

KANSAS GEOLOGICAL SURVEY

1930 Constant Ave., Campus West
The University of Kansas
Lawrence, Kansas 66047-3726
phone 785-864-3965
fax 785-864-5317

May 18, 2005

Dennis Bowman, CET
Bucher, Willis & Ratliff Corporation
609 West North Street
Salina, Kansas 67401-2064

**Re: Dwight D. Eisenhower Veterans Affairs Medical Center
Leavenworth, Leavenworth County, Kansas
Construction and Demolition Landfill Permit #0509
BWR Project #2005-0205**

Dear Mr. Bowman:

I received your request for comment by the Kansas Geological Survey (KGS) on the proposed updating of the operating procedures and constructions plans for the Construction and Demolition (C&D) Landfill at the Eisenhower Veterans Affairs Medical Center (VAMC) in Leavenworth, Kansas.

You provided an orthophotograph of unknown age, a topographic map, FEMA flood hazard map, a county soils map, and two tables on engineering interpretations of the soil units. Additional sources of information I consulted included: the geologic map of Leavenworth County (McCauley, 1998, KGS Map M-53), an inventory map of landslide features and a landslide hazard map of the Leavenworth 7½' quadrangle (Ohlmacher, 2003, KGS Map M109A and M109B), and a report on the caves of Kansas (Young and Beard, 1993, KGS Educational Series 9). These additional publications are available through Publication Sales at the Kansas Geological Survey.

Site overview:

The proposed Construction and Demolition Landfill is located on a north facing slope of a hill that is an extension of the Missouri River bluffs. Three geologic units are exposed at the landfill site: Loess, Stranger Formation, and Stanton Limestone. Loess is wind deposited silt and clay. The Stranger Formation is a bedrock unit composed dominantly of shale and sandstone, and the Stanton limestone consists of interbedded limestone and shale. These bedrock units weather to form residual soils with low strengths. The loess is at the top of the hill. It overlies the Stranger Formation which overlies the Stanton Limestone.

Landslides:

Ohlmacher (2003, M109A) shows that a portion of the landfill will be on an older landslide deposit. Older landslides are landslides that have occurred in the past but are not currently

active. The features (scarps, earth fissures, toes, etc.) of older landslides are muted. Given the right conditions older landslides can be reactivated. Ohlmacher (2003, M109B) indicates that the majority of the site has a 1% to 10% probability of being on a landslide or having a landslide in the future. Some portions of the site have landslide probabilities of greater than 10%. The data on the landslide maps is not intended as a substitute for a detailed site evaluation of landslides. The Kansas Geological Survey recommends that a detailed site investigation for landslides be conducted for this C&D Landfill and the results be incorporated in the design and operation plan.

Additional information on landslides and landslide-hazard maps of northeastern Kansas can be found in the following papers:

- Ohlmacher, G. C., 2000. The relationship between geology and landslide hazards of Atchison, Kansas, and vicinity. Kansas Geological Survey, Current Research in Earth Sciences, Bulletin 244, pt. 3, 9 pp.; online only at <http://www.kgs.ku.edu/Current/2000/ohlmacher/ohlmacher1.htm/>
- Ohlmacher, G. C., and Davis, J. C., 2003, Using multiple logistic regression for predicting landslide hazard in the vicinity of Atchison, Kansas, USA: Engineering Geology, v. 69, p. 331-343.

Karst:

The Kansas Geological Survey has no information about natural karst hazards in the City of Leavenworth. However, an abandoned coal-mine shaft opened next to a bridge pier for Route K92. The Kansas Department of Transportation might have information on that incident. Young and Beard (1993, p. 16) report caves in the Captain Creek Limestone Member of the Stanton Limestone in Wilson and Montgomery Counties. Whether the composition, hydrogeology, and landscape conditions that make the Captain Creek Member susceptible to karst in Wilson and Montgomery counties also exist in Leavenworth County needs to be investigated.

Summary:

The above discussion represents the information that the Kansas Geological Survey has on this C&D Landfill site. Other geologic conditions, not discussed here, might affect the stability of this landfill. The information provided in this letter is from regional studies and should not be used as a substitute for detailed site investigations by a licensed geologist or engineer. It is the responsibility of the applicant to produce the detailed site evaluation.

