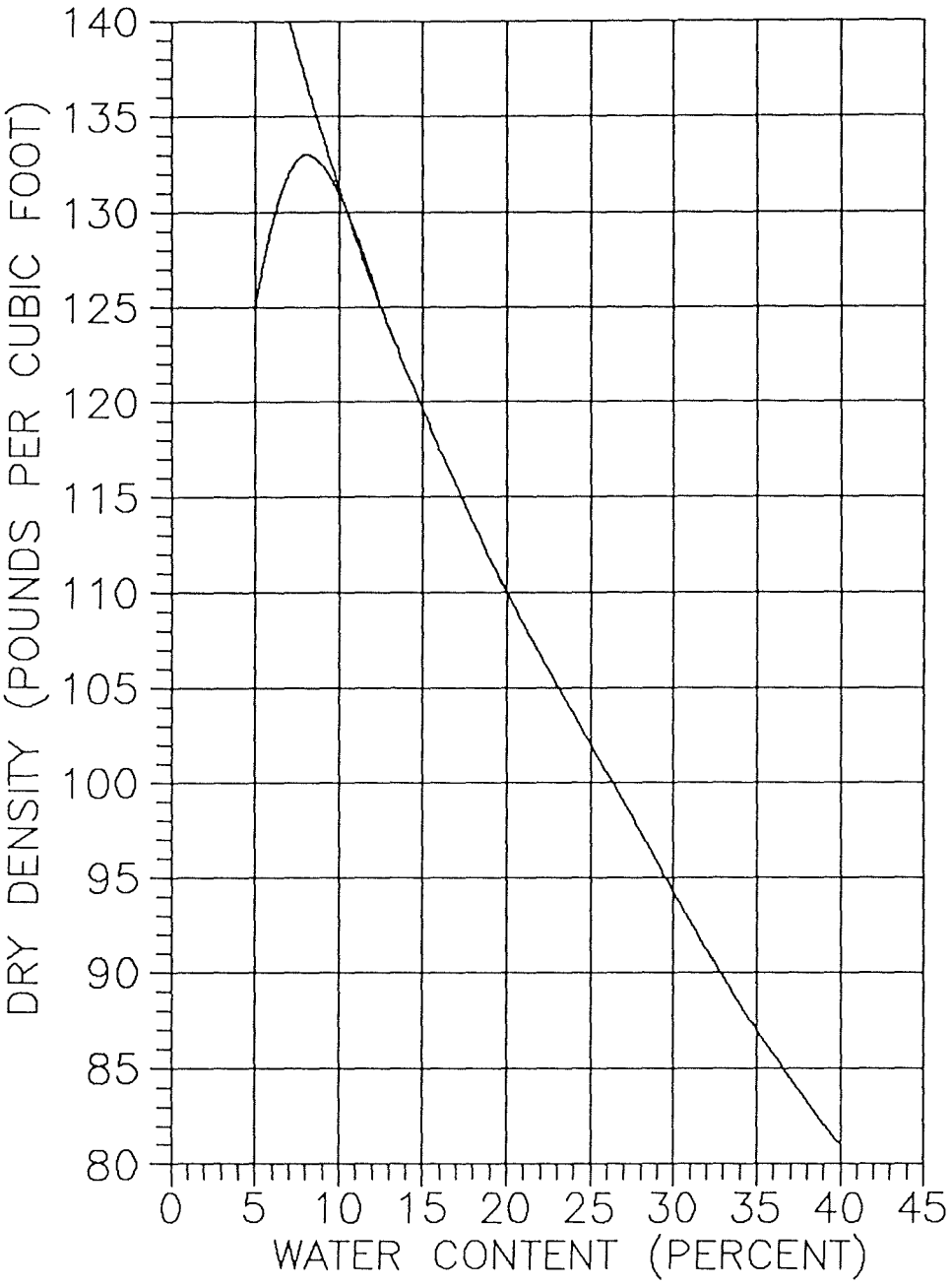


PROJECT NAME: Sparks–Buttercup Landfill
PROJECT NUMBER: S0318–0110
DATE: April 13, 1994
SAMPLE LOCATION: Borrow Area – In-Situ
SAMPLE DESCRIPTION: Dark Brown Silty SAND with Organics
PERCENT PASSING #4: 99.4%
PERCENT PASSING #200: 29.1%
TEST METHOD: ASTM D-422 D-1140

SIEVE ANALYSIS RESULTS

REVISIONS BY DATE
BY FILE
BY DATE
CHE ED BY

REVISIONS
BY_____ DATE_____



PROJECT NAME: SPARKS – BUTTERCUP LANDFILL
PROJECT NUMBER: S0318–0120
DATE: May 11, 1994
SAMPLE LOCATION: Unknown
SAMPLE DESCRIPTION: Medium Brown Silty SAND with Gravel
TEST METHOD: ASTM D–1557
MOISTURE CONTENT: 8.0%
DRY DENSITY: 133.0 PCF
REFERENCE NO:

PROCTOR TEST RESULTS

FILE_____

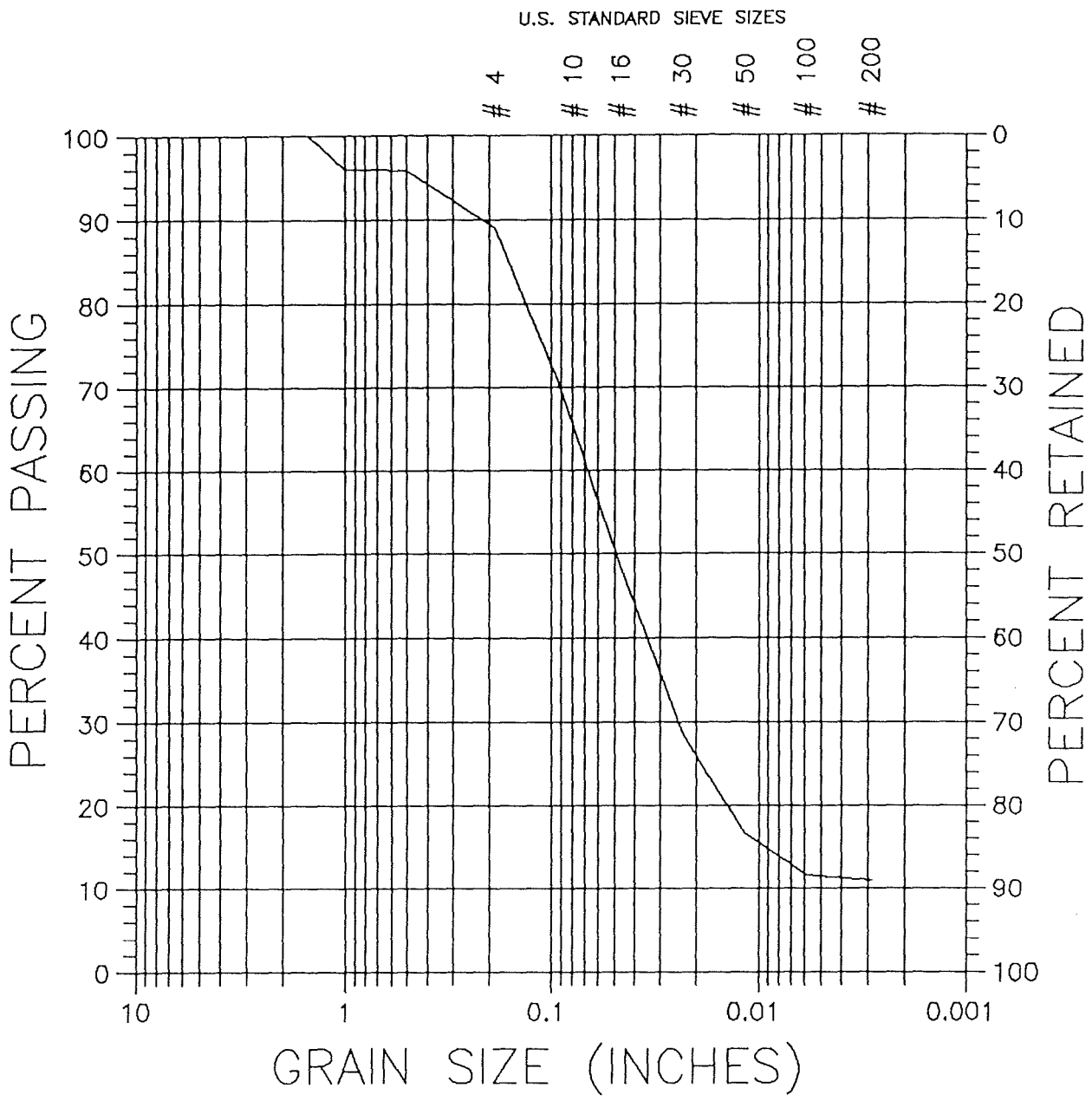
CHECKED BY_____

HCI Howard Consultants, Inc.

REVISIONS BY DATE

FILE

CHECKED BY



PROJECT NAME: SPARKS – BUTTERCUP
PROJECT NUMBER: S0318–0120
DATE: May 11, 1994
SAMPLE LOCATION: Unknown
SAMPLE DESCRIPTION: Medium Brown Silty SAND with Gravel
PERCENT PASSING #4: 89.1%
PERCENT PASSING #200: 10.9%
TEST METHOD: ASTM D–422 D–1140

SIEVE ANALYSIS RESULTS

HCI Howard Consultants, Inc.

FILE NO. 60- 35-03
JOB NAME Sparks & Buttercup
DATE ~~May~~ May 11, '94
TECH JAS
TEST LOCATIONS SELECTED BY: JAS/RSW
COMPACTION CONTROL ☒ DENSITY TESTING ☐

NUCLEAR DENSI.. FIELD FORM

KLEINFELDER

MILEAGE
HOURS 0700-
WEATHER Clear/Sunny

RESULTS REPORTED TO

STANDARD COUNT
Density 3194
Moisture 675

Test No.	Mode	Approximate Location	Wet Density	Depth below FSG (ft)	Moisture Percentage	Dry Density	Curve No.	Lab Maximum	% Compaction	Specified Compaction	Remarks
1	m/D	Station 11 Lift #1	117.7	.667	4.3	112.8		126.5	89.1	90.0	
2	m/D	S12 L1	125.6	.667	8.1	116.2		126.5	91.9	90.0	

SHEET of

FILE NO. 60- 335-03
JOB NAME Sparks & [illegible]
DATE [illegible] 12, '94
TECH JAS
TEST LOCATIONS SELECTED BY: JAS/RSW
COMPACTION CONTROL ☒ DENSITY TESTING ☐

NUCLEAR DENSITY FIELD FORM

KLEINFELDER

MILEAGE
HOURS
WEATHER Clear/hot

RESULTS REPORTED TO

STANDARD COUNT
Density 3187
Moisture 669

Test No.	Mode	Approximate Location	Wet Density	Depth below FSG (ft)	Moisture Percentage	Dry Density	Curve No.	Lab Maximum	% Compaction	Specified Compaction	Remarks
1	M/D	STATION 13 LIFT 1	118.0	.667	5.0	112.4		126.5	88.8	90.0	± 5.0%
2	m/D	S14 L1	115.1	.667	5.6	109.0		126.5	86.2	90.0	±5.0%
3	m/D	S1 L1	121.9	.667	6.3	114.6		126.5	90.6	90.0	± 5.0%
4	m/D	S4 L1	129.5	.667	7.2	120.8		126.5	95.5	90.0	± 5.0%
5	m/D	S14 L1 - A	118.8	.667	6.1	111.9		133	84.1	90.0	
6	m/D	S14 L1 - B	119.9	.667	5.6	113.5		133	85.4	90.0	
7	m/D	S15 L1	108.9	.667	6.6	102.1		133	76.8	90.0	

SHEET of

FILE NO. CA 5035-03
JOB NAME C. ARKS & BUTTERCUP
DATE 5/6/94
TECH JAS
TEST LOCATIONS SELECTED BY: JAS / RGN
COMPACTION CONTROL ☒ DENSITY TESTING ☐

NUCLEAR DENS. / FIELD FORM

KLEINFELDER

MILEAGE
HOURS
WEATHER

RESULTS REPORTED TO

STANDARD COUNT
Density
Moisture

Test No.	Mode	Approximate Location	Wet Density	Depth below FSG (ft)	Moisture Percentage	Dry Density	Curve No.	Lab Maximum	% Compaction	Specified Compaction	Remarks
1	m/D	S15 L1 - A	116.9	.667	6.5	109.6		133	82.5	90.0	± 5% Near Rock
2	m/D	S15 L1 - B	114.1	.667	6.0	107.6		133	80.9	90.0	± 5%
3	m/D	S15 L1 - C	120.8	.667	6.5	113.4		133	85.3	90.0	± 5%
4	m/D	S15 L1 - D	115.0	.667	6.2	108.2		133	81.4	90.0	± 5%
5	m/D	S2 L1	127.8	.667	6.2	120.2		133	90.4	90.0	
6	m/D	S3 L1	122.6	.667	6.0	115.7		133	87.0	90.0	
7	m/D	S5 L1	128.3	.667	7.2	119.7		133	90.0	90.0	
8	m/D	S6 L1	123.1	.667	6.1	116.0		133	87.2	90.0	
9	m/D	S8 L1	124.5	.667	5.9	117.6		133	88.4	90.0	
10	m/D	S7 L1	128.8	.667	8.2	119.0		133	89.5	90.0	
11	m/D	S9 L1	124.1	.667	7.4	115.6		133	86.9	90.0	
12	m/D	S10 L1	122	.667	6.3	114.7		133	86.3	90.0	

SHEET of

ACCEPTANCE REPORT
SPARKS AND BUTTERCUP LANDFILL
SPOKANE, WASHINGTON

Work Element: **Geomembrane Installation**

Date: May 19, 1994

CQA Monitor: Jim Sprott, Kleinfelder JAS

40 mil PVC geomembrane was installed as per project specifications on May 18 and 19, 1994, by Northwest Linings and Geotextiles of Kent, Washington. Field and factory seam samples (5 of each) were collected for destructive testing by Kleinfelder. Bonded seam strength in shear and peel met specifications and placement of vegetative layer soils was authorized on May 19, 1994. The quantity of geomembrane installed was 105,000 square feet. Geomembrane warranty and certifications were received from the manufacturer and installer in accordance with project plans and specifications. Manufacturer's certifications, panel layout schematic and panel placement logs, bonded seam strength test results, and the installers warranty are included for reference following this acceptance report.

