



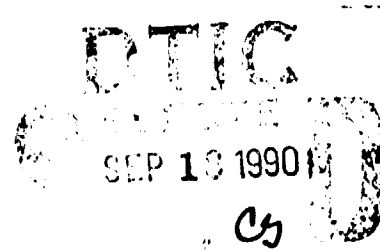
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TECHNICAL REPORT GL-90-13

PROPOSED 9TH INFANTRY DIVISION FORCE CONVERSION
DAMAGE, EROSION, AND NATURAL RESOURCES ASSESSMENT
FORT LEWIS, WASHINGTON

Volume II: PLATES

by

Monte L. Pearson, Patricia A. Morris, Robert J. Larson

Geotechnical Laboratory

and

L. Jean O'Neil, Michael R. Waring, H. Glenn Hughes, Mary C. Landin

Environmental Laboratory

DEPARTMENT OF THE ARMY

Waterways Experiment Station, Corps of Engineers
3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199



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CONVERSION; SOURCES ASSESSMENT

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0180-6199

by

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Geotechnical Laboratory

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Environmental Laboratory

DEPARTMENT OF THE ARMY

Waterways Experiment Station, Corps of Engineers
3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6



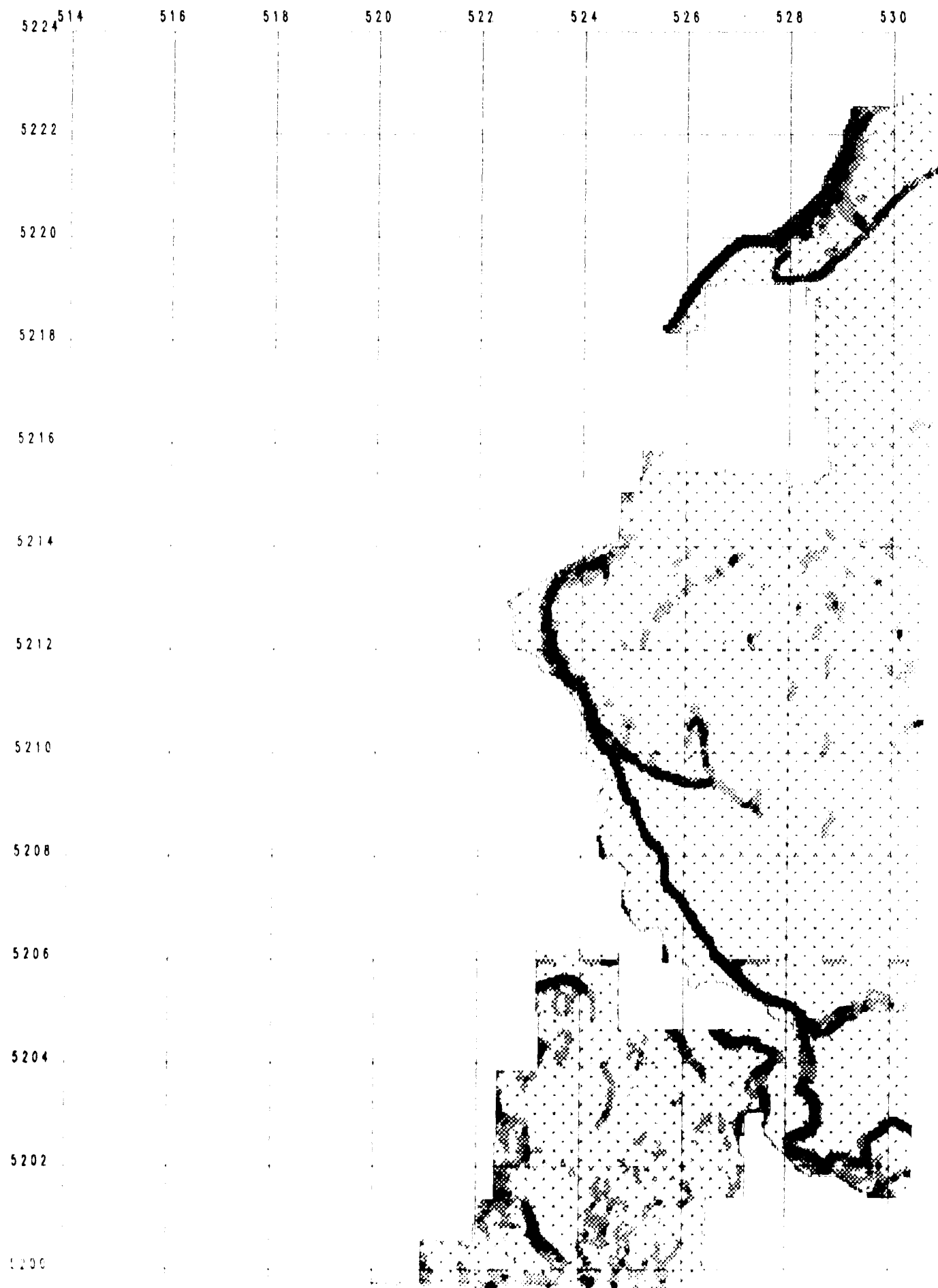
August 1990

Final Report

Approved For Public Release; Distribution Unlimited

Prepared for DEPARTMENT OF THE ARMY
US Army Engineer District, Seattle
Seattle, Washington 98124-2255