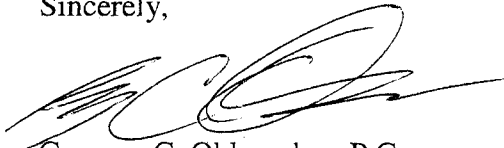
The Bureau of Waste Management, Kansas Department of Health and Environment (KDHE) intends to rewrite the section of *Kansas Statutes Annotated ... Administrative Regulations Article 29-Solid Waste* with respect to "unstable areas." The change involves removing the requirement of "approval and exemption" from the KGS in 28-29-302(h)(4). Paul Graves at KDHE (letter dated April 15, 2005) informed me that "the amended regulations might simply list a number of relevant agencies (including KGS), requiring applicants to notify agencies about proposed new/expanded landfills and request whether the agencies have information on the suitability of the proposed site for the intended use." KDHE intends to post an interim policy on their web

site. In anticipation of the interim policy, I have responded to your request without approval or exemption of the landfill site. If you have questions regarding landfill regulations, please contact:

Paul Graves, P.E.
Chief, Solid Waste Landfills Unit
Bureau of Waste Management
Kansas Department of Health & Environment
Phone: (785) 296-1596
E-mail: pgraves@kdhe.state.ks.us

If you have any questions about my comments, feel free to contact me at (785) 864-2194 or ohlmac@kgs.ku.edu.

Sincerely,

A handwritten signature in black ink, appearing to read 'G. Ohlmacher', with a long horizontal flourish extending to the right.

Gregory C. Ohlmacher, P.G.
Engineering Geologist

May 12, 2005

Lee Allison
Director
Kansas Geological Survey
University of Kansas, West Campus
1930 Constant Avenue
Lawrence, KS 66047-3726

Re: Dwight D. Eisenhower Veterans Affairs Medical Center
Leavenworth, Kansas
Construction/Demolition Landfill Permit No. 0509
BWR Project No. 2005-0205

To Whom It May Concern:

Bucher, Willis & Ratliff Corporation, in coordination with the Eisenhower Veterans Affairs Medical Center (VAMC), is in the process of updating the facility's current operating procedures and construction plans. The Kansas Department of Health and Environment requires both the operating and construction plans be updated and approved by their Bureau of Waste Management before permit renewal is granted. An intergovernmental review is required to gather information from other agencies to be utilized throughout the Bureau's review process.

Your agency is one of which the Bureau requests comments from. Please review the information contained within this letter and attached references. Then respond in writing with any comments your agency feels should be considered during the review process.

The C/D landfill site is owned by the VAMC and currently comprises approximately 2.7 acres. The updated construction plans will expand the current area to no greater than 10 acres. The existing site is located in Section 7, Township 9S, Range 23E as indicated on the enclosed site plan and contour map.

Three additional attachments are enclosed to aid in the review process. One being a FEMA floodplain to show the landfill site is located outside of both the 100- and 500-year flood plains. The other attachments include a soil survey map and a table identifying and summarizing the soil characteristics anticipated to be found on site.

Please feel free to call me at 785-827-3603, if you should have any questions or comments.