MANUFACTURER'S CERTIFICATIONS

STAFF INDUSTRIES INC. 240 Chene Street · Detroit, MI 48207 · Telephone (313) 259-1820
Fax (313) 259-0631

May 6, 1994

Mr. Kirk Lilleskare
Northwest Linings
20017 89th Ave., South
Kent, WA 98031

Re: Sparks-Buttercup Landfill
40 mil PVC
Our File No. J12352

Dear Kirk:

Enclosed are the manufacturer's certifications, as well as Staff Industries production run sheets and factory seam test results for the above referenced project. Please note that the two manufacturer's certifications are from different companies. This is because Huls America changed their name to HPG International.

If you have any questions, or if any additional documentation is required, please do not hesitate to call me.

Sincerely yours,

STAFF INDUSTRIES, INC.

Darren Manees

Encl.

cc: J12352

DEC 27 1993

hüls

HÜLS AMERICA INC.

Oak Hill Road
Crestwood Industrial Park
Mountaintop
PA 18707
Tel: (717) 474-6741
FAX: (717) 474-0998

CUSTOMER: Staff Industries

HULS ORDER: 126628-001

THICKNESS: 40 MIL PVC

ROLLS TESTED: 12, 22, 27.

PRODUCT NO: 1746

COLOR NO: 60570 GREY

FINISH: E9621 Faille

PRODUCED WEEK OF: 11/22/93

TEST REPORT DATE: 12/16/93

PROPERTY	SPECIFICATION	TEST VALUE	ASTM TEST METHOD
Thickness, mils, +/-5%	40.0	41.3	D- 751
Specific Gravity, min.	1.20	1.26	D- 792
Tensile Strength, psi, min. (breaking factor lbs./in. width, min.)	MD 2300 TD 2300	2587 2497	D- 882
Elongation at Break, %, min.	MD 350 TD 350	523 532	D- 882
Modulus @100% Elongation, psi, min. (force @100% elongation, lbs./in. width, min.)	MD 900 TD 900	1099 1051	D- 882
Tear Resistance, lbs., min. (tear force lbs., min.)	MD 10.0 TD 10.0	12.3 12.9	D-1004
Low Temperature, Deg. F Pass	-20	Pass	D-1790
Dimensional Stability, % Change, max.	5.0	0.6	D-1204
Water Extraction, % loss, max.	0.35	0.17	D-3083
Volatility, % loss, max.	0.50	0.45	D-1203

Order #126628-001

PROPERTY	SPECIFICATION	TEST VALUE	ASTM TEST METHOD
Resistance to soil burial, % Change, max.			D-3083
Breaking Factor	-5	Pass	
Elongation @ Break	-20	Pass	
Modulus @ 100% elongation	+20	Pass	

Walter F. Yeager

WALTER F. YEAGER, QUALITY CONTROL MANAGER

CC: W. YEAGER, P. SAWHNEY, A. ARENA, L. KARPOWICZ, LAB. (2), CUSTOMER SERVICE, PROJECT NO. 93-272.

HPG INTERNATIONAL INC. Oakhill Road Crestwoood Industrial Park Mountaintop.PA 18707
Tel: (717) 474-6741 Fax (717) 474-0998

CUSTOMER: Staff Industries HULS ORDER: 127425-001

THICKNESS: 40 MIL PVC ROLLS TESTED: See attached sheet.

PRODUCT NO: 0853 COLOR NO: 60570 Grey

FINISH: E9621 Faille PRODUCED WEEK OF: 04/19/94

TEST REPORT DATE: 04/29/94

PROPERTY	SPECIFICATION	TEST VALUE	ASTM TEST METHOD
Thickness, mils, +/-5%	40.0	39.2	D-1593
Specific Gravity, min.	1.20	1.26	D- 792
Tensile Strength, psi, min. (breaking factor lbs./in. width, min.)	MD 2300 TD 2300	2885 2698	D- 882
Elongation at Break, %, min.	MD 350 TD 350	524 539	D- 882
Modulus @100% Elongation, psi, min. (force @100% elongation, lbs./in. width, min.)	MD 900 TD 900	1237 1140	D- 882
Tear Resistance, lbs., min. (tear force lbs., min.)	MD 10.0 TD 10.0	12.4 13.2	D-1004
Low Temperature, Deg. F Pass	-20	Pass	D-1790
Dimensional Stability, % Change, max.	5.0	1.6	D-1204
Water Extraction, % loss, max.	0.35	0.19	D-3083
Volatility, % loss, max.	0.50	0.48	D-1203

Order #127425-001

PROPERTY	SPECIFICATION	TEST VALUE	ASTM TEST METHOD
Resistance to soil burial, % Change, max.			D-3083
Breaking Factor	-5	Pass	
Elongation @ Break	-20	Pass	
Modulus @ 100% elongation	+20	Pass	

PARVIN SAWHNEY. PLANT CHEMIST

CC: W. YEAGER, P. SAWHNEY. A. ARENA, Y. FRY. LAB (1). CUSTOMER SERVICE. PROJECT NO. 94-109.

Order #127425-001

CUSTOMER: Staff Industries HULS ORDER: ~~126894~~-001
127425

THICKNESS: 40 MIL PVC

PRODUCT NO: 0853 COLOR NO: 60570 Grey

FINISH: E9621 Faille

ROLL NUMBERS OF THE ORDER TESTED ARE AS FOLLOWS:

2, 6, 14, 25

2.

APR 25 1994

RUN SHEET NO. 012999 A.W.L.

STAFF INDUSTRIES INC.

TIME OF START

DATE 4-25-9

ITEM 1. SOURCE, FORMULA 1000-40 mil PVC Huls 61"

MAT ITEM 2. SOURCE, FORMULA

ITEM 3. SOURCE, FORMULA

PALLET BOXES ASSEMBLED BY Lot # 127425, Pos 1-6, 16-19 Lot # 126628, Pos 8-15, 7, 20

WICKS Double 1" w/Hole

IMPRINTS	0.	1.	2.

REMAINDER CIR.	REMAINDER FT	ROLL POS. NO.	ITEM	MFG. ROLL NUMBER	MFG. WT.	SCALE WT. / CIR.	YDS. / CIR.	REMAINDER CIR.	REMAINDER FT	ROLL POS. NO.	ITEM	MFG. ROLL NUMBER	MFG. WT.	SCALE WT. / CIR.	YDS. / CIR.
20 1/4		# 1		14			285	20 1/2		#11		6			44
19 1/2		# 2		13				19		#12		13			44
18 3/4		# 3		23				19 1/4		#13		12			44
18 1/2		# 4		24				19		#14		7			44
19 1/2		# 5		20				21		#15		8			44 1/2
62		# 6		19				62 1/2		#16		2			285
23 1/2		# 7		9170-R2D			46	60 1/2		#17		1			
20		# 8		11			44	62 1/2		#18		3			
19		# 9		14			44 1/4	62		#19		4			
20 1/2		#10		5			44 1/2	0		#20		9170-R2-C			41

GLUE 42 Sec 215

MAX SPEED 540

START-HAND GLUED BY MARGIN LINE SIDE Verl Dave INSP. BY OTHER SIDE Tony Bill C. INSP. BY

RUN BY Nick-ED / Rob - Randy F.

START ASSISTED BY

FINISH ASSISTED BY

SPECIAL INSTRUCTIONS NEED 6' Peel Test c width Strip From Both A...

			DEFECTS	CUT OFF MARK BY
J-12338	BOX L.P.C.	R-3-1A 5w X 800n (804i) OK 805i 804i		Rob
J-12352	BOX L.P.C.	R-3-1B 15w X 240n (241i) OK 241i 242i cut 8pc OFF		
	BOX	R-		
	BOX	R-		
	BOX	R-		
	BOX	R-		

7167.

RUN SHEET NO. 012994 N.W.L APR 94

STAFF INDUSTRIES INC.

TIME OF START _____ DATE 4-14-94

ITEM 1. SOURCE, FORMULA 40Mil PVC H4/S 6"

ITEM 2. SOURCE, FORMULA

ITEM 3. SOURCE, FORMULA

PALLET BOXES ASSEMBLED BY Lot # 126628 WICKS Doublet w/Holes

IMPRINTS 0. 1. 2.

REMAINDER CIR.	REMAINDER FT	ROLL POS. NO.	ITEM	MFG. ROLL NUMBER	MFG. WT.	SCALE WT. / CIR.	YDS. / CIR.
44½		# 1		8			280
44		# 2		7			
44		# 3		12			
44		# 4		11			
44½		# 5		6			
44½		# 6		5			
44½		# 7		14			
44		# 8		13			
40 3/4		# 9		9170R-2B			
46½		#10		9170R-2B			

REMAINDER CIR.	REMAINDER FT	ROLL POS. NO.	ITEM	MFG. ROLL NUMBER	MFG. WT.	SCALE WT. / CIR.	YDS. / CIR.
41		#11		9170-R-2C			8
46		#12		9170-R-2D			8
30		#13		9164-R-2C			38
28¼		#14		9164-R-2B			38
28¼		#15		9164-R-2A			38
		#16					
		#17					
		#18					
		#19					
		#20					

GLUE MAX SPEED 540 42 Sec 215

START-HAND GLUED BY MARGIN LINE SIDE Vern Mike INSP. BY OTHER SIDE Tony Carlos INSP. BY

RUN BY NICK-ED Rob-R. Stine

START ASSISTED BY

FINISH ASSISTED BY

SPECIAL INSTRUCTIONS NEED 6" PEEL TEST

J-12352	BOX L.P.C.	R-1-1 15W X 263'N (264) OK 264 NEED 6" width strip → 265 cut to 12 wide	DEFECTS	CUT OFF MARK BY R.
		R-	DEFECTS	CUT OFF MARK BY
J-12352	BOX L.P.C.	R-1-2 12W X 155N (156) OK 421 cut to 11 wide	DEFECTS	CUT OFF MARK BY
J-12352	BOX M.P.C.	R-1-3 11W X 125N (126) OK 547	DEFECTS	CUT OFF MARK BY
	BOX	R-	DEFECTS	CUT OFF MARK BY
	BOX	R-	DEFECTS	CUT OFF MARK BY

RUN SHEET NO. 012995 N.W.C. APR 22 1994

STAFF INDUSTRIES INC.

TIME OF START _____ DATE 4-22-94

ITEM 1. SOURCE, FORMULA 1000-40 mil PVC Huls. 61"

ITEM 2. SOURCE, FORMULA

ITEM 3. SOURCE, FORMULA

PALLET BOXES ASSEMBLED BY Lot # 127425 WICKS Double i.w/Holes

IMPRINTS 0. 1. 2.

REMAINDER CIR.	REMAINDER FT	ROLL POS. NO.	ITEM	MFG. ROLL NUMBER	MFG. WT.	SCALE WT. / CIR.	YDS. / CIR.
27 1/2		# 1		8			285
27 1/4		# 2		7			
26 3/4		# 3		18			
26 1/4		# 4		17			
26	3/4	# 5		6			
26	3/4	# 6		5			
27		# 7		12			
26	1/2	# 8		11			
26	1/2	# 9		27			
26	1/4	#10		15			

REMAINDER CIR.	REMAINDER FT	ROLL POS. NO.	ITEM	MFG. ROLL NUMBER	MFG. WT.	SCALE WT. / CIR.	YDS. / CIR.
26		#11		16			28
26		#12		25			
26		#13		26			
25	3/4	#14		22			
25	1/2	#15		21			
		#16					
		#17					
		#18					
		#19					
		#20					

GLUE MAX SPEED 540 42 Sec 215

START-HAND GLUED BY MARGIN LINE SIDE Paul Stanley INSP. BY OTHER SIDE Tony Mike INSP BY

RUN BY Nick - ED / Rob - R. Stone

START ASSISTED BY

FINISH ASSISTED BY

SPECIAL INSTRUCTIONS NEED 6" PEEL Test

J-12352	BOX L.P.C	R-2-1 15w X 258n (254c) OK 259c NEED 6" width str. P 260c	DEFECTS	CUT OFF MARK BY
J-12352	BOX L.P.C.	R-2-2 15w X 253n (254c) OK 514c	DEFECTS	CUT OFF MARK BY
J-12352	BOX 2 P.C.	R-2-3 15w X 248n (244c) OK 762c	DEFECTS	CUT OFF MARK BY
	BOX	R-	DEFECTS	CUT OFF MARK BY
	BOX	R-	DEFECTS	CUT OFF MARK BY
	BOX	R-	DEFECTS	CUT OFF MARK BY

Staff Industries, Inc.
240 Chene St.
Detroit, MI 48207

BONDED SEAM STRENGTH TEST - PVC

per ASTM D3083 (NSF Modified)

Instron Corporation
Series IX Automated Materials Testing System 6.03

Operator name: James Clark

Test Date: 26 Apr 1994

Sample Identification: B235201A
Interface Type: 1011 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (in/min): 20.0000

Sample Type: ASTM

Humidity (%): 47
Temperature (deg. F): 75

JOB/RUN NUMBERS..... J12352/R-1-1
MATERIAL..... 40 mil HULS PVC
SEAM TYPE..... Machine (Solvent)
FAB. DATE..... 4/19/94
NSF REQUIREMENT..... 74 lbs/in

Dimensions:

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Width (in)	1.0000	1.0000	1.0000	1.0000	1.0000
Thickness (in)	.04000	.04000	.04000	.04000	.04000
Spec gauge len (in)	5.0000	5.0000	5.0000	5.0000	5.0000
Grip distance: (in)	5.0000	5.0000	5.0000	5.0000	5.0000

Out of 5 specimens, 0 excluded.
Sample comments: All specimens passed. Failures occurred in the material, at seam edge.