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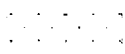
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U. S. Army Corps of Engineers
Waterways
Experiment
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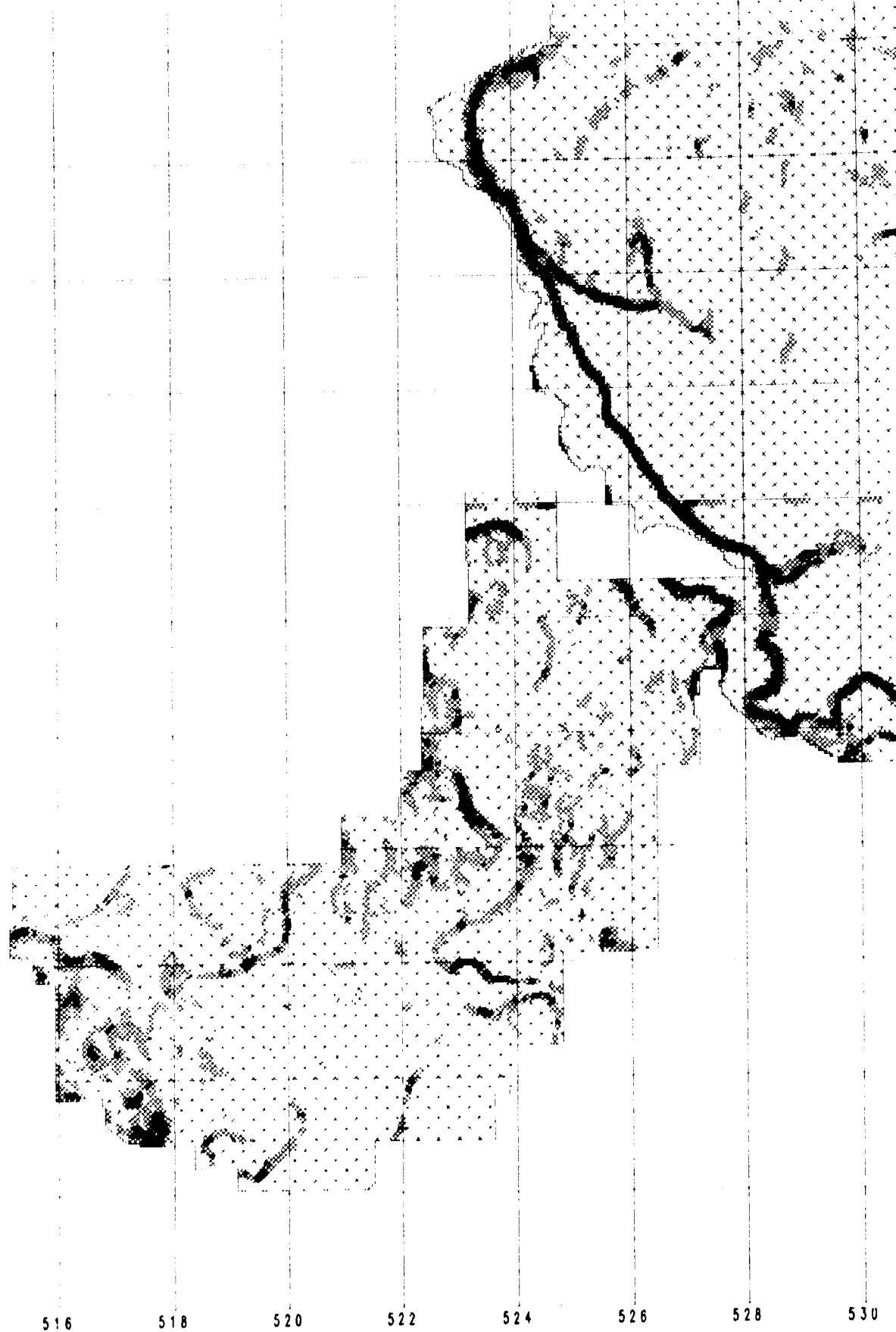
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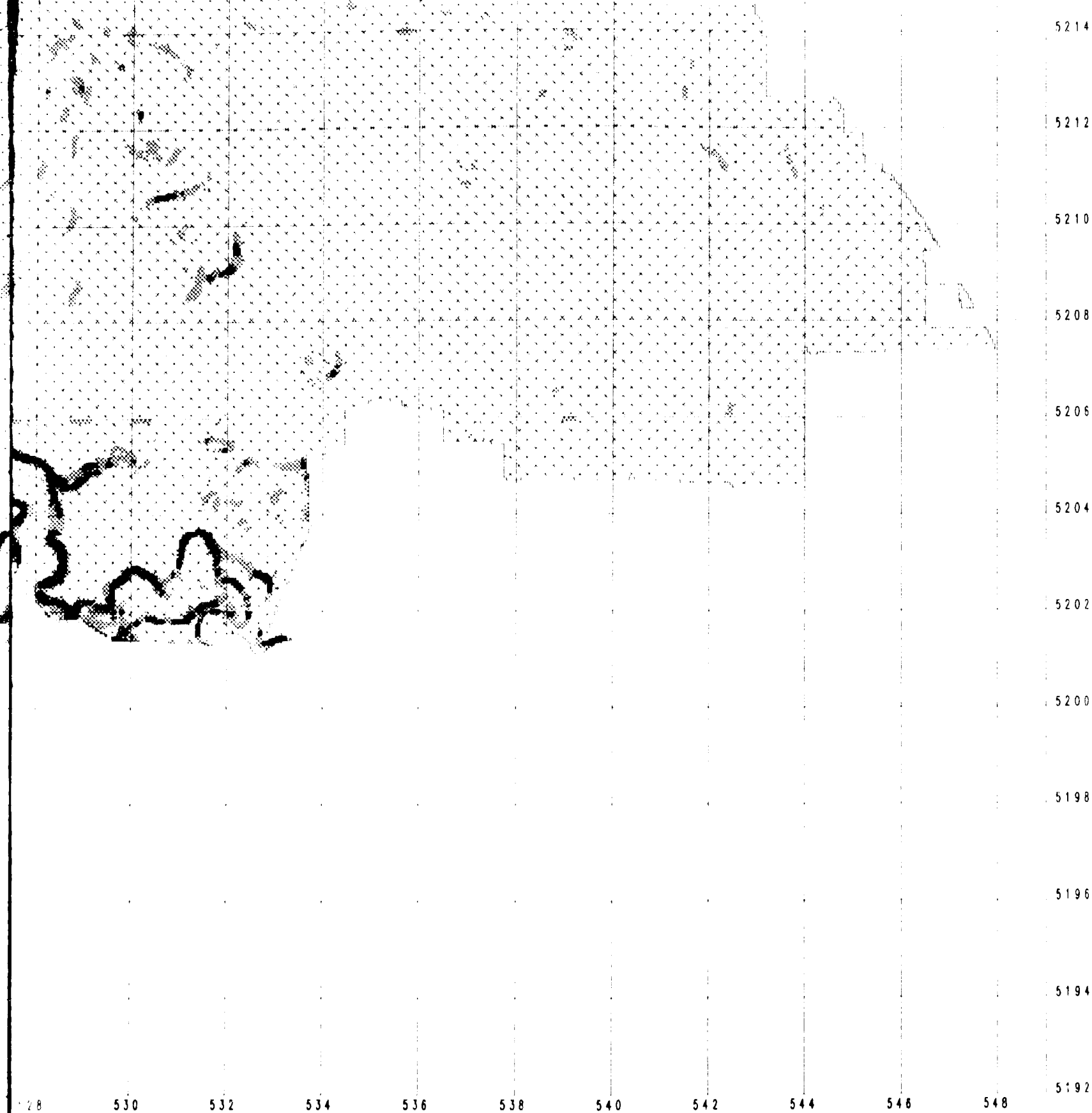