Sincerely,

BUCHER, WILLIS & RATLIFF CORPORATION



Dennis Bowman, CET
Project Manager
Environmental Engineering

DMB/jpm/ds

Enclosures



Leavenworth VA Medical Center

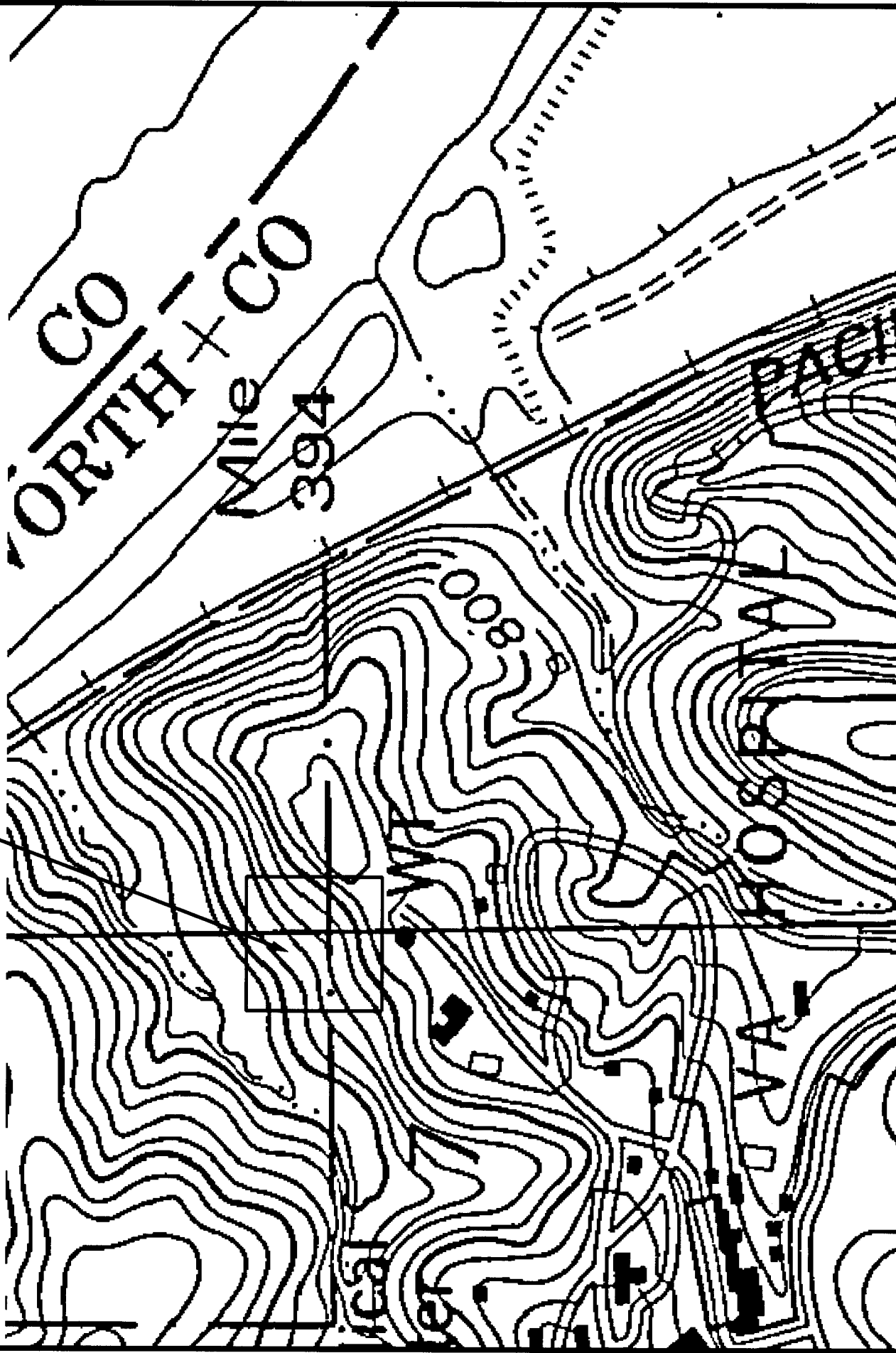


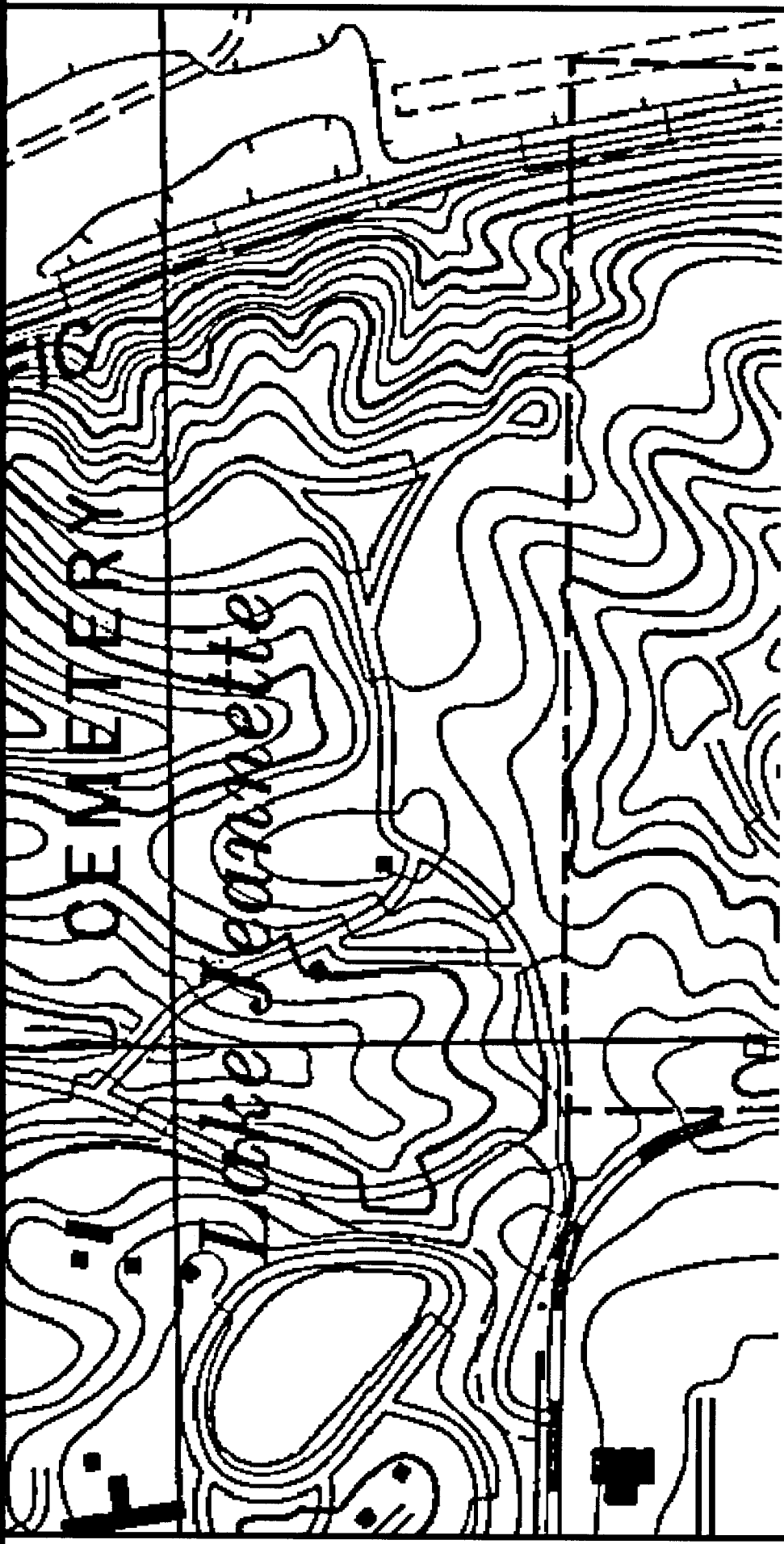
VA Medical Center C/D Landfill-Site Plan Leavenworth, Kansas