Specimen Number	Seam No.	Displcment at Max.Load (in)	Load/Width at Max.Load (lbs/in)	Stress at Max.Load (psi)	Strain at Max.Load (in/in)	Elongation at Max.Load (%)
1	1	14.90	79.75	1994.	2.980	298.0
2	3	13.93	79.00	1975.	2.786	278.6
3	8	15.14	76.50	1913.	3.027	302.7
4	11	12.81	76.50	1913.	2.561	256.1
5	14	14.19	78.50	1963.	2.839	283.9
Mean:		14.19	78.05	1951.	2.839	283.9
Standard Deviation:		.92	1.48	37.	.184	18.4

Staff Industries, Inc.
240 Chene St.
Detroit, MI 48207

PEEL ADHESION TEST - PVC

per ASTM D413 (NSF Modified)

Instron Corporation
Series IX Automated Materials Testing System 6.03

Operator name: James Clark

Test Date: 26 Apr 1994

Sample Identification: P235201A
Interface Type: 1011 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (in/min): 2.0000

Sample Type: ASTM

Humidity (%): 49
Temperature (deg. F): 77

JOB/RUN NUMBERS..... J12352/R-1-1
MATERIAL..... 40 mil HULS PVC
SEAM TYPE..... Machine (Solvent)
FAB. DATE..... 4/19/94
NSF REQUIREMENT..... 10 lbs/in

Dimensions:

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Width (in)	1.0000	1.0000	1.0000	1.0000	1.0000
Thickness (in)	.04000	.04000	.04000	.04000	.04000
Spec gauge len (in)	2.0000	2.0000	2.0000	2.0000	2.0000
Grip distance: (in)	2.0000	2.0000	2.0000	2.0000	2.0000

Out of 5 specimens, 0 excluded.
Sample comments: All five specimens passed.

Specimen Number	Seam No.	Displcment at Max.Load (in)	Load/Width at Max.Load (lbs/in)	Stress at Max.Load (psi)	Avg Load/W from 1.5 to 3.5 in. (lbs/in)	Avg Stress from 1.5 to 3.5 in. (psi)
1	2	3.280	13.25	331.2	12.46	311.6
2	4	2.936	15.50	387.5	14.53	363.2
3	7	3.533	14.50	362.5	13.20	330.1
4	10	1.968	18.00	450.0	17.25	431.2
5	13	3.592	14.25	356.2	13.44	335.9
Mean:		3.062	15.10	377.5	14.18	354.4
Standard Deviation:		.664	1.81	45.2	1.87	46.8

Staff Industries, Inc.
240 Chene St.
Detroit, MI 48207

BONDED SEAM STRENGTH TEST - PVC

per ASTM D3083 (NSF Modified)

Instron Corporation
Series IX Automated Materials Testing System 6.03

Operator name: James Clark

Test Date: 26 Apr 1994

Sample Identification: B235202A
Interface Type: 1011 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (in/min): 20.0000

Sample Type: ASTM

Humidity (%): 47
Temperature (deg. F): 75

JOB/RUN NUMBERS..... J12352/R-2-1
MATERIAL..... 40 mil HULS PVC
SEAM TYPE..... Machine (Solvent)
FAB. DATE..... 4/22/94
NSF REQUIREMENT..... 74 lbs/in

Dimensions:

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Width (in)	1.0000	1.0000	1.0000	1.0000	1.0000
Thickness (in)	.04000	.04000	.04000	.04000	.04000
Spec gauge len (in)	5.0000	5.0000	5.0000	5.0000	5.0000
Grip distance: (in)	5.0000	5.0000	5.0000	5.0000	5.0000

Out of 5 specimens, 0 excluded.
Sample comments: All specimens passed. Failures occurred in the material, at seam edge.

Specimen Number	Seam No.	Displcment at Max.Load (in)	Load/Width at Max.Load (lbs/in)	Stress at Max.Load (psi)	Strain at Max.Load (in/in)	Elongation at Max.Load (%)
1	2	13.86	80.00	2000.	2.772	277.2
2	5	14.80	87.50	2188.	2.960	296.0
3	9	13.56	83.75	2094.	2.712	271.2
4	12	14.87	88.00	2200.	2.974	297.4
5	13	14.94	90.75	2269.	2.987	298.7
Mean:		14.40	86.00	2150.	2.881	288.1
Standard Deviation:		.65	4.18	105.	.129	12.9

Staff Industries, Inc.
240 Chene St.
Detroit, MI 48207

PEEL ADHESION TEST - PVC

per ASTM D413 (NSF Modified)

Instron Corporation
Series IX Automated Materials Testing System 6.03

Operator name: James Clark

Test Date: 26 Apr 1994

Sample Identification: P235202A
Interface Type: 1011 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (in/min): 2.0000

Sample Type: ASTM

Humidity (%): 50
Temperature (deg. F): 77

JOB/RUN NUMBERS..... J12352/R-2-1
MATERIAL..... 40 mil HULS PVC
SEAM TYPE..... Machine (Solvent)
FAB. DATE..... 4/22/94
NSF REQUIREMENT..... 10 lbs/in

Dimensions:

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Width (in)	1.0000	1.0000	1.0000	1.0000	1.0000
Thickness (in)	.04000	.04000	.04000	.04000	.04000
Spec gauge len (in)	2.0000	2.0000	2.0000	2.0000	2.0000
Grip distance: (in)	2.0000	2.0000	2.0000	2.0000	2.0000

Out of 5 specimens, 0 excluded.
Sample comments: All five specimens passed.

Specimen Number	Seam No.	Displcment at Max.Load (in)	Load/Width at Max.Load (lbs/in)	Stress at Max.Load (psi)	Avg Load/W from 1.5 to 3.5 in. (lbs/in)	Avg Stress from 1.5 to 3.5 in. (psi)
1	3	1.468	15.25	381.2	13.11	327.7
2	6	2.711	15.25	381.2	13.77	344.2
3	8	2.867	17.75	443.7	16.75	418.8
4	11	3.009	15.50	387.5	14.87	371.7
5	14	3.590	15.25	381.2	13.33	333.3
Mean:		2.729	15.80	395.0	14.36	359.1
Standard Deviation:		.779	1.10	27.4	1.50	37.4

Staff Industries, Inc.
240 Chene St.
Detroit, MI 48207

BONDED SEAM STRENGTH TEST - PVC

per ASTM D3083 (NSF Modified)

Instron Corporation
Series IX Automated Materials Testing System 6.03

Operator name: James Clark

Test Date: 28 Apr 1994

Sample Identification: B235203A

Sample Type: ASTM

Interface Type: 1011 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (in/min): 20.0000

Humidity (%): 35
Temperature (deg. F): 70

JOB/RUN NUMBERS..... J12352/R-3-18
MATERIAL..... 40 mil HULS PVC
SEAM TYPE..... Machine (Solvent)
FAB. DATE..... 4/25/94
NSF REQUIREMENT..... 74 lbs/in

Dimensions:

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Width (in)	1.0000	1.0000	1.0000	1.0000	1.0000
Thickness (in)	.04000	.04000	.04000	.04000	.04000
Spec gauge len (in)	5.0000	5.0000	5.0000	5.0000	5.0000
Grip distance: (in)	5.0000	5.0000	5.0000	5.0000	5.0000

Out of 5 specimens, 0 excluded.
Sample comments: All specimens passed. Failures occurred in the material, at seam edge.

Specimen Number	Seam No.	Displcment at Max.Load (in)	Load/Width at Max.Load (lbs/in)	Stress at Max.Load (psi)	Strain at Max.Load (in/in)	Elongation at Max.Load (%)
1	6	13.91	80.75	2019.	2.782	278.2
2	9	12.82	76.25	1906.	2.564	256.4
3	12	13.99	83.00	2075.	2.798	279.8
4	15	12.64	77.50	1938.	2.527	252.7
5	18	12.42	81.50	2038.	2.483	248.3
Mean:		13.15	79.80	1995.	2.631	263.1
Standard Deviation:		.74	2.83	71.	.148	14.8

Staff Industries, Inc.
240 Chene St.
Detroit, MI 48207

PEEL ADHESION TEST - PVC

per ASTM D413 (NSF Modified)

Instron Corporation
Series IX Automated Materials Testing System 6.03

Operator name: James Clark

Test Date: 28 Apr 1994

Sample Identification: P235203A

Sample Type: ASTM

Interface Type: 1011 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000

Humidity (%): 35

Crosshead Speed (in/min): 2.0000

Temperature (deg. F): 70

JOB/RUN NUMBERS..... J12352/R-3-18
MATERIAL..... 40 mil HULS PVC
SEAM TYPE..... Machine (Solvent)
FAB. DATE..... 4/25/94
NSF REQUIREMENT..... 10 lbs/in

Dimensions:

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Width (in)	1.0000	1.0000	1.0000	1.0000	1.0000
Thickness (in)	.04000	.04000	.04000	.04000	.04000
Spec gauge len (in)	2.0000	2.0000	2.0000	2.0000	2.0000
Grip distance: (in)	2.0000	2.0000	2.0000	2.0000	2.0000

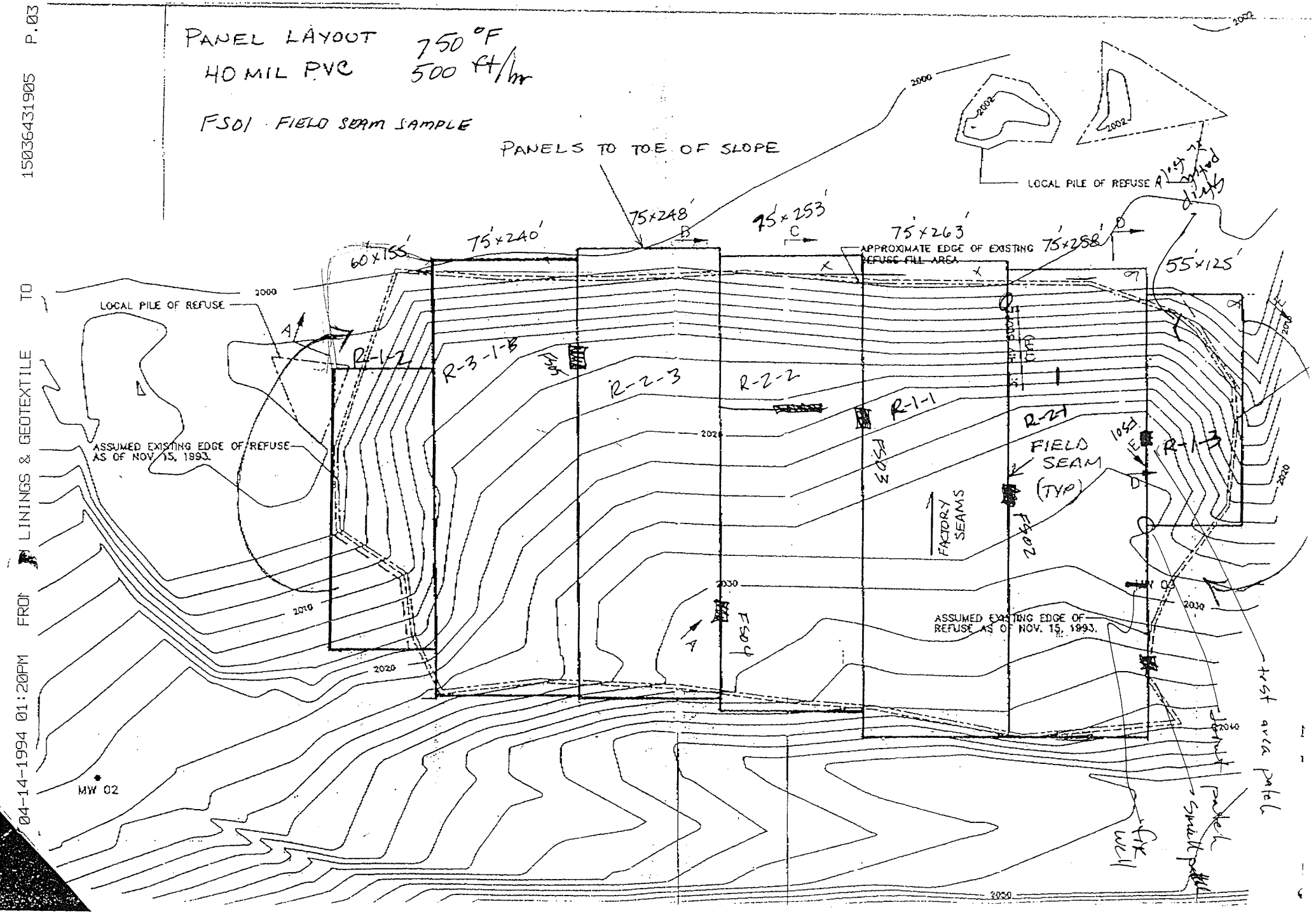
Out of 5 specimens, 0 excluded.
Sample comments: All five specimens passed.

Specimen Number	Seam No.	Displcment at Max.Load (in)	Load/Width at Max.Load (lbs/in)	Stress at Max.Load (psi)	Avg Load/W from 1.5 to 3.5 in. (lbs/in)	Avg Stress from 1.5 to 3.5 in. (psi)
1	7	1.7890	15.00	375.0	13.33	333.2
2	10	2.9290	16.00	400.0	14.74	368.6
3	13	1.6150	15.75	393.7	14.59	364.9
4	16	3.5230	20.00	500.0	17.41	435.2
5	17	.8773	17.75	443.7	13.27	331.9
Mean:		2.1470	16.90	422.5	14.67	366.7
Standard Deviation:		1.0640	2.01	50.1	1.68	41.9

PANEL LAYOUT DRAWING

PANEL PLACEMENT LOGS

SPARKS - BUTTERCUP L.F.