Plate 1. Slope map for Fort Lewis, Washington study area

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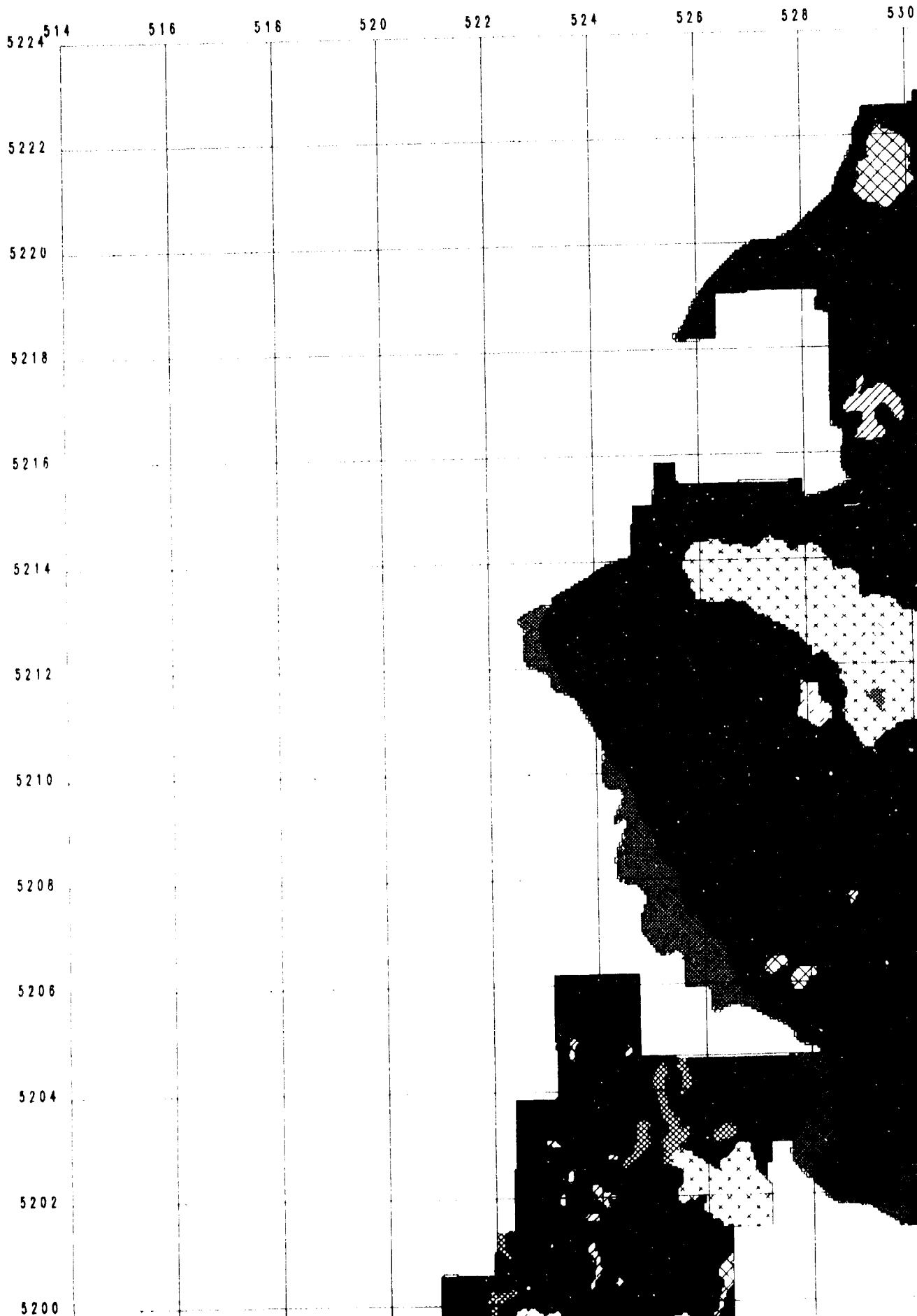
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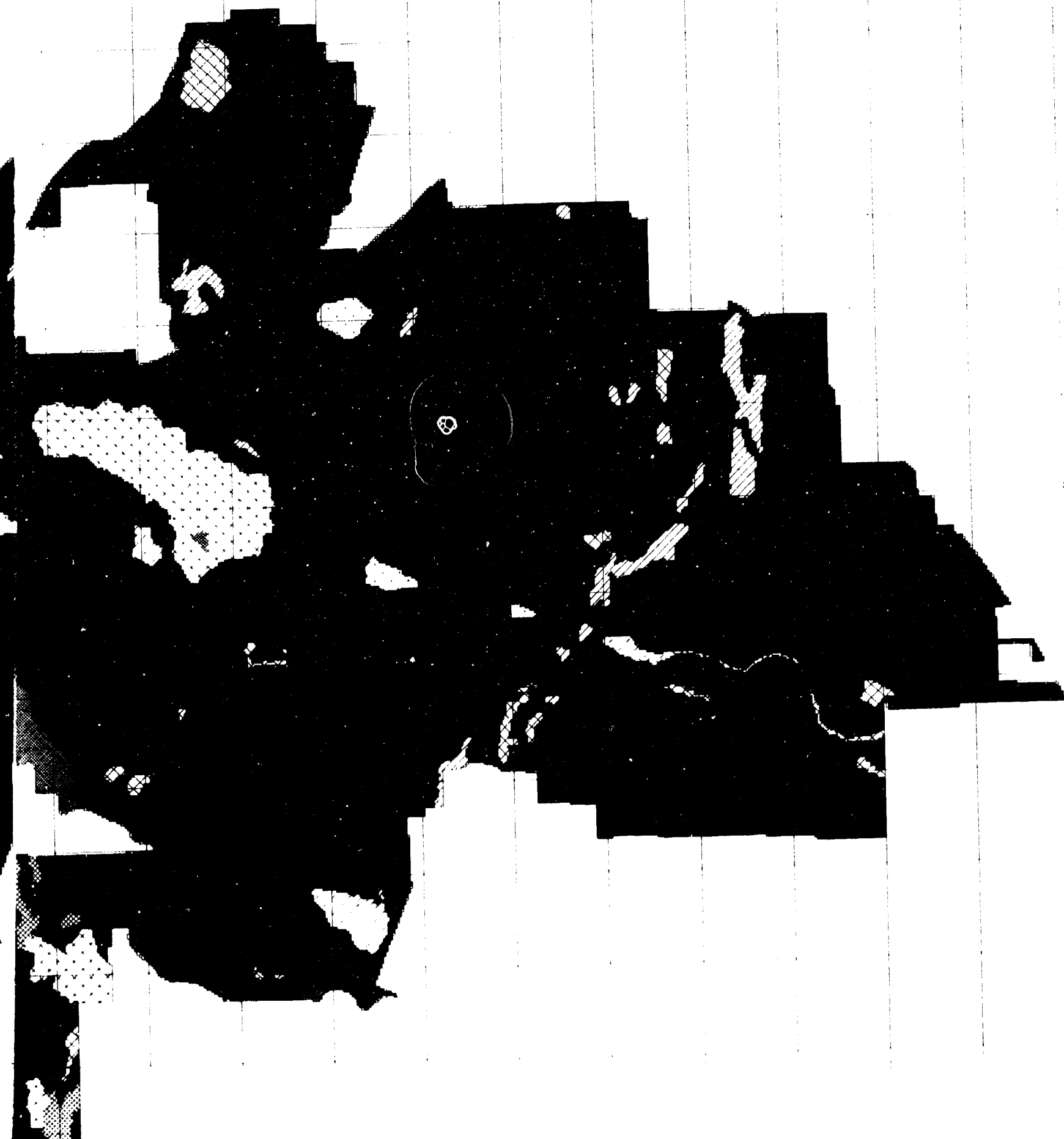
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Waterways
Experiment
Station