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BUH BUCHER, WILLIS & RATLIFF
CORPORATION
609 WEST NORTH STREET SALINA, KANSAS 67401 785-827-3603

Existing C/D Landfill
S7,R23E,T9S
2.7 Acres



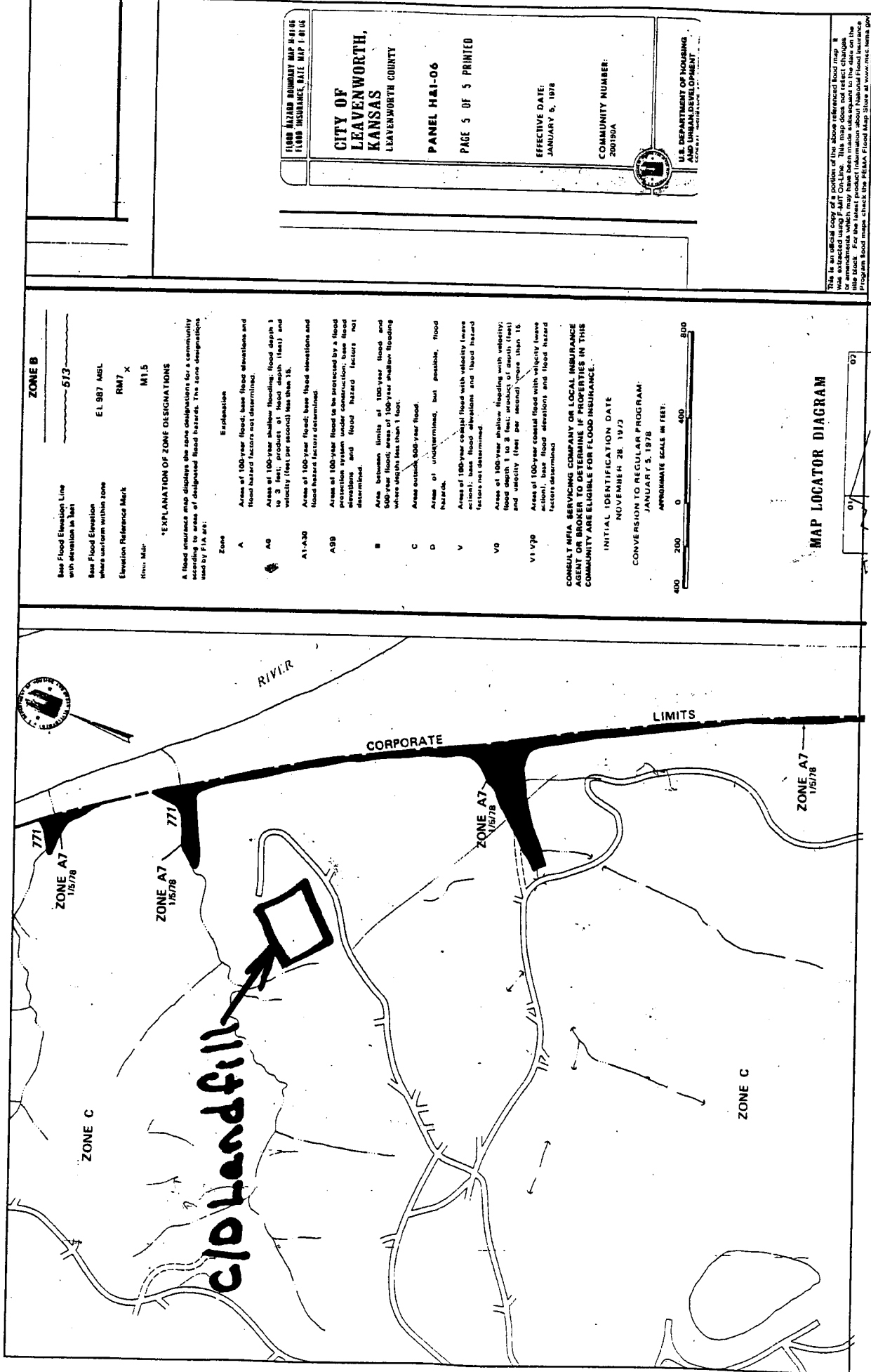


VA Medical Center C/D Landfill-Contour Map Leavenworth, Kansas

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Scale: 1" = 400'



FLOOD HAZARD ZONING MAP H-21-06
FLOOD INSURANCE RATE MAP F-21-06

**CITY OF
LEAVENWORTH,
KANSAS**
LEAVENWORTH COUNTY

PANEL H-21-06

PAGE 5 OF 5 PRINTED

EFFECTIVE DATE:
JANUARY 5, 1978

COMMUNITY NUMBER:
200150A

U.S. DEPARTMENT OF HOUSING
AND URBAN DEVELOPMENT
FLOOD INSURANCE

This is an official copy of a portion of the above referenced flood map. It is not to be used for any purpose other than to determine flood hazard. Any change or amendment which may have been made subsequent to the date of this map. For the latest product information about National Flood Insurance Program flood maps, check the FEMA Flood Map Store at www.nrc.fema.gov





(Joins inset A, sheet 20)

R. 23 E. | R. 35 W.

2 890 000 FEET

TABLE 7.—Engineering

An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in for referring to other series.

Soil series and map symbol	Suitability as a source of—		Soil features affecting—	
	Road fill and subgrade	Topsoil	Highway location	Pond reservoir areas
Knox: Kh, Kk, Km, Kn	Fair road fill; fair shear strength; fair subgrade; medium plasticity; medium support.	Fair: silty clay loam texture; low organic-matter content. Poor if slope is more than 15 percent.	Erodible; slope	Moderate permeability; slope.
Konawa: Ko, Kw	Fair road fill; fair shear strength; fair subgrade; medium plasticity; medium support.	Good where slope is less than 5 percent, fair where slope is 5 to 15 percent, and poor where slope is more than 15 percent.	Erodible; slope	Seepage potential; and in drainageways, slope.
Ladoga: La	Fair road fill; fair shear strength; fair subgrade; medium support; medium plasticity.	Fair: silt loam to silty clay loam texture.	Erodible	Moderately slow permeability.
Marshall: Mb, Mc, Md	Fair road fill; fair shear strength; fair subgrade; medium support.	Fair: silt loam texture; 8 to 16 inches thick; high organic-matter content.	Erodible	Moderate permeability.