GEOMEMBRANE DELIVERY AND STORAGE LOG

DATE	ROLL#	LOT/BATCH	LENGTH	WIDTH	AREA	FACTORY QC	STORAGE	PASS/FAIL
	R-1-3	J-12352	125	55	6,875	✓	factory box on pallet	P
	R-2-2	J-12352	253	75	18,975	✓	"	P
	R-1-1	J-12352	263	75	19,725	✓	"	P
	R-2-1	"	258	75	19,350	✓	"	P
	R-2-3	"	248	75	18,600	✓	"	P
	R-3-1-B	"	240	75	18,000	✓	"	P
	R-1-2	"	155	60	9,300	✓	"	P
					110,825			

MANUFACTURER: Hulls America / HPG International SIGNED: _____

KLEINFELDER

PANEL PLACEMENT LOG

PANEL NUMBER: R-1-#3

Owner: U.S. BANK
Location: EAST EDGE
Project: 60-5035-03
Temperature: 70-80°F
Date/Time: 5/18/94
Wind:
By: NORTHWEST LININGS & GEOTEXTILES

SUBGRADE CONDITIONS:

Line and Grade:
Surface Compaction: 90%, surface screened & for RAKED
Protrusions: all debris & rocks removed
Ponded Water: NONE
Dessication:

PANEL CONDITIONS:

Transport Equipment: TRUCKS in BOXES on PALLETS
Visual Panel Inspection: RSW/JAS
Temporary Loading:
Temp. Welds/Bonds: 750° - 500 ft per hour
Temperature: 60-85°F
Damages: No noticeable damage

SEAM DETAILS:

Seam Nos.: FS01
Seaming Crews:
Seam Crew Testing: NORTHWEST LINING / JAS of KLEINFELDER

Notes: Field seam #1 (FS01) taken by RSW Samples R-1-2 and R-2-1. ~~No noticeable patterns in the liner~~. Field seamed to extra piece of R-2-1 on South end. Wire from subsurface sticking up, liner cut, wire removed and liner subsequently patched.

KLEINFELDER

PANEL PLACEMENT LOG

PANEL NUMBER: R-2-1

Owner: V.S. BANK
Location: 2nd Panel from East end
Project: 60-5035-03
Temperature: 70-80°
Date/Time: 5/18/94 — 1000
Wind: 10 mph
By: NORTHWEST LININGS and GEOTEXTILES.

SUBGRADE CONDITIONS:

Line and Grade:
Surface Compaction: 90% of optimum
Protrusions: all removed
Ponded Water: None
Dessication:

PANEL CONDITIONS:

Transport Equipment: Trucks in Boxes on Pallets
Visual Panel Inspection: checked by RSW/SAS
Temporary Loading:
Temp. Welds/Bonds: 750° — 500 ft/hour
Temperature: 70-80°
Damages: No noticable damage noted

SEAM DETAILS:

Seam Nos.: FS01 and FS02
Seaming Crews: Northwest Living
Seam Crew Testing: Northwest Living and Kleinfelder (HAS)

Notes: Extra end cut and placed on East side South of R-1-3. FS01 samples the seam between R-1-3 and R-2-1 and FS02 samples R-2-1 and R-1-1.

KLEINFELDER

PANEL PLACEMENT LOG

PANEL NUMBER: R-1-1

Owner: U.S. BANK
Location: 3rd panel from East end
Project: 60-5035-03
Temperature: 70-80°
Date/Time: 5/18/94
Wind: 2-10 mph
By: Northwest Linings and Geotextiles

SUBGRADE CONDITIONS:

Line and Grade:
Surface Compaction: 90% of optimum
Protrusions: all surface protrusions removed
Ponded Water: None
Dessication: N/A

PANEL CONDITIONS:

Transport Equipment: trucks, in boxes on pallets
Visual Panel Inspection: By Kleinfelder RSW/GAS
Temporary Loading:
Temp. Welds/Bonds: 750° - 500 ft/hr
Temperature: 70°-80°
Damages: Not noticable damage noted

SEAM DETAILS:

Seam Nos.: FS02 & FS03
Seaming Crews: NWL
Seam Crew Testing: NWL and Kleinfelder

Notes: Some bubbles in the factory seams, nothing that breached the seam found. All bubbles that left less the 1" of seam were field seamed or overlaid with a patch
FS02 seams R-2-1, FS03 seam R-2-2

KLEINFELDER

PANEL PLACEMENT LOG

PANEL NUMBER: R-2-2

Owner: U.S. Bank

Location: 4th Panel From East Edge

Project: Sparks & Buttercup 60-5035-03

Temperature: 70-80° F

Date/Time: 5/18/94 / 1200

Wind:

By: Northwest Linings and Geotextiles

SUBGRADE CONDITIONS:

Line and Grade:

Surface Compaction: 90% surface screened and/or raked

Protrusions: all debris and rocks removed

Ponded Water: None

Dessication: N/A

PANEL CONDITIONS:

Transport Equipment: Trucked in boxes on pallets

Visual Panel Inspection: RSW/SAS - no obvious flaws

Temporary Loading:

Temp. Welds/Bonds: 750° - 500 ft/hr

Temperature: ~~8~~70-80°

Damages: No damages noted

SEAM DETAILS:

Seam Nos.: FS03 & FS04

Seaming Crews: NWL

Seam Crew Testing: NWL

Notes: FS03 & FS04 sampled by RSW. No protrusions in liner. ~~Red seamed … …~~ FS03 connects in to R-1-1 and FS04 connects it with R-2-3.

24-160326-C07/CR23-85L (1993)

KLEINFELDER

PANEL PLACEMENT LOG

PANEL NUMBER: R-2-3

Owner: U.S. BANK
Location: 3RD PANEL FROM WEST
Project: 60-5035-03
Temperature: 80°F
Date/Time: 5/18/94
Wind: 10-15
By: Northwest Linings

SUBGRADE CONDITIONS:

Line and Grade:
Surface Compaction: 90%, Surface Screened & RAKED
Protrusions: All debris & Rocks REMOVED
Ponded Water: NONE
Dessication:

PANEL CONDITIONS:

Transport Equipment: Trucks in boxes on pallets
Visual Panel Inspection: RSW/IAS - okay
Temporary Loading:
Temp. Welds/Bonds: 750° - 500 ft per hour
Temperature: 80°F
Damages: No noticable damage

SEAM DETAILS:

Seam Nos.: FS04 & FS05
Seaming Crews: Northwest Linings
Seam Crew Testing: NWL/KLEINFELDER

Notes: FS04 bonds R-2-2 & R-2-3; FS05 bonds R-2-3 & R-3-1-B.

KLEINFELDER

PANEL PLACEMENT LOG

PANEL NUMBER: R-3-1-B

Owner: U.S. BANK
Location: 2ND PANEL FROM WEST
Project: # 60-5036-03
Temperature: 80°F
Date/Time: 5/18/94 1600
Wind: 10-15 mph
By: NORTHWEST LININGS (NWL)

SUBGRADE CONDITIONS:

Line and Grade:
Surface Compaction: 90%, screened & RAKED
Protrusions: All debris & Rocks Removed
Ponded Water: NONE
Dessication:

PANEL CONDITIONS:

Transport Equipment: trucks in boxes on pallets
Visual Panel Inspection: RSW/SAS - okay
Temporary Loading:
Temp. Welds/Bonds: 750°-500 ft/hr
Temperature: 60-85°F
Damages: No Noticable damage

SEAM DETAILS:

Seam Nos.: FS05 & FS06
Seaming Crews: NWL
Seam Crew Testing: NWL with KLEINFELDER

Notes: FS05 bonds R-2-3 to R-3-1-B; FS06 bonds R-3-1-B to R-1-2. FS06 was made on 5/19/94 in different weather conditions, see PANEL PLACEMENT LOG FOR R-1-2.

KLEINFELDER

PANEL PLACEMENT LOG

PANEL NUMBER: R-1-2

Owner: U.S. BANK
Location: WEST EDGE
Project: 60-5035-03
Temperature: 50°F RAINY
Date/Time: 5/19/94 0800
Wind: —
By: NORTHWEST LININGS

SUBGRADE CONDITIONS:

Line and Grade:
Surface Compaction: 90%, screened & Raked
Protrusions: All debris & Rocks Removed
Ponded Water: NONE
Dessication:

PANEL CONDITIONS:

Transport Equipment: trucks in boxes on pallets
Visual Panel Inspection: RSW/SAS approved
Temporary Loading:
Temp. Welds/Bonds: 750 ~~750~~°F @ 1000 ft/hr
Temperature: 50-60°
Damages: No noticable damages

SEAM DETAILS:

Seam Nos.: F506
Seaming Crews: NWL
Seam Crew Testing: NWL with KLEINFELDER.

Notes: DUE TO WEATHER THE "WELDER" WAS SLOWED TO 1/2 SPEED. THE END OF THE ~~SEAM~~ WAS COMPLETED WITH A ~~OTHER~~ SOLVENT WELD. APPROX 15-20' WAS ADDED TO THE SOUTH END TO COVER WASTE PILE. EXTRA ~~PIECE~~ PIECE WAS TAKE FROM R-3-1-B.

BONDED SEAM STRENGTH TEST RESULTS

8555 CHESAPEAKE DRIVE, SUITE 101
SAN DIEGO, CALIFORNIA 92123

Project Name: Sparks & Buttercup
Location: Spokane, Washington
Project Number: 60-5035-03
Date: May 19, 1994

Bonded Seam Strength - Shear 74 lbs/in
Bonded Seam Strength - Peel 10 lbs/in
FTB - Film Tear Break

BONDED SEAM STRENGTH TEST RESULTS

TABLE I

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FS-01	1	41.3	40.8	76	~~4~~	No Break
AVERAGE						
HIGH						
LOW						

NOTES: Geomembrane elongated beyond capacity of testing equipment before failure occured.

TABLE II

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FS-01	1	40.8	40.5		10	FTB
AVERAGE						
HIGH						
LOW						

NOTES:

8555 CHESAPEAKE DRIVE, SUITE 101
SAN DIEGO, CALIFORNIA 92123

Project Name: Sparks and Battcreep
Location: Spokane Washington
Project Number: 60-5035-03
Date: May 19, 1994

BONDED SEAM STRENGTH TEST RESULTS

TABLE I

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FS-02	2	40.2	40.0	69		No break
AVERAGE						
HIGH						
LOW						

NOTES: Elongation beyond capacity of testing equipment before failure occured
Sample slipped in jaws while test was in progress.

TABLE II

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FS-02	1	41.0	40.7		11	FTB
AVERAGE						
HIGH						
LOW						

NOTES:

8555 CHESAPEAKE DRIVE, SUITE 101
SAN DIEGO, CALIFORNIA 92123

Project Name: Sparks and Buttercup
Location: Spokane, Washington
Project Number: 60-5035-03
Date: May 19, 1994

BONDED SEAM STRENGTH TEST RESULTS

TABLE I

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FS-03	3	41.5	40.9	78		No Break
AVERAGE						
HIGH						
LOW						

NOTES: Elongation beyond capacity of testing equipment before failure occured.

TABLE II

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FS-03	3	41.2	40.3		12	FTB
AVERAGE						
HIGH						
LOW						

NOTES:

8555 CHESAPEAKE DRIVE, SUITE 101
SAN DIEGO, CALIFORNIA 92123

Project Name: Sparks and Buttercup
Location: Spokane Washington
Project Number: 60-5035-03
Date: May 19, 1994

BONDED SEAM STRENGTH TEST RESULTS

TABLE I

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FS-04	4	40.3	38.9	78		No break
AVERAGE						
HIGH						
LOW						

NOTES: Elongation beyond capacity of testing equipment before failure occured.

TABLE II

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FS-04	4	40.0	39.7		13	FTB
AVERAGE						
HIGH						
LOW						

NOTES:

8555 CHESAPEAKE DRIVE, SUITE 101
SAN DIEGO, CALIFORNIA 92123

Project Name: Sparks and Buttercup
Location: Spokane, Washington
Project Number: 60-5035-03
Date: May 19, 1994

BONDED SEAM STRENGTH TEST RESULTS

TABLE I

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FS-05	5	41.0	41.1	84		No break
AVERAGE						
HIGH						
LOW						

NOTES: Elongation beyond capacity of testing equipment before failure occured.

TABLE II

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FS-05	5	40.9	40.8		12	FTB
AVERAGE						
HIGH						
LOW						

NOTES:

8555 CHESAPEAKE DRIVE, SUITE 101
SAN DIEGO, CALIFORNIA 92123

Project Name: Sparks and Buttercup
Location: Spokane, Washington
Project Number: 100-5035-03
Date: May 19, 1994

BONDED SEAM STRENGTH TEST RESULTS

TABLE I

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FCS-01	Panel 1	40.5	40.0	80		No break
	R-1-3					
AVERAGE						
HIGH						
LOW						

NOTES: Elongation beyond capacity of testing equipment before failure occured.