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FT LEWIS, WASHINGTON

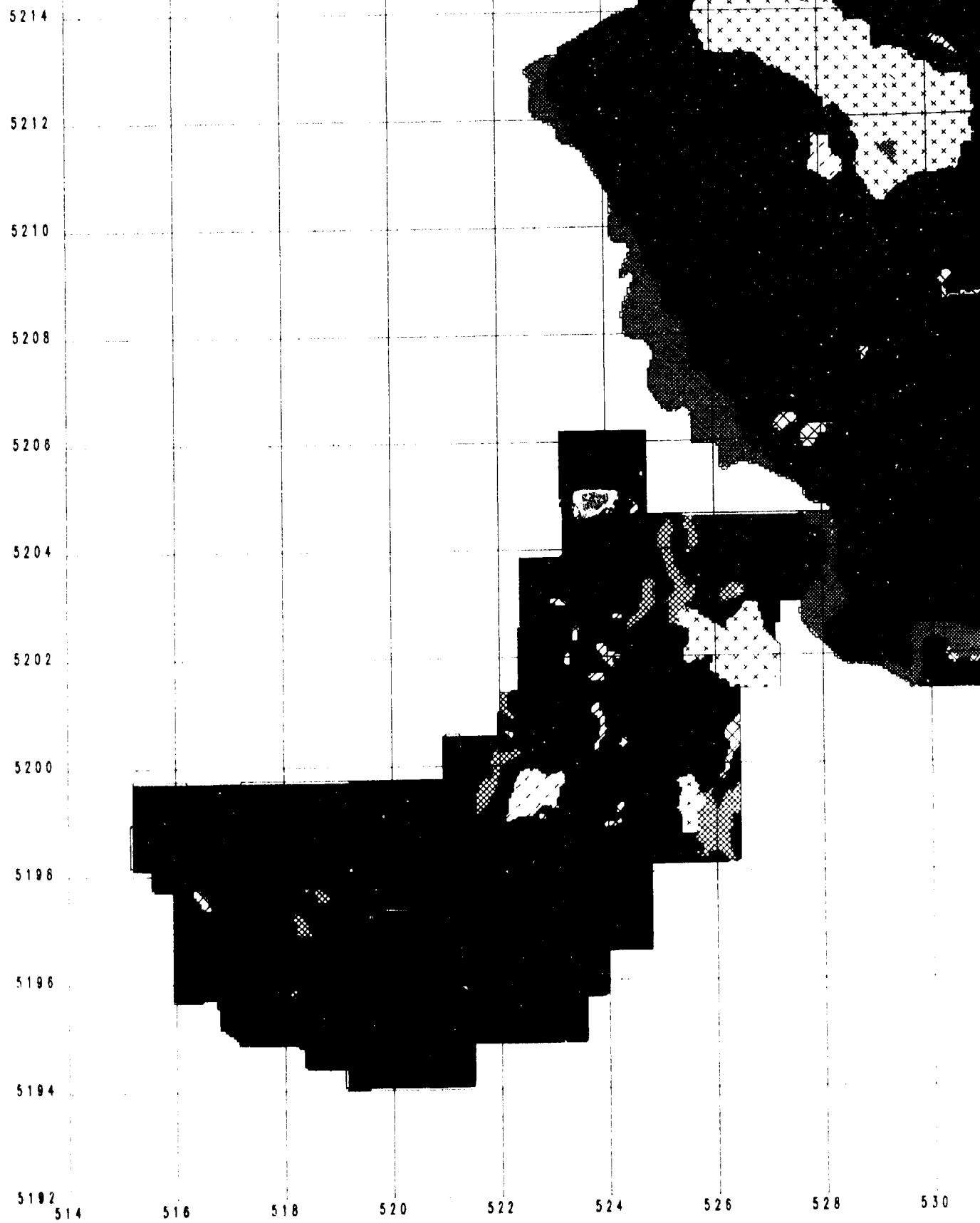
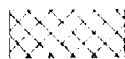


Plate 2.