Martin: Mn, Mr, Ms	Poor road fill; poor shear strength; poor subgrade; high plasticity; low support.	Poor: silty clay loam texture; less than 8 inches thick.	Difficult to establish vegetation; seepage potential; poor workability.	Slow permeability; shale within a depth of less than 40 inches in a few places; seepage potential.
Onawa: On, Oo	Poor road fill to a depth of 25 inches; poor shear strength; good road fill at a depth of 25 to 60 inches. Poor subgrade to a depth of 25 inches; high plasticity; low support; good subgrade at a depth of 25 to 60 inches.	Poor: less than 8 inches thick.	Subject to flooding; erodible; water table at a depth of 4 to 5 feet.	Slow permeability; moderately rapid below a depth of 25 inches; water table at a depth of 4 or 5 feet.
Oska: Os	Fair road fill; fair shear strength; fair subgrade; medium support.	Fair: silty clay loam texture; 8 to 16 inches thick.	Limestone within a depth of 40 inches.	Limestone within a depth of 40 inches; seepage potential; fractured limestone.
Pawnee: Pb, Pc, Pe	Poor road fill; poor shear strength; poor subgrade; low support; high plasticity.	Fair: clay loam texture; 8 to 16 inches thick.	Difficult to establish vegetation; poor workability; seepage potential; slow permeability.	Slow permeability; seepage potential along gravel pockets.
*Sarpy: Sa For Haynie part, see Haynie series.	Good road fill if confined; good subgrade.	Poor: loamy fine sand and fine sand textures.	Subject to flooding; erodible.	Very rapid permeability; high seepage potential.
Sharpsburg: Sb, Sc	Fair road fill; fair shear strength; fair subgrade; medium plasticity; medium support.	Fair: silty clay loam texture; 8 to 16 inches thick.	Erodible	Moderately slow permeability.
*Shelby: Se, Sh, Sm, Sp, Ss For Pawnee part of Sp and Ss, see Pawnee series.	Fair road fill; fair shear strength; fair to poor subgrade; medium to low support.	Fair: loam and clay loam texture; 8 to 16 inches thick.	Difficult to establish vegetation.	Moderately slow permeability; seepage potential; gravel pockets.
Sibleyville: Sy	Good road fill; fair subgrade; medium support.	Fair: loam texture; 8 to 16 inches thick.	Sandstone within a depth of 40 inches.	Moderate permeability; sandstone within a depth of 40 inches; seepage in places.