TABLE II

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FCS-01	Panel 1	40.5	40.1	~~8~~	13	FTB
AVERAGE						
HIGH						
LOW						

NOTES:

8555 CHESAPEAKE DRIVE, SUITE 101
SAN DIEGO, CALIFORNIA 92123

Project Name: Sparks and Buttercup
Location: Spokane, Washington
Project Number: 60-5035-03
Date: May 19, 1994

BONDED SEAM STRENGTH TEST RESULTS

TABLE I

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FCS-02	Panel 2	42.0	41.3	74		No break
	R-2-1					
AVERAGE						
HIGH						
LOW						

NOTES: Elongation beyond capacity of testing equipment before failure occurred

TABLE II

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FCS-02	Panel 2	42.1	41.6		10	FTB
AVERAGE						
HIGH						
LOW						

NOTES:

8555 CHESAPEAKE DRIVE, SUITE 101
SAN DIEGO, CALIFORNIA 92123

Project Name: Sparks and Buttercup
Location: Spokane, Washington
Project Number: 60-5035-03
Date: May 19, 1994

BONDED SEAM STRENGTH TEST RESULTS

TABLE I

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FCS-03	Panel 3	40.0	39.5	77		No Break
	R-1-1					
AVERAGE						
HIGH						
LOW						

NOTES: Elongation beyond capacity of testing equipment before failure occured.

TABLE II

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FCS-03	Panel 3	40.1	39.7		12	FTB
AVERAGE						
HIGH						
LOW						

NOTES:

9555 CHESAPEAKE DRIVE, SUITE 101
SAN DIEGO, CALIFORNIA 92123

Project Name: Sparks and Buttercup
Location: Spokane, Washington
Project Number: 60-5035-03
Date: May 19, 1994

BONDED SEAM STRENGTH TEST RESULTS

TABLE I

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FCS-04	Panel 4	39.5	40.1	75		No break
	R-2-2					
AVERAGE						
HIGH						
LOW						

NOTES: Elongation beyond capacity of testing equipment before failure occured.

TABLE II

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FCS-04	Panel 4	39.7	39.8		14	FTB
AVERAGE						
HIGH						
LOW						

NOTES:

9555 CHESAPEAKE DRIVE, SUITE 101
SAN DIEGO, CALIFORNIA 92123

Project Name: Sparks and Buttercup
Location: Spokane, Washington
Project Number: 60-5035-03
Date: May 19, 1994

BONDED SEAM STRENGTH TEST RESULTS

TABLE I

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FCS-05	Panel 5	40.1	40.7	79		No break
	R-2-3					
AVERAGE						
HIGH						
LOW						

NOTES: Elongation beyond capacity of testing equipment before failure occured

TABLE II

SEAM ID		THICKNESS		BONDED SEAM STRENGTH (SHEAR)	SEAM PEEL ADHESION	
SAMPLE NO.	SEAM NO.	TOP (MIL)	BOTTOM (MIL)	LOAD (PPI)	LOAD (PPI)	BREAK TYPE
FCS-05	Panel 5	39.9	40.4		13	FTB
AVERAGE						
HIGH						
LOW						

NOTES:

KLEINFELDER

SHEET 1 OF 1

PROJECT Sparks Buttercup PROJECT NO. 60-5035-03

SUBJECT Destructive Testing of Geomembrane Welds BY KRW DATE 5-19-94

REVIEWED BY DATE

- Tested 5 field seams and 5 factory seams from Panels 1 - 5 which were installed on 5-18-94.

- Results of testing indicate seams met specifications for installation as per shear & peel requirements.

- Approval given to Jim Sprott and Contractor to begin covering geomembrane with vegetative layer.

- No breakage was observed during strength in shear testing due to the PVC ~~Geotex~~ geomembranes elongation. Each of the samples tested elongated beyond the capacity of the testing equipment before failure occured.

- Testing Equipment: Applied Ultrasonics, Inc.
  Tensile Check System Model TCS-03
  Serial #9327

  (calibration sheet attached)

APPLIED
ULTRASONICS
INCORPORATED

CALIBRATION CERTIFICATE

This is to certify that Tensile Check System Model TCS-03, Serial# 9327 has been calibrated to means traceable to the National Bureau of Standards.

Edward G. Obeda
APPLIED ULTRASONICS, INC.
Date 23 March 1993

INSTALLER'S WARRANTY

NORTHWEST LININGS & GEOTEXTILE PRODUCTS, Inc.
20017 89th AVE. SOUTH
KENT, WA 98031
206-872-0244
FAX 206-872-0245

June 17, 1994

Kleinfelder, Inc.
15050 SW Koll Parkway, # L
Beaverton, Oregon 97006

Attention: Scott Wallace

Subject: Warranty for Sparks & Buttercup Landfill Project

Dear Steve,

Enclosed please find Northwest Linings Limited Installation Warranty for the above mentioned project.

The Manufacturers Warranty Application has been forwarded to Staff Industries for processing and will be forwarded to your attention as soon as it is complete.

If you have any further questions regarding this matter please contact me at your convenience.

Sincerely,

Bonnie Knight

Bonnie Knight
Project Secretary

Enclosure

/blk

NORTHWEST LININGS & GEOTEXTILE PRODUCTS, INC.
LIMITED INSTALLATION WARRANTY

Purchaser: US NATIONAL BANK OF OREGON

Owner: US NATIONAL BANK OF OREGON

Project: SPARKS & BUTTERCUP LANDFILL

Type of Material: 40 Mil PVC **S.F. of Material:** 110,825 S.F.

Effective Date: May 20, 1994

NORTHWEST LININGS & GEOTEXTILE PRODUCTS, INC., (Northwest Linings) hereby warranty to Purchaser, subject to the terms and conditions contained herein, and not withstanding anything to the contrary in any applicable or related contracts, as follows:

The fabrication of all field seams and penetrations made by Northwest Linings shall be free of defects and shall withstand the effects of normal weather conditions and normal wear and tear, for a period of 1 year (s) based on a pro-rata formula as defined herein. Weather which shall not be considered normal, for purposes of this Limited Installation Warranty, shall be that which is customarily considered to be in the nature of an act of God, casualty or catastrophe, including, but not limited to, earthquake, flood, piercing hail, tornado or fire.

This Limited Installation Warranty is expressly conditioned upon normal use and service of the materials supplied by Northwest Linings for the purpose and in the manner for which said materials are designed and manufactured. Normal use and service shall exclude, by way of example and not limitation, exposure of the delivered materials to harmful chemicals or solid falling objects; abuse by machinery, equipment, people, insects or animals; excessive pressures or stresses on the delivered materials during and/or after installation; failure to properly prepare the soil base underlying the delivered materials, in a pre-consolidated basis with due consideration for the water table and water content of said soil base. Deviation from any aforesaid conditions shall void this Limited Installation Warranty.

By issuance of this Installation Warranty Northwest Linings assumes no responsibility whatsoever for and cannot be held liable in any way for any claim, demand, loss, damage or injury arising from, resulting from or connected with any engineering characteristic or failure.

Any liability incurred by Northwest Linings pursuant to this Limited Installation Warranty shall be and is hereby limited to repair of the specific area of the liner found to be defective and within the scope of this Installation Warranty. In no event shall Northwest Linings' liability for repair exceed the value of said area pursuant to a pro-rata formula whereby the value of the area decreases from the initial value of the area by ten percent (10%) per year.

Any claims of defective workmanship under this Limited Installation Warranty must be made to Northwest Linings by Purchaser within thirty (30) days after the alleged defect in workmanship was noticed or should have been noticed. Any claim of alleged defective workmanship not received by Northwest Linings within said thirty (30) day period shall be deemed to have been waived by Purchaser.

The previously mentioned warranties are granted to Purchaser in lieu of any other warranties, express or implied, including, but not limited to, warranties of merchantability of fitness for a particular purpose. This Limited Installation Warranty and the remedies set forth herein are exclusive remedies available to Purchaser in the event the delivered materials and/or installation are claimed or found to be defective. Neither Northwest Linings, nor its agents, officers, directors, shareholders, successors and assigns shall be liable for any special, direct, indirect or consequential damages, losses or injuries (including, without limitation, lost profits) resulting from or caused by the delivered materials, or any defect, failure or malfunction thereof, of the installation by Northwest Linings.

NORTHWEST LININGS & GEOTEXTILE PRODUCTS, INC.

By: _____
Rod W. Newton, President

Dated: June 16, 1994

ACCEPTANCE REPORT
SPARKS AND BUTTERCUP LANDFILL
SPOKANE, WASHINGTON

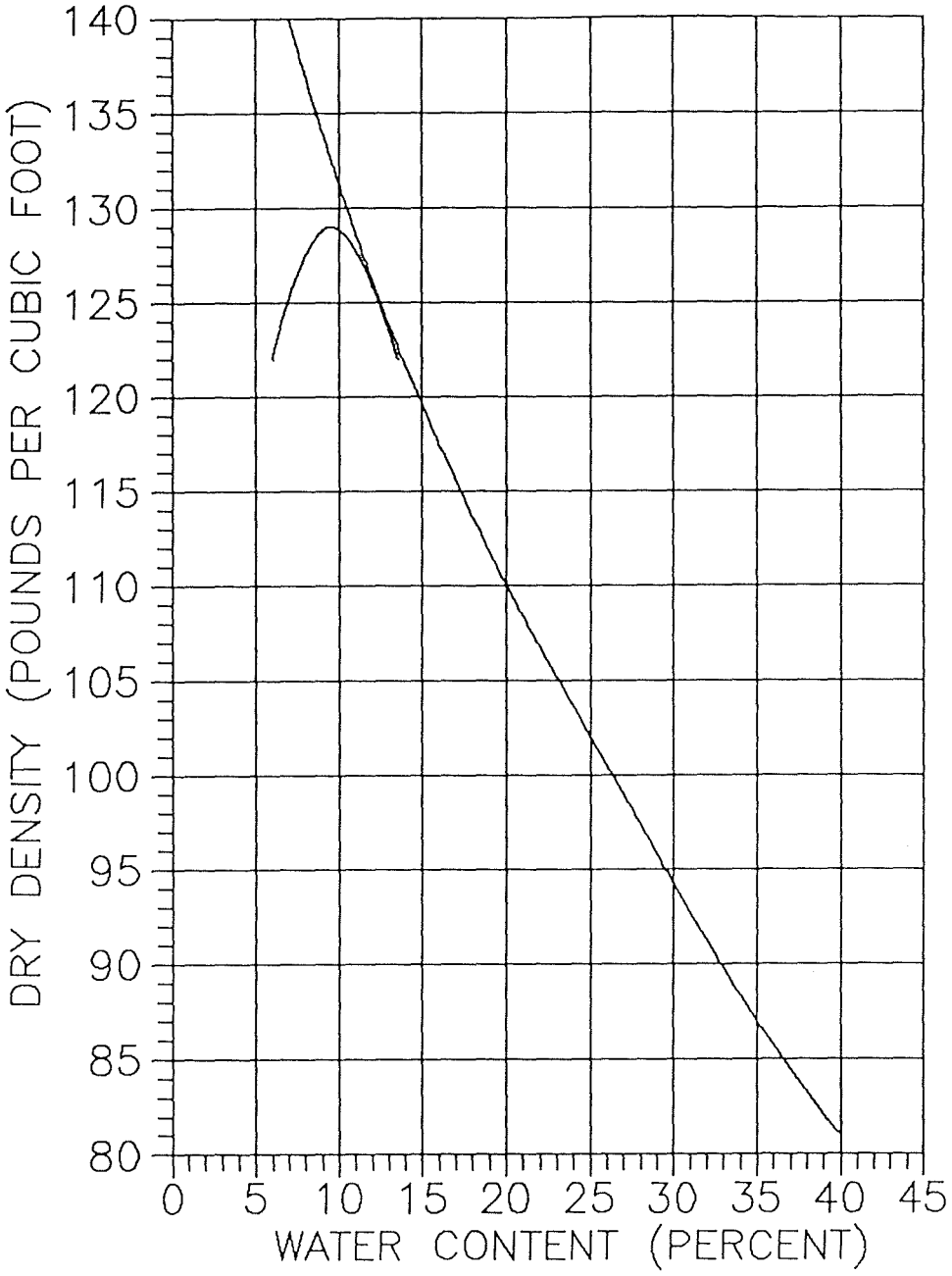
Work Element: **Vegetative Layer**

Date: June 1, 1994

CQA Monitor: Jim Sprott, Kleinfelder JAS

Vegetative layer soils overlying the geomembrane liner were placed in accordance with project plans and specifications. Approximate thicknesses based on grade stake markers is 1.5 feet over the landfill surface and 2.0 to 3.5 feet over slopes on the north, east, and west sides. Field measurements and survey data indicate 8500 cubic yards of material was placed over the geomembrane liner to meet finish grade specifications. Field desity tests indicate that vegetative layer soils were compacted to an average of 89.5% of their maximum dry density, thereby meeting the compaction criteria for vegetative layer soils (85% of maximum dry density) set forth in the project plans and specifications. Approval was issued for placement of the vegetative layer by the CQA Monitor on June 1, 1994.