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FT LEWIS, WASHINGTON

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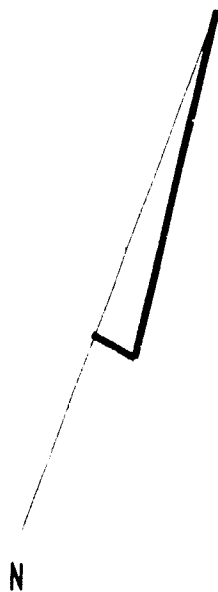
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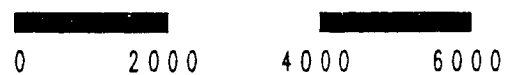
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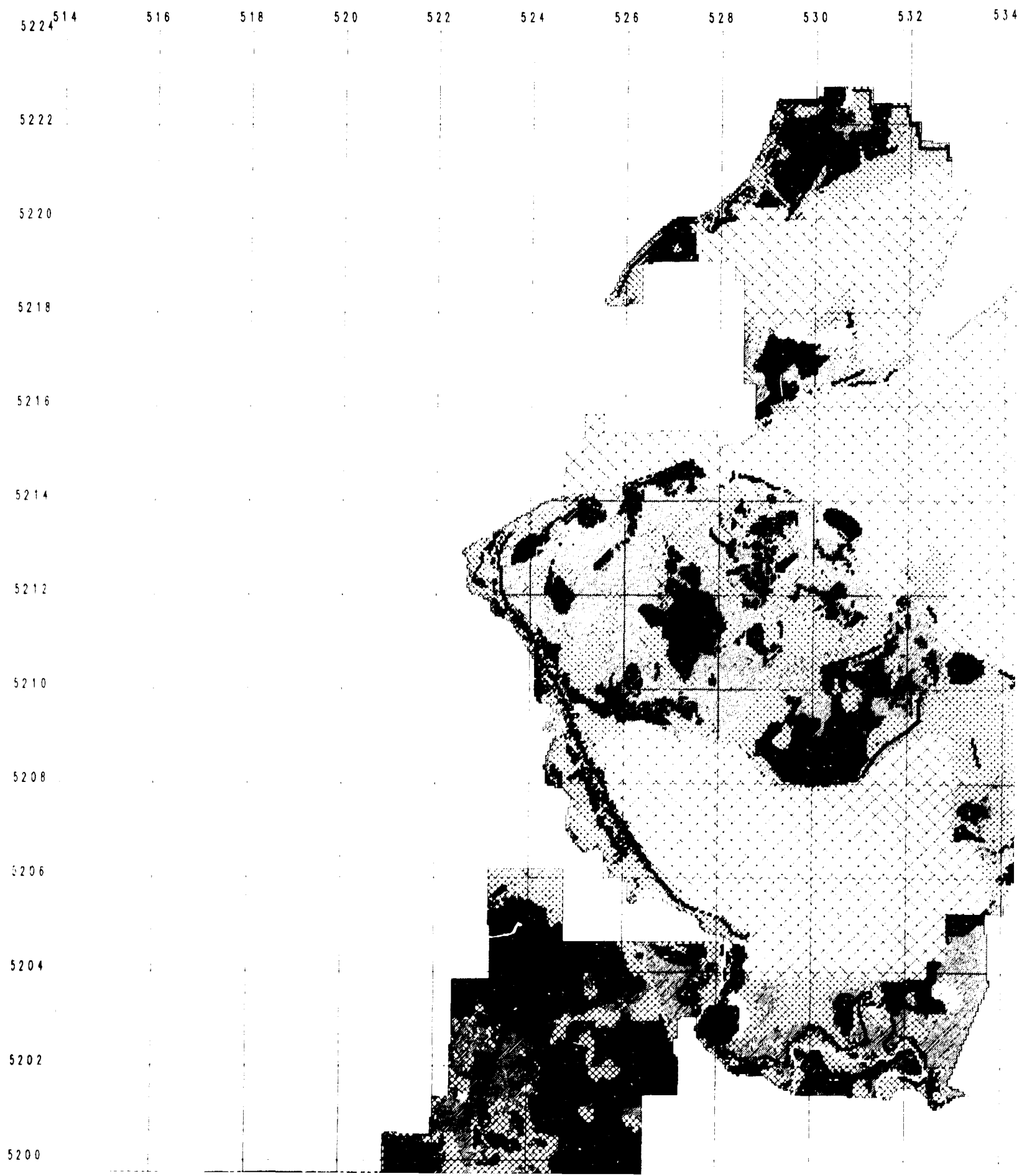
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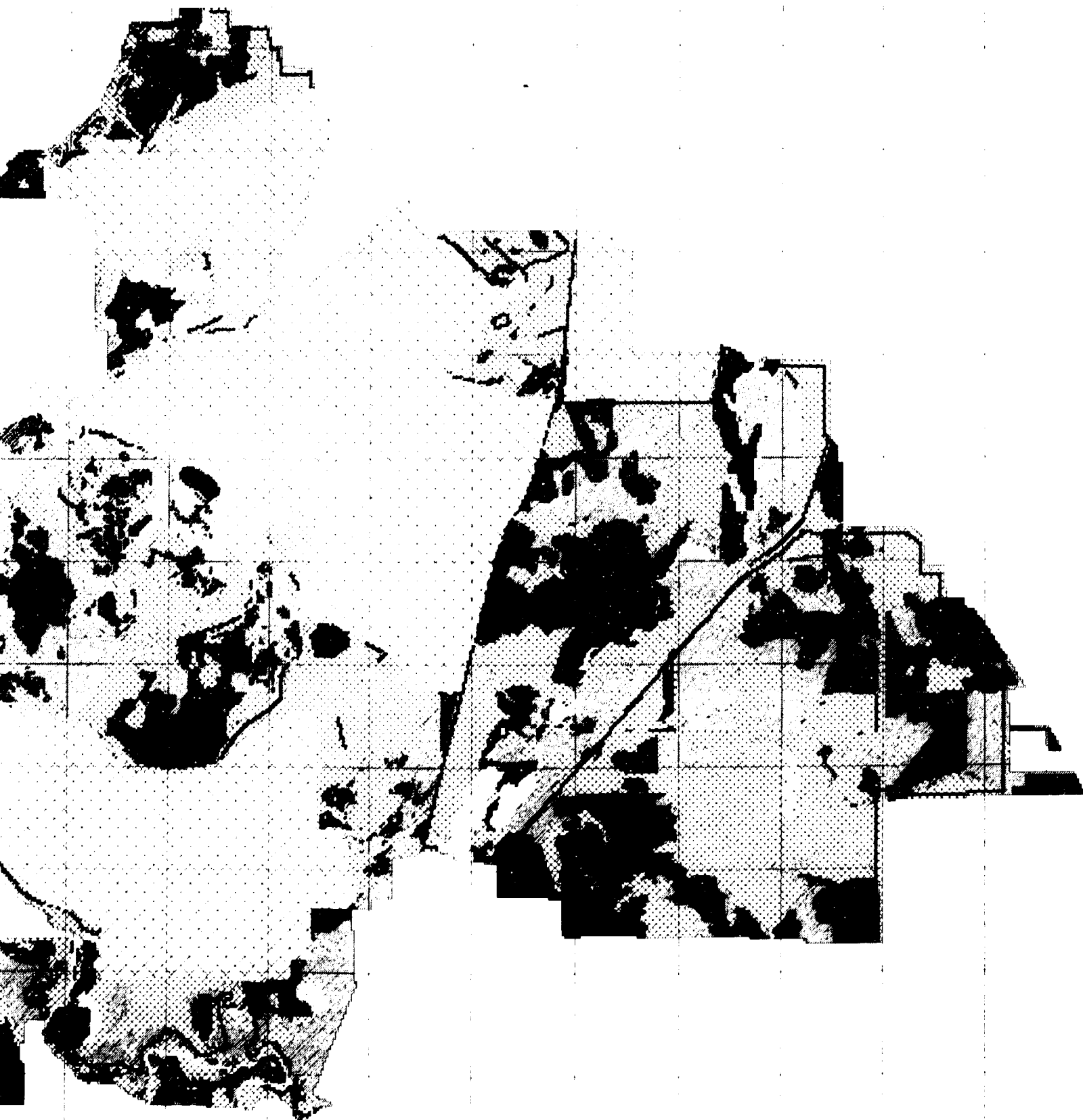
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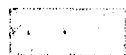