interpretations—Continued

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions that appear in the first column]

Soil features affecting—Continued

Embankments, dikes, and levees	Drainage of crops and pasture	Irrigation	Terraces and diversions	Waterways
Fair to good stability and compaction; fair shear strength; moderate shrink-swell potential; impervious.	Well drained; moderate permeability; sloping to steep.	Medium intake rate; high available water capacity; medium fertility; sloping to steep.	Irregular slopes; siltation of channels; erodible.	Slope; siltation of channels; erodible; medium fertility.
Fair to good stability and compaction; fair shear strength; moderate shrink-swell potential; impervious.	Well drained; rapid permeability in surface layer.	High intake rate of topsoil; low intake rate of subsoil; low fertility; gently sloping to steep; high available water capacity.	Low fertility; erodible; sedimentation of channels; slope.	Low fertility; erodible; siltation of channels; slope.
Fair to poor stability and compaction; fair shear strength; moderate to high shrink-swell potential; impervious.	Moderately well drained; moderately slow permeability; sloping.	Low intake rate; high available water capacity; medium fertility; sloping.	Dense, clayey subsoil; very hard when dry; construction difficult; erodible.	Clayey subsoil; medium fertility; siltation of channels.
Fair to good stability and compaction; fair shear strength; moderate shrink-swell potential; impervious.	Well drained; moderate permeability; gently sloping to moderately steep.	Medium intake rate; very high available water capacity; high fertility; gently sloping to moderately steep.	All features favorable.	All features favorable.
Fair to poor stability and compaction; poor shear strength; high shrink-swell potential; impervious; subject to sliding.	Moderately well drained; slow permeability; seepage in places; gently sloping to moderately steep.	Low intake rate; moderate available water capacity; seepy in places; gently sloping to moderately steep.	Dense, clayey subsoil; very hard when dry; slope; construction difficult.	Clayey soil; seepy; slope; difficult to establish vegetation.
Fair to poor stability and compaction; poor shear strength; high shrink-swell potential; impervious; high organic-matter content.	Somewhat poorly drained; slow permeability; nearly level; water table at a depth of 4 or 5 feet; poor slope stability below a depth of 25 inches; erodible; side slopes of ditches; outlets remote.	Low intake rate; high available water capacity; runoff slow; high fertility; nearly level.	Nearly level -----	Nearly level.
Fair to poor stability and compaction; fair shear strength; high shrink-swell potential; impervious.	Well drained; slow permeability; gently sloping and sloping.	Low intake rate; moderate available water capacity; gently sloping and sloping.	Local rocky areas -----	Local rocky areas.
Fair to poor stability and compaction; poor shear strength; high shrink-swell potential; impervious.	Moderately well drained; slow permeability; seepy in places; gently sloping and sloping.	Low intake rate; high available water capacity; seepy in places; gently sloping and sloping.	Clayey subsoil; construction difficult.	Clay subsoil; difficult to establish vegetation; erodible.
Good stability; fair to good compaction; low shrink-swell potential; poor resistance to piping; erodible.	Excessively drained ----	High intake rate; low available water capacity; soil blowing; low fertility; nearly level to undulating.	Nearly level to undulating; high intake rate.	Nearly level to undulating; high intake rate.
Fair to good stability and compaction; fair shear strength; moderate to high shrink-swell potential; impervious.	Moderately well drained; moderately slow permeability; gently sloping and sloping.	Low intake rate; high available water capacity; high fertility; gently sloping and sloping.	All features favorable	All features favorable.
Fair to good stability and compaction; fair shear strength; moderate shrink-swell potential; impervious.	Moderately well drained; moderately slow permeability; gently sloping to moderately steep; seepy in places.	Low to medium intake rate; high available water capacity; gently sloping to moderately steep.	All features favorable ----	All features favorable.
Fill material limited by depth; fair to good stability and compaction; good shear strength; moderate shrink-swell potential; erodible; moderately impervious.	Well drained; moderate permeability; seepy in places; bedrock within a depth of 40 inches; sloping.	Medium intake rate; low to moderate available water capacity; bedrock at a depth of 20 to 40 inches; sloping.	Bedrock at a depth of 20 to 40 inches; medium fertility; erodible; siltation of channels.	Bedrock at a depth of 20 to 40 inches; medium fertility; erodible; difficult to establish vegetation.