REVISIONS
BY_____ DATE_____



PROJECT NAME: SPARKS – BUTTERCUP LANDFILL
PROJECT NUMBER: S0318–0120
DATE: May 13, 1994
SAMPLE LOCATION: Unknown
SAMPLE DESCRIPTION: Brn Silty SAND w/ Trace Gravel
TEST METHOD: ASTM D–1557
MOISTURE CONTENT: 9.5%
DRY DENSITY: 129.0 PCF
REFERENCE NO:

PROCTOR TEST RESULTS

FILE_____

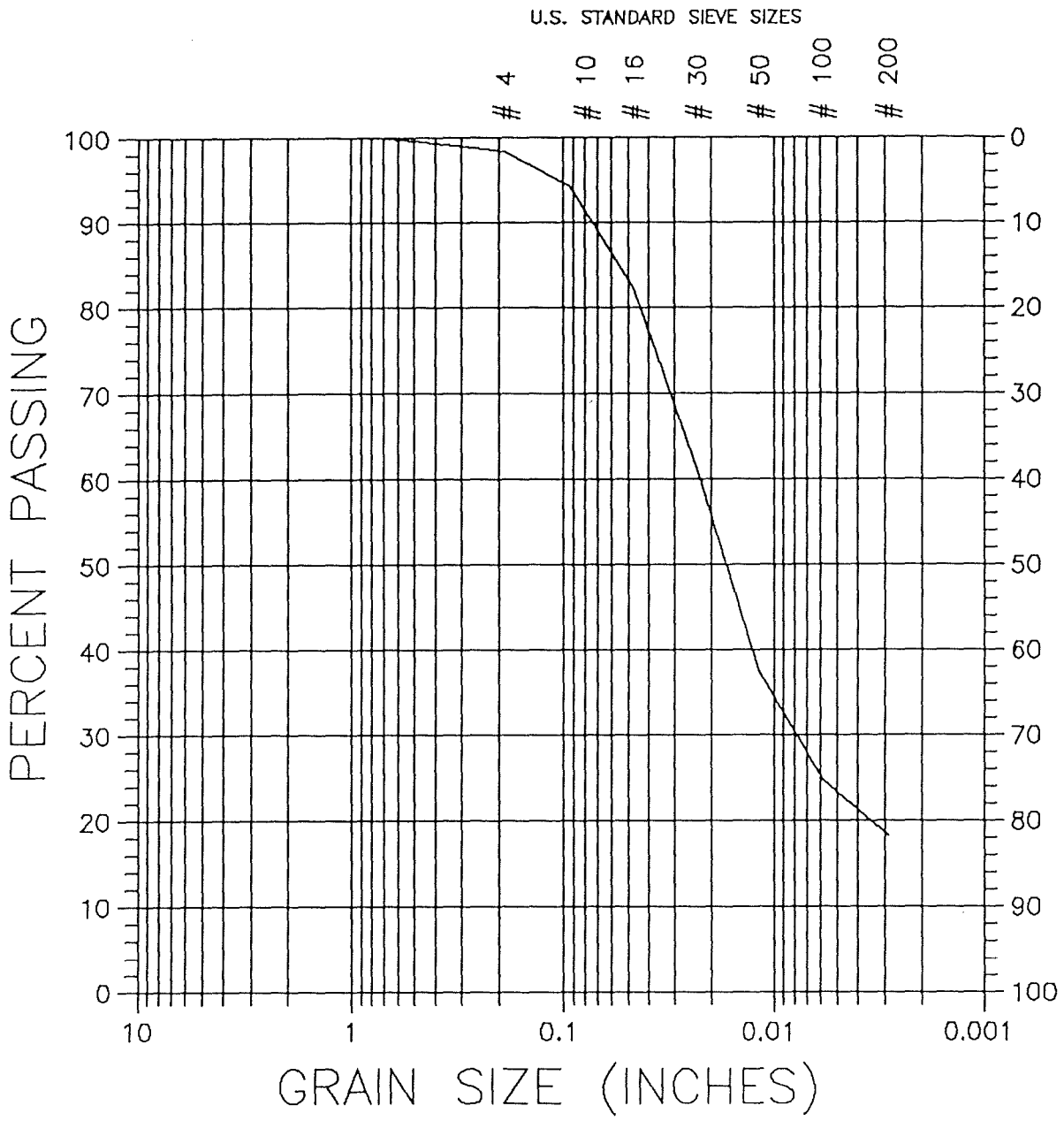
CHECKED BY_____

HCI Howard Consultants, Inc.

REVISIONS BY DATE

FILE

CHECKED BY

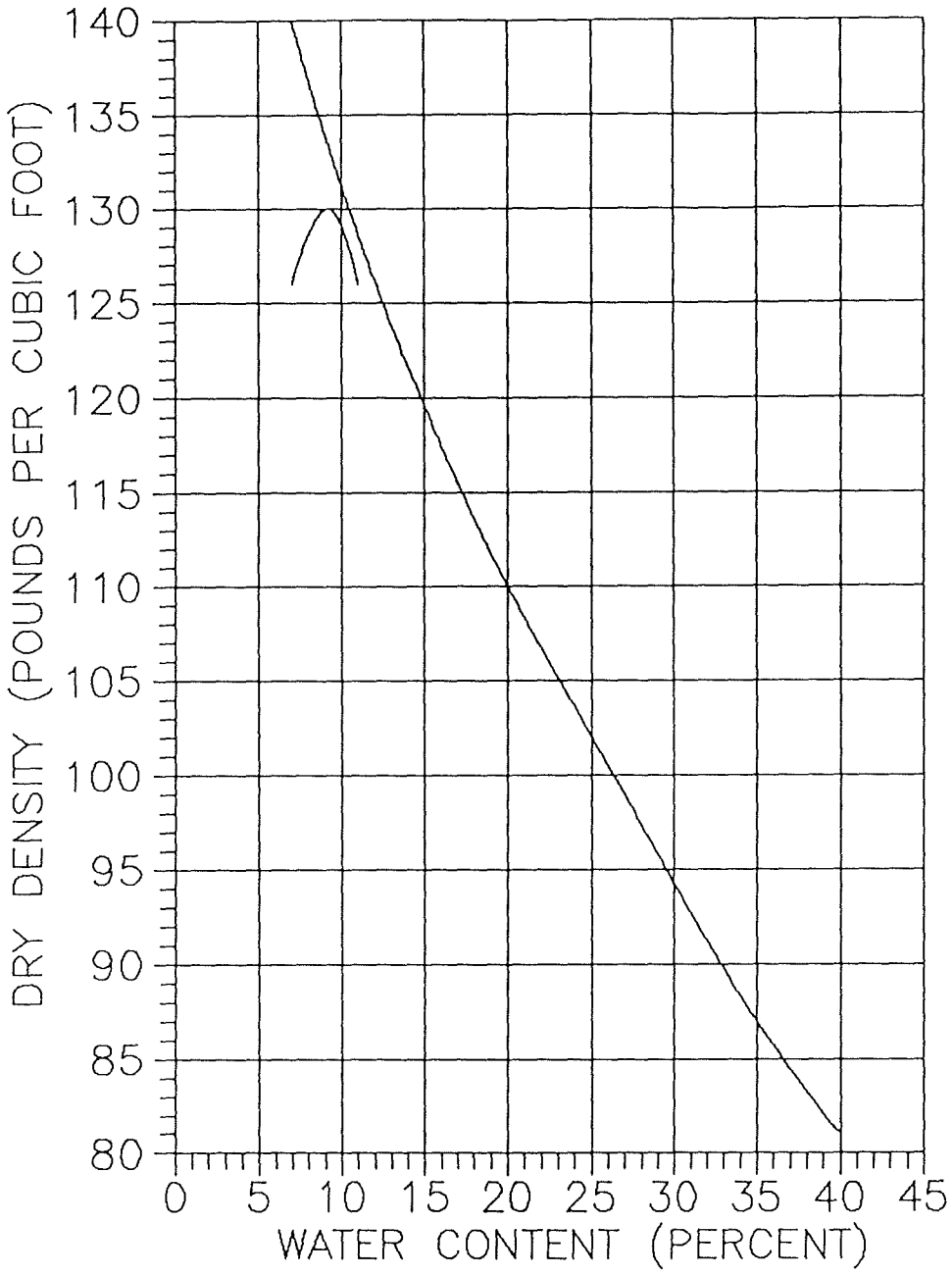


PROJECT NAME: Sparks–Buttercup Landfill
PROJECT NUMBER: S0318–0120
DATE: May 13, 1994
SAMPLE LOCATION: Unknown
SAMPLE DESCRIPTION: Brown Silty SAND with Trace Gravel
PERCENT PASSING #4: 98.5%
PERCENT PASSING #200: 18.3%
TEST METHOD: ASTM D–422 D–1140

SIEVE ANALYSIS RESULTS

HCI Howard Consultants, Inc.

REVISIONS
BY_____ DATE_____



PROJECT NAME: SPARKS – BUTTERCUP LANDFILL
PROJECT NUMBER: S0318-0120
DATE: May 27, 1994
SAMPLE LOCATION: Unknown
SAMPLE DESCRIPTION: Medium Brown Silty SAND with Gravel
TEST METHOD: ASTM D-1557
MOISTURE CONTENT: 9.2%
DRY DENSITY: 130.0 PCF
REFERENCE NO:

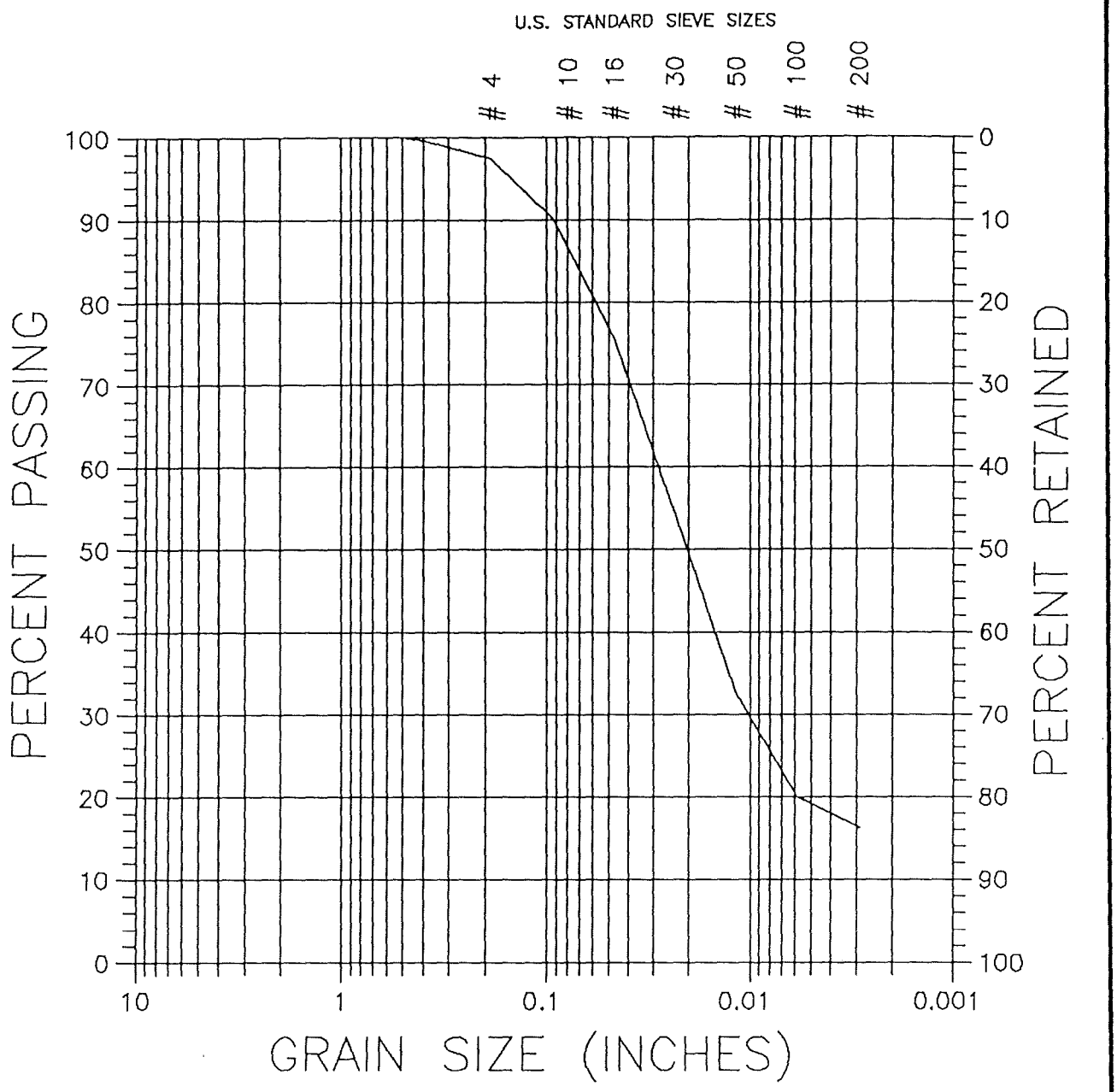
PROCTOR TEST RESULTS

FILE_____

CHECKED BY_____

HCI Howard Consultants, Inc.

REVISIONS BY_____ DATE_____



PROJECT NAME: SPARKS – BUTTERCUP
PROJECT NUMBER: S0318–0120
DATE: May 25, 1994
SAMPLE LOCATION: Unknown
SAMPLE DESCRIPTION: Medium Brown Silty SAND with Gravel
PERCENT PASSING #4: 97.5%
PERCENT PASSING #200: 16.3%
TEST METHOD: ASTM D–422 D–1140

SIEVE ANALYSIS RESULTS

HCI Howard Consultants, Inc.