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Waterways
Experiment
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SPEED MAP
HMMWV
DRY SEASON
NORMAL CONDITION

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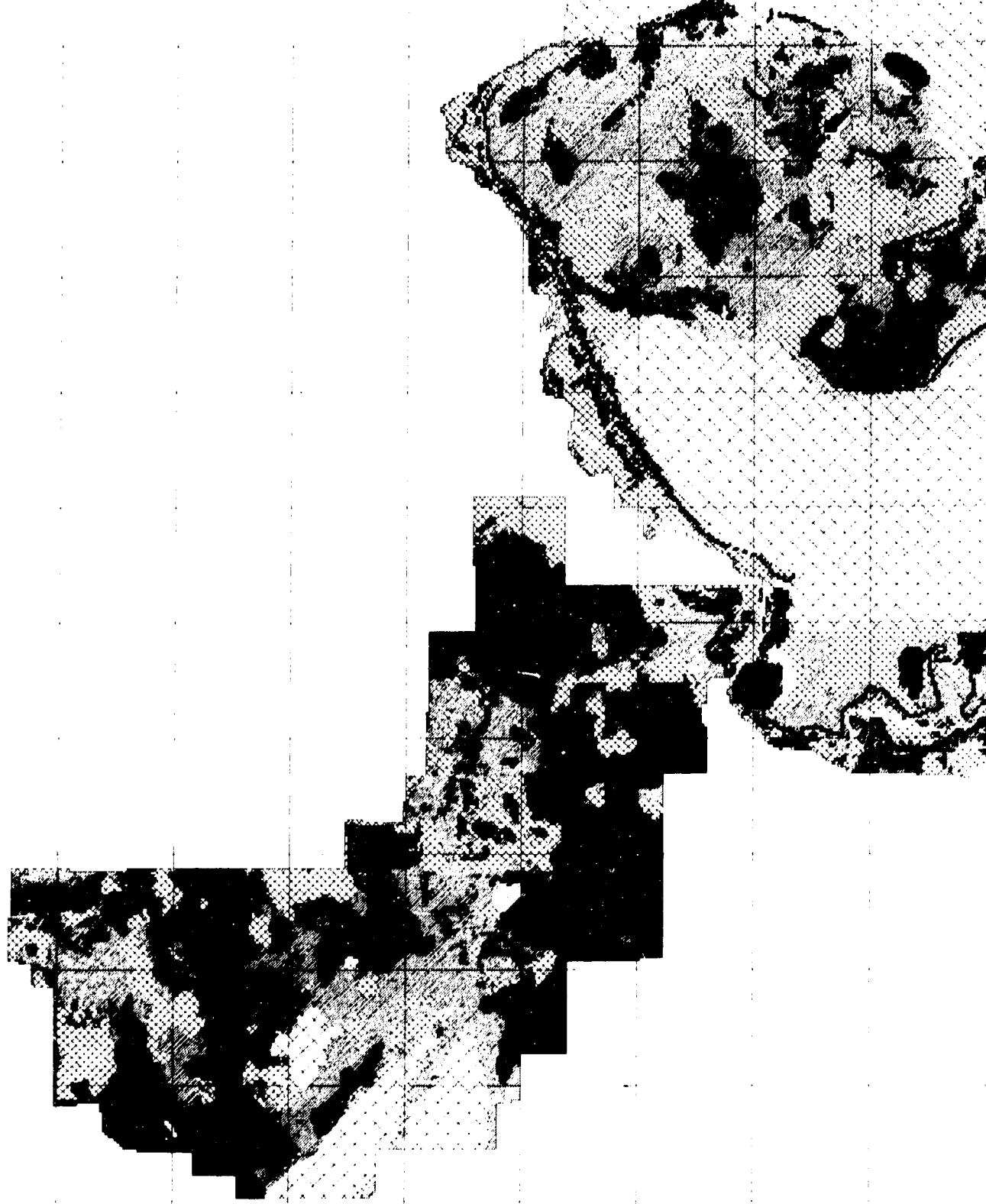