TABLE 6.—*Estimates of soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in for referring to other series that appear in the first column. The

Soil series and map symbols	Depth to—		Depth from surface	USDA texture	Classification	
	Bedrock	Water table			Unified	AASHO
	<i>Inches</i>	<i>Feet</i>	<i>Inches</i>			
Alluvial land: Aa. No valid estimates can be made. Variable material.						
Armster: Ac, Ad, Ae	>60	>10	0-10 10-60	Loam Clay loam	CL, ML-CL CL	A-4 or A-6 A-6 or A-7
Basehor: Ba	<20	>10	0-11 11	Loam Sandstone.	ML	A-4
Bremer: Br	>60	>5	0-13 13-34 34-70	Silty clay loam Silty clay Silty clay loam	CL or CH CH CL or CH	A-6 or A-7 A-7 A-6 or A-7
Elmont: Ec, Ed	>40	>10	0-15 15-65	Silt loam Silty clay loam	CL, ML-CL CL	A-4 or A-6 A-6 or A-7
Eudora: Eu	>60	>5	0-9 9-12 12-34 34-65	Very fine sandy loam Loamy very fine sand Silt loam Very fine sandy loam	ML-CL or ML SM or ML ML ML-CL or ML	A-4 A-4 A-4 A-4
*Gosport: Gc, Gs For Sogn part of Gs, see Sogn series.	20-40	>5	0-6 6-23 23	Silt loam Silty clay Shale.	ML or CL CH	A-4 or A-6 A-7
Grundy: Gt, Gu	>60	>10	0-15 15-30 30-65	Silty clay loam Silty clay Silty clay loam	ML-CL or CL CH CL or CH	A-6 A-7 A-6 or A-7
Gymer: Gy	>60	>10	0-7 7-60	Silt loam Silty clay loam	ML-CL or CL CL	A-4 or A-6 A-6 or A-7
Haig: Hg	>60	>10	0-9 9-45 45-60	Silty clay loam Silty clay Silty clay loam	CL CH CL or CH	A-6 or A-7 A-7 A-6 or A-7
Haynie: Hy	>60	>5	0-26 26-60	Silt loam Very fine sandy loam	ML ML-CL or ML	A-4 A-4
Judson: Ju	>60	>10	0-30 30-70	Silt loam Silty clay loam	ML-CL or CL CL	A-4 or A-6 A-6 or A-7
Kennebec: Ke	>60	>5	0-45 45-72	Silt loam Silty clay loam	ML-CL or CL CL	A-4 or A-6 A-6 or A-7
Knox: Kh, Kk, Km, Kn	>60	>10	0-6 6-60	Silt loam Silty clay loam	ML ML-CL or CL	A-4 A-4 or A-6
Konawa: Ko, Kw	>60	>10	0-19 19-47 47-60	Fine sandy loam Clay loam Loam	SM or ML CL ML-CL	A-4 A-6 A-4
Ladoga: La	>60	>10	0-7 7-60	Silt loam Silty clay loam	ML-CL CL or CH	A-4 A-6 or A-7
Marshall: Mb, Mc, Md	>60	>10	0-13 13-46 46-65	Silt loam Silty clay loam Silt loam	ML-CL or CL CL ML-CL or CL	A-6 or A-7 A-6 or A-7 A-6 or A-7

significant in engineering

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions symbol > means more than; the symbol < means less than]