CHECKED BY_____ FILE_____

FILE NO. 60 1535-03
JOB NAME Sparks & Summerlin
DATE 6/24/94
TECH James Sprott
TEST LOCATIONS SELECTED BY: JHG/RGW
COMPACTION CONTROL ☒ DENSITY TESTING ☐

NUCLEAR DENSI. FIELD FORM

KLEINFELDER

MILEAGE
HOURS
WEATHER

RESULTS REPORTED .0

STANDARD COUNT
Density
Moisture

Test No.	Mode	Approximate Location	Wet Density	Depth below FSG (ft)	Moisture Percentage	Dry Density	Curve No.	Lab Maximum	% Compaction	Specified Compaction	Remarks
1	m/d	STATION #15 LIFT #2	126.6	.667	6.0	119.5		129.0	92.6	85.0	
2	m/d	STATION #14 LIFT #2	126.0	.667	7.8	116.8		129.0	90.5	85%	
3.		STATION #13 LIFT #2	118.5	.667	7.6	110.0		129.0	85.3	85%	
4		STATION #9 LIFT #2	132.5	.667	9.1	121.4		129.0	94.1	85%	
		STATION #7 LIFT #2	131.5	.667	7.3	122.5		129.0	95.0	85%	
		STATION #6 LIFT #2	129.1	.667	6.9	120.7		129.0	93.6	85%	
		STATION #5 LIFT #2	124.2	.667	6.8	116.2		129.0	90.1	85%	

SHEET of

FILE NO. 6 5035-03
JOB NAME ~~JONES & BUTTERCUP~~
DATE 6/2/94
TECH JAS
TEST LOCATIONS SELECTED BY: JAS/RSW
COMPACTION CONTROL ☒ DENSITY TESTING ☐

NUCLEAR DENSITY FIELD FORM

KLEINFELDER

MILEAGE
HOURS
WEATHER

RESULTS REPORTED TO

STANDARD COUNT
Density 3204
Moisture 663

Test No.	Mode	Approximate Location	Wet Density	Depth below FSG (ft)	Moisture Percentage	Dry Density	Curve No.	Lab Maximum	% Compaction	Specified Compaction	Remarks
1	m/D	STATION #10 LIFT #2	117.1	.667	5.3	111.2		130.0	85.5	85%	
		STATION #16 LIFT #2	125.1	.667	6.8	117.2		130.0	90.1	85%	
		STATION #8 LIFT #2	120.9	.667	5.9	114.1		130.0	87.8	85%	
		STATION #3 LIFT #2	116.1	.667	6.9	108.6		130.0	83.5	85%	
		STATION #2 LIFT #2	120.5	.667	5.4	114.3		130.0	87.9	85%	
		STATION #6 LIFT #2	121.8	.667	6.7	114.2		130.0	87.9	85%	
		STATION #12 LIFT #2	118.7	.667	6.9	111.0		130.0	85.4	85%	
		STATION #1 LIFT #2	129.2	.667	6.5	121.3		130.0	93.3	85%	

SHEET of

5

ACCEPTANCE REPORT
SPARKS AND BUTTERCUP LANDFILL
SPOKANE, WASHINGTON

Work Element: **Drainage Structures**

Date: June 3, 1994.

CQA Officer: Scott Wallace, Kleinfelder

Shotcrete drainage channels were installed by Champion Concrete Pumping in accordance with project plans and specifications on June 3, 1994. Drainage structure installation was tentatively approved on June 3, 1994, contingent upon receipt of satisfactory compressive strength testing documentation on cores taken from a test panel. 28 day minimum compressive strength tests for the shotcrete used to construct the drainage channels exceeded the project specification of 3000 psi. Laboratory results are included for reference following this acceptance report.

REVISIONS BY DATE

SPARKS-BUTTERCUP LANDFILL
8th Avenue and Dollar
Spokane, Washington

Project No. S0318-0120

SHOTCRETE CORE COMPRESSIVE STRENGTH

	CORE #1	CORE #2	CORE #3
Location	cored from test panel		
Date Received	06/03/94	06/03/94	06/03/94
Date Tested	06/30/94	06/30/94	06/30/94
Core Length Caped (inches)	4.29	4.69	4.55
Core Diameter (inches)	2.76	2.76	2.76
Area (square inches)	6.0	6.0	6.0
Ultimate Load (lbs)	34,700	34,000	35,000
CORRECTION FACTOR (percent)	96	98	98
COMPRESSIVE STRENGTH (psi)	5550	5550	5720

FILE

BY DATE
CHECKED BY

HCI Howard Consultants, Inc.

PLATE

APPENDIX B

Daily Field Reports

KLEINFELDER

TECHNICIAN'S DAILY REPORT

Date May 2-6, 1994 Hours (6 hrs. travel time)(0.5 hrs. on-site)

File No. 60-5035-03 Miles 375 miles Portland-Spokane

Project Sparks & Buttercup Weather Clear 85° F

Diary: During the week Motley Motley, Inc. began grubbing the site and regrading the surface of the landfill in preparation for the import of foundation layer soils early next week. Vegetation was removed and trees were cut down in within the footprint of the debris fill area. Local residents salvaged some of the trees for use as firewood. The remainder of the wood debris was taken to a chipping facility in north Spokane for use as hog fuel. No landfill debris was removed from the site. See field file for pictures of grubbing/regrading operations. Density tests were taken after regrading operations were complete. In-place density measurement varied from 80% relative percent compaction - moisture 11.4% to 104% compaction - moisture 6%. A CAT 980 loader, ~~track~~ tracklhoe and CAT trackexcavator were used to regrade and compact the debris materials. Surface was fairly uniform in appearance and topography generally ~~was~~ resembled the regrading contours outlined in the specification. RSW authorized placement of fill materials after observing regraded surface on 5-9-94.

Approved: _____ Signed: KJW

M-3

KLEINFELDER

TECHNICIAN'S DAILY REPORT

Date May 10, 1994 Hours 0715-11:30 (4.25)

File No. 60-505-03 Hours Dailies 12:15-15:45 (3.50)

Project Sparks & Buttercup Weather Clear 80°F

Diary: On-Site @ 0715 Met with Tom of Motley-Motley (Job Foreman) went over alignment of anchor trench relative to edge of refuse along upper portion of fill (top of slope).

- Surveyor on-site to record initial grade measurements @ 0900-1200
- 0930 RSW went with Gerry Motley to take a look at source area for fill material (Barker Rd. Pit) Also met with landscape contractor to get input on surface materials for finish grade and hydroseeding compatibility. Will met with Gary Sander of Nelson Landscape Service later in week to observe samples of hydroseeding projects done around Spokane area.

- Waited for trucks from 12:30-15:30 no show so we shut down for the day.

- 1545 off-site to Hotel

Approved: _____ Signed: RSW

M-3

KLEINFELDER

SHEET ____ OF ____

PROJECT Sparks & Buttercup PROJECT NO. 60-5035-01

SUBJECT Daily Report BY JAS / RSW DATE 5/10/94

Day 1 REVIEWED BY ____ DATE ____

Joe on site, Tom with contractor here removing tree debris

Scott & Tom went over top of landfill to locate anchor trench. Top of cap will be adjusted to blend with natural grade.

Tom & Scott staked out probable anchor trench location.

800 Surveyor showed up establishing bench @ NW corner and SE corner.

- Jerry with contractor arrived on site. Trying to get fire permit to get water from hydrant.

Tom has scheduled 3 trucks of fill for today.

KLEINFELDER

TECHNICIAN'S DAILY REPORT

TRUCK COUNT - ||| |||.... 8C for the day

Date May 11, 1994 Hours 0710-1815 (11 hrs) +/-

File No. 60-5035-03 Hours ~~Miles~~

Project Sparks & Buttercup Weather Clear

Diary: On-Site @ 0710 3 trucks had come the previous afternoon after we had left according to Tom of Motley - Motley. 6 trucks had brought material by the time we arrived. Tom was spreading the material out.

1000 - Collected bulk sample for gradation (ASTM D-422) and moisture density (proctor ASTM D1557) analysis by Howard Consultants, Inc of Spokane (Mark Story - contact)

1330 - Met with Ron Brown of Nelson Landscaping re: application of hydroseed. Optimal application would be Late August Early September. Also toured an application of Weyerhauser Experimental (Soil Guard) Bonded Fiber Matrix for slope areas or areas susceptible to erosion. We will need to alter spec. and negotiate with Motley Motley for the application of the seed as Motley's early June does not appear to be the time of year for application of seed. Dust control & Weed control may also be an issue to address.

Off-Site @ 1815 after observing placement of foundation layer rocks around toe of slope.

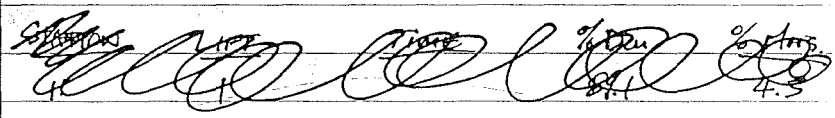
Approved: _____ Signed: _____

M-3

Daily Notes: 5/11/94

710 on site
- 3 trucks delivered last night.
- take procter sample this morning.
-

1030 Procter Sample taken to lab.



Truck Count:

KLEINFELDER

TECHNICIAN'S DAILY REPORT

Date May 12, 1994 Hours 0730-1215 (4.25)

File No. 60-5035-03 Miles 1315-1715 (4.00)

Project Kopperks & Buttercup Landfill Cap Weather 55°F P.C.

Diary: 0730 - On Site to begin observation of foundation layer construction. TAS taking periodic ND readings to monitor compaction in fill soils. Measured toe of slope at several locations to assess how far the vegetative layer will have to extend around the existing perimeter of the fill area in order to meet the specification (3:1 H:V). Estimate 5-10 feet.

Collected sample for gradation & Moisture Density Testing @ Howard Consultants.

Preliminary estimate based on # of trucks delivering material to-date is 3000-3400 yd³.

Off Site @ 1715

Approved: _____ Signed: RSW

M-3

KLEINFELDER

SHEET____ OF____

PROJECT Sparks & Buttercup PROJECT NO. 60-5035-03

SUBJECT _____ BY JAS DATE ~~Today~~ 6/12/13

_____ REVIEWED BY _____ DATE _____

TRUCK COUNT:

0715 arrived on site.

- Started density gauge warm up
- Checked with Tom 9 loads in this morning

KLEINFELDER

SHEET ____ OF ____

PROJECT Sparks & Butterfield PROJECT NO. 60-5035-03

SUBJECT Daily Log BY SAS DATE 5/13/94

REVIEWED BY ____ DATE ____

- on site 7:15-
- Tom had compacted most of the North Slope after we left last night.
- Checked length of landfill @ short end it was 208' including the slope.
- Checking slope to confirm 3:1 H:V final slope.

1-800-448-7772 STATE WIDE FENCING

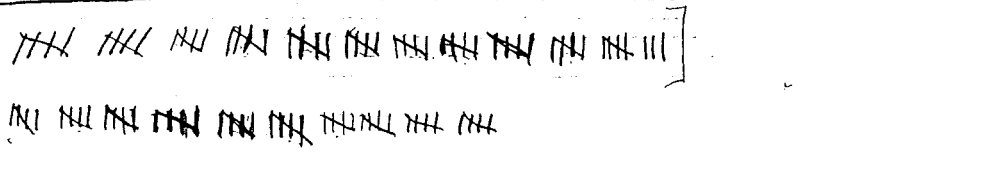
D1557

D422

- Copy forms for MEMBRANE Logs while in office on Saturday.

TRUCK COUNT:

12 North - 58



KLEINFELDER

SHEET 1 OF 1

PROJECT Sparks 4 Buttercups PROJECT NO. 160-5035-03

SUBJECT Daily Field Report BY DATE 5-13-94

REVIEWED BY DATE

0715 - JAS & RSW on-site to observe foundation layer construction. Final grading operations were underway along toe of slope and upper (southern 1/2 of fill area).

Met with Shotcrete guy to go over locations of trenches. Estimate 1-2 days for completion. 2 test panels to be sprayed for QC.

Approved foundation layer grade @ 1330.

Lined out JAS on tasks and responsibilities for next week.

Total Trucks for foundation layer = 270 @ 15-18 yd^3/truck

Off-site to Ecology to get info. on well head protection program and to say hello to Patti Cantin @ 1400

0715-1400 (6 3/4 hrs.) RSW

Travel time to RHd. (6.5 hrs.) ≈ 375 miles

KLEINFELDER SHEET ___ OF ___

PROJECT Sparks & Buttercup PROJECT NO. 60-5035-03

SUBJECT Daily Field Log BY JAS DATE 5/16/94

REVIEWED BY ___ DATE ___

0715 arrived on site;

- Tom 2 has removed the guard ~~posts~~ posts from the monitoring well. Currently they are raking the slope and ~~the~~ picking up rocks from the top of the cap
- Tracks show that people were on the landfill over the weekend. Car tracks are everywhere. ?

0800 liner contractor not here

0820 liner contractor still not here.

Scott arrives @ 1030 - 1045 Horizon Air

0930 Bill from Motley Motley came by

~~#2~~ 6 months of fencing. See if

post area

KLEINFELDER

SHEET ____ OF ____

PROJECT Sparks & Boxercup — PROJECT NO. 60-5035-01

SUBJECT Daily Field Log — BY TAS — DATE 5/19

REVIEWED BY ____ DATE ____

0715 arrived on site.
raining - temp wet but not too wet for Northwest Liner.
Tom is starting to build up slope and across road.

0800 Northwest liner people are setting patches, and drying area for seam to new panels.

1200 Northwest liner finished with the liner and left site.

515 left site, a total of 52 trucks for the day.

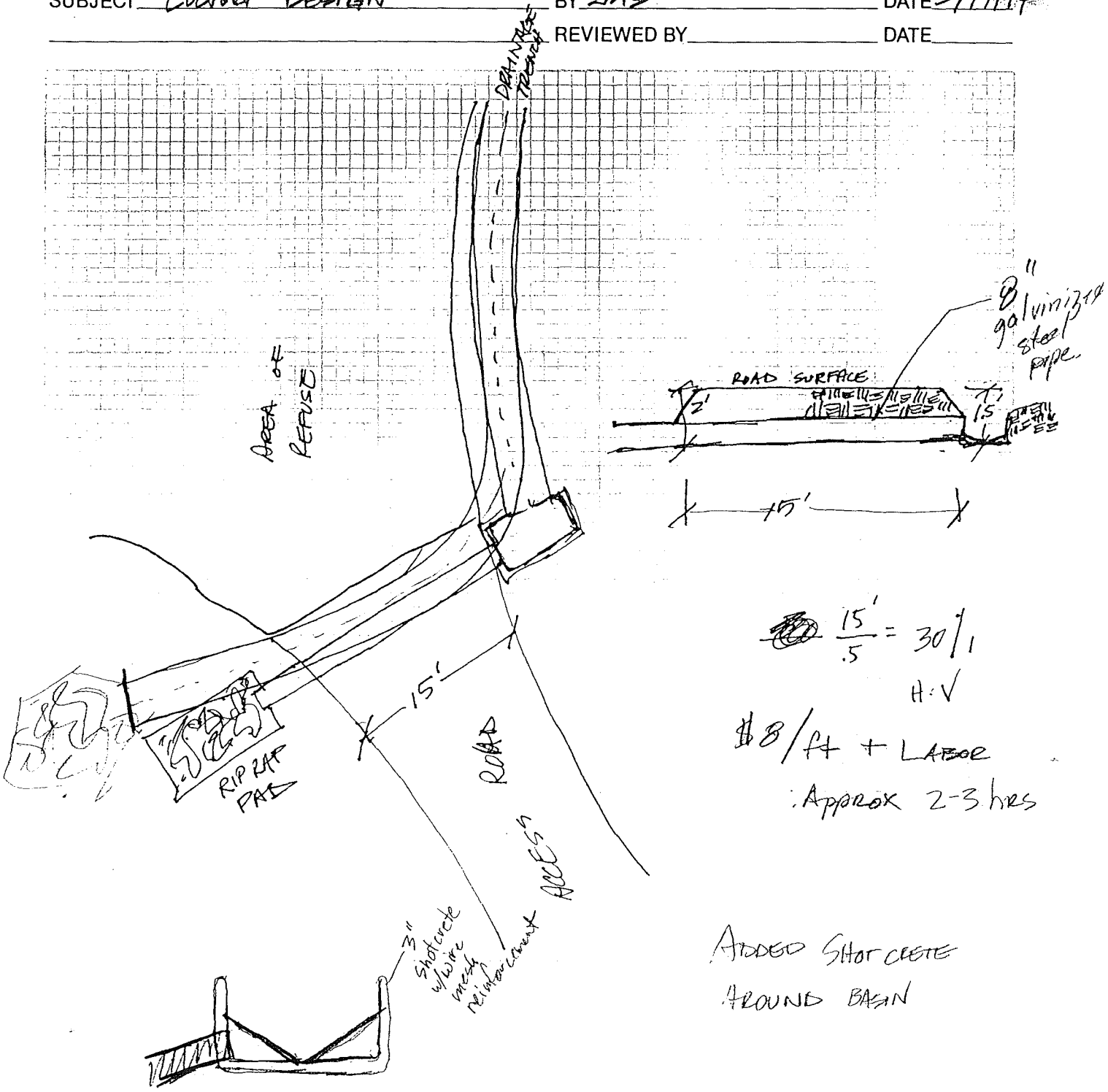
KLEINFELDER

SHEET____ OF____

PROJECT Sparks & Buffalo PROJECT NO. 60-5035-03

SUBJECT Culvert Design BY JAS DATE 5/19/94

REVIEWED BY_____ DATE_____



$\frac{15'}{.5} = 30/1$

H:V

$8/ft + LABOR

: Approx 2-3 hrs

ADDED SHOTCRETE AROUND BASIN

KLEINFELDER

SHEET____ OF____

PROJECT Sparks & Buttercup PROJECT NO. 60-5035-03

SUBJECT Daily Log BY SAS DATE 5/20/94

REVIEWED BY_____ DATE_____

0730 at site, Tom & Tom working on slope and top.

1000 raining very hard, site is very sloppy, Tom thinks that we can go on as long as the trucks are able to make the runs. Took pictures of the runoff on top and bottom to show how it will flow.

415 trucks done running for the day approx 62 cubic yards today. Tarp not totally covered. Tom is parking machines in road and putting up no trespassing signs.

KLEINFELDER

SHEET 1 OF 2

PROJECT Sparks & Buttercup PROJECT NO. 60-5035-03

SUBJECT Daily Field Log BY SAS DATE 5/23

REVIEWED BY DATE

730 arrived on site. walked across tarp. Seemed to survive the weekend ok. There are some motocross tracks across the tarp but no signs of any holes. Tom and Tom are working the top with a back hoe and the belly dumps and the slope with the loader and the end dumps. Tom is planning a four day work week until Thursday.

SE corner 12th & Eastern

Jerry, Tom and I measured the ~~slope~~ top and the slope to estimate the amount of soil will be necessary to put 18" of top soil on the area.

- 12590.6 yds total counting the yds for the foundation layer.

Informed RSW of estimated totals, wants to continue with 14-18" cap with possibly making up some soil with the final slope.

Truck count: 86 trucks running!

25 & gray C 1142

#16 8:50
9:34
2:22

KLEINFELDER

SHEET 2 OF 2

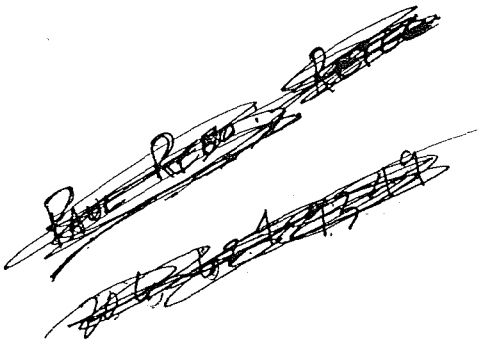
PROJECT Sparks & Buttercup PROJECT NO. 60-5035-03

SUBJECT Daily field log. BY JAS DATE 5/23

REVIEWED BY DATE

Fence was ordered to be ~~[illegible]~~ delivered on June 1st. Sorry & Tom think that is pushing the schedule and that should be pushed back some.

Unable to get more than 6 trucks today and probably all week as well.



KLEINFELDER

SHEET____ OF____

PROJECT Sparks & Buttercup PROJECT NO. 60-5035-03

SUBJECT Daily Field Log BY JAS DATE 5/24/94

REVIEWED BY____ DATE____

0800 arrived on site. Tom & Tom working on top and bottom still.

-person-
Shotcrete (509) 928-6776 David Bertsch

1215 left to get gauge from hotel
picked up gauge from hotel.

Ran preliminary density measurements along slope to give Tom an idea where he stands now. Using the proctor of 129 pcf there was 87% and 91% compacting along the Northeast corner of the slope. Rip Rap delivered to site. Consists of rounded and semi-angular 3-12" rock. 2 loads delivered.

315 called state wide Rent a fence — postponed delivery of fence until further notice. Need 1 week notice for delivery and set up.

#16 11:20

81 TRUCKS

KLEINFELDER

SHEET ___ OF ___

PROJECT Sparks & Boomerang PROJECT NO. 60-5035-03

SUBJECT Daily Field Log BY JAS DATE 5/25

REVIEWED BY ___ DATE ___

0715 arrived on site, trucks running dirt and Tom and Tom working on the top and slopes

Contacted David Bertsch of Shotcrete company. He tried to come by on Friday to schedule but rain. Said he'll be by on 5/26 to look at site again.

1130 Took bulk sample to Howard Consultants to run gradation and Moisture Density on it.

130 Tom has completed 80% of the slope. After he has graded it, it measures out to be approx. 3 to 1 slope.

730 PM HORIZON

91 trucks

TRUCK COUNT:

𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 — 50

𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 1

KLEINFELDER

SHEET____ OF____

PROJECT Sparks & Butter cup — PROJECT NO. 60-5035-03

SUBJECT Daily Geo Log — BY JAS — DATE 5/26

REVIEWED BY________ DATE________

715 arrived on site

Tom & I tried to figure how many loads we had left before we went over.

5448 total yds estimated in place

6854 total yds uncompacted delivered

assuming 18 yds/load

7,200 total estimated

117 total trucks remaining

Truck Counts	
Thursday	52
Friday	62
Monday	83
Tuesday	81
Wednesday	104
Total	382

1136 Dave Bartsch with Champion visited site. Walked with him and showed him the channel locations. Tom says that the area will be ready on Thursday for the wire mesh. Dave will drop by on Tuesday to check if he can begin on Wednesday PM.

Schedule fence for 6/3

285 trucks

~~trucks~~

Scott's # Tuesday Night.
(503) 389-1733

Truck Count:

卌 卌 卌 卌 卌 卌 卌 卌 卌 卌 卌 卌 卌 卌 ||||

KLEINFELDER

SHEET ___ OF ___

PROJECT Sparks E. Extension PROJECT NO. 60-5035-07

SUBJECT Daily Field Log BY ___ DATE 5/31/94

REVIEWED BY ___ DATE ___

715 arrived on site.
- no ~~[illegible]~~ mishaps over the memorial day weekend.
- Tom and I discussed the runoff control berm, told him I want it to be high enough to be compacted and noticeable.

930 Tom is starting to grade the top for the finished cap thickness.

200 Tim has started to fill in the 6" on top of the flats, 2 trucks are running so Tom & Tom can keep up with them while completing the grade.

Backhoe broken down. Bill working on it with Tom

330 Tom is ready to remove to grade stakes to get the final grade. ~~18"~~ 14-18" of soil in all areas except NW corner.

545 Talked with Tom about posts at the entrance. There weren't any in place when he arrived so we decided to hold off on installing any new posts. Trucks will haul in the morning until we are ready. I told Tom to leave approx 4-6" of new soil on the construction road at a spot where water was collecting. We will have to survey it by tape for billing.

TRUCK COUNT:

||||| ||||| ||||| ||

= 45 trucks

KLEINFELDER SHEET ___ OF ___

PROJECT Sparks & Buttercup PROJECT NO. 60-5035-03

SUBJECT Daily Field Log BY SAS DATE 6/1/94

REVIEWED BY ___ DATE ___

0730 on site. Tom has started the berm around the top edge. 2 trucks are running dirt. Berm was been changed to a slight upward slope at the top edge. The slope is wide enough so it can be walked in with the trackscavator and the height is adjusted according to the slope of the uphill side

berm cross section

1000 checked cover thickness on top of NW corner. Had Tom 2 put up to 10" of additional cover with 8" remaining below rip rap pad.

1200 Called Howard Consultants, the latest proctor numbers for the fill are 130.0 pcf and 9.2% moisture. Asked them to send all sample reports to date to the Portland office.

1300 Tom is grading the Eastern Drainage Channel. Told him that the plans indicated that the top channel and side channel was not connected. Decided to not have him connect them so people would be force to drive over the channel and break it up.

224 trucks

11 trucks dumped in low areas

KLEINFELDER

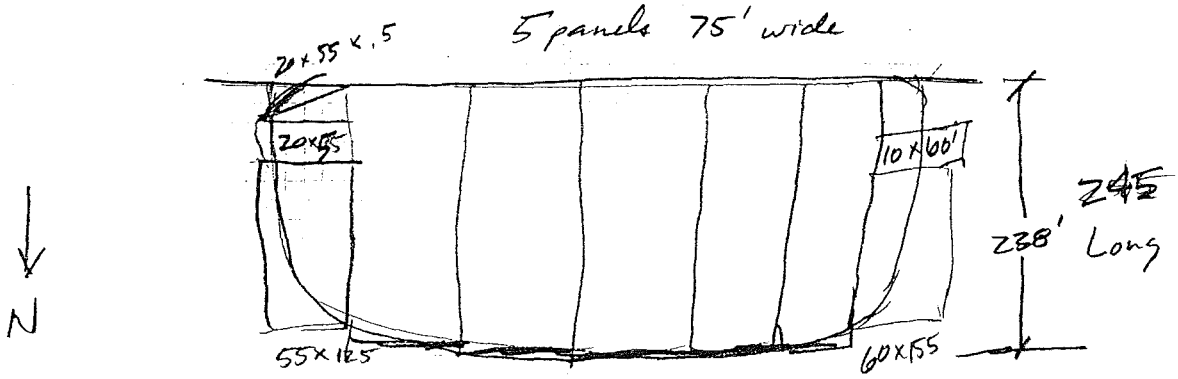
SHEET 2 OF 2

PROJECT Sparks & Boomerang PROJECT NO. 60-5035-03

SUBJECT Daily Field Log BY SAS DATE 6/1/94

REVIEWED BY DATE

330 Tom just got the bill in from Northwest Linings. The total area was 110,000 sft. The bid estimate called for 90,000 sft. After reviewing the panel placement log and using measurements taken before the lining was placed, I figured the area covered was approx. 108,000 – 110,000 sft. T



Approx 108,000 – 110,000

545 – culvert installed. leaving site

KLEINFELDER

SHEET____ OF____

PROJECT_____ PROJECT NO._____

SUBJECT_____ BY_____ DATE 6/2/94

_____ REVIEWED BY_____ DATE_____

730 arrived on site. Tom & Leroy here with Motley Motley fence person showed up today, left will be back

830: Champion Concrete pumping on site. started working of South Drainage channel.

Daily Report 6-2-94 60-5035-03 LDW

JAS & RSW on-site @ 0715. Motley crew was completing surface grading operations on landfill cap.

0815 Champion Concrete Pumping crew showed up to begin setting up for shotcreting drainage channels. Placed wire reinforcing mesh 6"x6" in ditches and applied shotcrete over the mesh.

Champion crew completed shotcreting @ 1800 hrs.

Off-site to get rental car w/ JAS @ ~1300

Off-site for day @ 1835. Met w/ Fenceman. His crew will be out Sat. (6-5-94) to set up.

6-3-94

Met Motley crew (Tom & Jerry) who were putting final touches on grades and picking up rocks after staging the field.

Survey crew on-site to measure finish elevations and calculate volumes.

Motley began loading excavation equipment on low-boys to haul away from job site.

Dropped off shotcrete panel (1) for 28 day break @ Howard Consultants (Jack Lamb) 3-3" cores

APPENDIX H

Application for Authorization to Use

APPLICATION FOR AUTHORIZATION TO USE

INDEPENDENT REMEDIAL ACTION REPORT
SPARKS AND BUTTERCUP SUBDIVISION
SPOKANE, WASHINGTON

KLEINFELDER PROJECT NUMBER 60-5035-03

JULY 25, 1994

TO: Kleinfelder, Inc.
15050 S.W. Koll Parkway, Suite L
Beaverton, Oregon 97006

FROM:

Gentlemen:

Applicant _____ hereby applies for permission to:
[State here the use(s) contemplated]

for the purpose(s) of:
[State here why you wish to do what is contemplated as set forth above]

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Dated: _____ _____
Applicant

by_____