Percentage less than 3 inches passing sieve—				Permea- bility	Available water capacity	Reaction	Shrink- swell potential
No. 4	No. 10	No. 40	No. 200				
				<i>Inches per hour</i>	<i>Inches per inch of soil</i>	<i>pH</i>	
	100	90-98	65-90	0.6-2.0	0.20-0.22	5.6-7.3	Moderate.
	100	90-98	70-85	0.2-0.6	0.15-0.19	5.1-7.3	Moderate to high.
	100	85-95	60-75	2.0-6.0	0.17-0.21	5.1-6.5	Low.
	100	95-100	85-95	0.2-0.6	0.21-0.23	6.1-7.3	Moderate to high.
	100	95-100	90-95	0.06-0.2	0.15-0.18	5.6-6.5	High.
	100	95-100	85-95	0.06-0.2	0.18-0.20	5.6-7.3	Moderate to high.
	100	90-100	70-90	0.6-2.0	0.22-0.24	5.6-6.5	Low.
	100	95-100	85-95	0.2-0.6	0.18-0.20	5.6-7.3	Moderate.
	100	85-95	51-65	2.0-6.0	0.20-0.22	6.6-7.3	Low.
	100	90-95	40-60	2.0-6.0	0.09-0.11	6.6-7.3	Low.
	100	90-100	70-90	0.6-2.0	0.20-0.22	7.3-8.4	Low.
	100	90-95	51-65	2.0-6.0	0.17-0.19	7.3-8.4	Low.
	100	90-100	70-90	0.6-2.0	0.22-0.24	5.6-6.5	Low.
	100	95-100	90-95	<0.06	0.15-0.17	4.5-5.5	Moderate.
	100	95-100	95-99	0.2-0.6	0.21-0.23	5.6-6.5	Moderate.
	100	95-100	90-98	0.06-0.2	0.16-0.19	5.1-6.5	High.
	100	95-100	95-99	0.2-0.6	0.15-0.17	5.6-7.3	Moderate to high.
	100	90-100	70-90	0.6-2.0	0.22-0.24	5.6-6.5	Moderate.
	100	95-100	85-95	0.2-0.6	0.16-0.19	5.6-6.5	Moderate to high.
	100	95-100	85-95	0.2-0.6	0.21-0.23	6.1-7.3	Moderate.
	100	95-100	90-95	0.06-0.2	0.14-0.17	6.1-7.3	High.
	100	95-100	85-95	0.06-0.2	0.18-0.20	6.1-7.3	Moderate.
	100	90-100	70-90	0.6-2.0	0.22-0.24	7.4-8.4	Low.
	100	90-95	51-65	2.0-6.0	0.17-0.19	7.4-8.4	Low.
	100	90-100	70-90	0.6-2.0	0.22-0.24	6.1-7.3	Moderate.
	100	95-100	85-90	0.6-2.0	0.18-0.20	5.6-6.5	Moderate.
	100	90-100	70-90	0.6-2.0	0.22-0.24	6.1-7.3	Moderate.
	100	95-100	85-90	0.6-2.0	0.18-0.20	6.1-7.3	Moderate.
	100	95-100	90-100	0.6-2.0	0.22-0.24	5.6-6.5	Low.
	100	95-100	90-100	0.6-2.0	0.16-0.18	5.6-6.5	Low to moderate.
	100	75-85	40-55	2.0-6.0	0.16-0.18	5.6-6.5	Low.
	100	90-100	70-80	0.6-2.0	0.15-0.19	5.1-6.0	Moderate.
	100	85-95	60-75	0.6-2.0	0.17-0.19	5.1-6.0	Moderate.
	100	95-100	80-98	0.6-2.0	0.22-0.24	5.6-7.3	Low to moderate.
	100	95-100	85-98	0.2-0.6	0.18-0.20	5.1-7.3	Moderate to high.
	100	90-100	85-99	0.6-2.0	0.22-0.24	5.6-6.5	Moderate.
	100	95-100	95-100	0.6-2.0	0.18-0.20	5.6-6.5	Moderate.
	100	90-100	95-100	0.6-2.0	0.20-0.21	6.1-7.3	Moderate.