plate 3. Spee



Plate 3. Speed map for M998 (HMMWV) wheeled vehicle in the dry normal surface

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WATER

URBAN /
OFF LIMITS

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FT LEWIS, WASHINGTON

SPEED MAP

HMMWV

DRY SEASON

NORMAL CONDITION

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METERS

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surface condition

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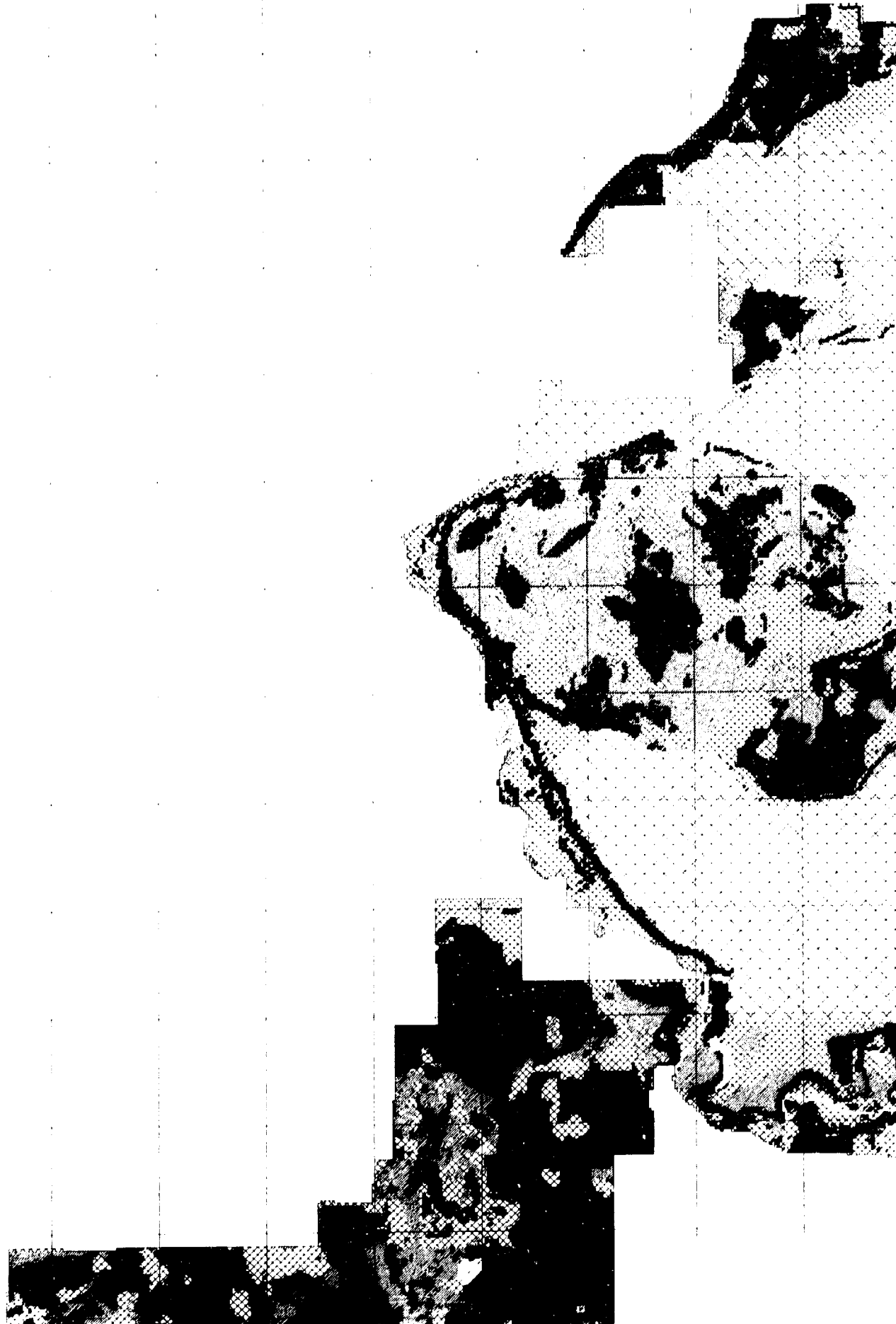
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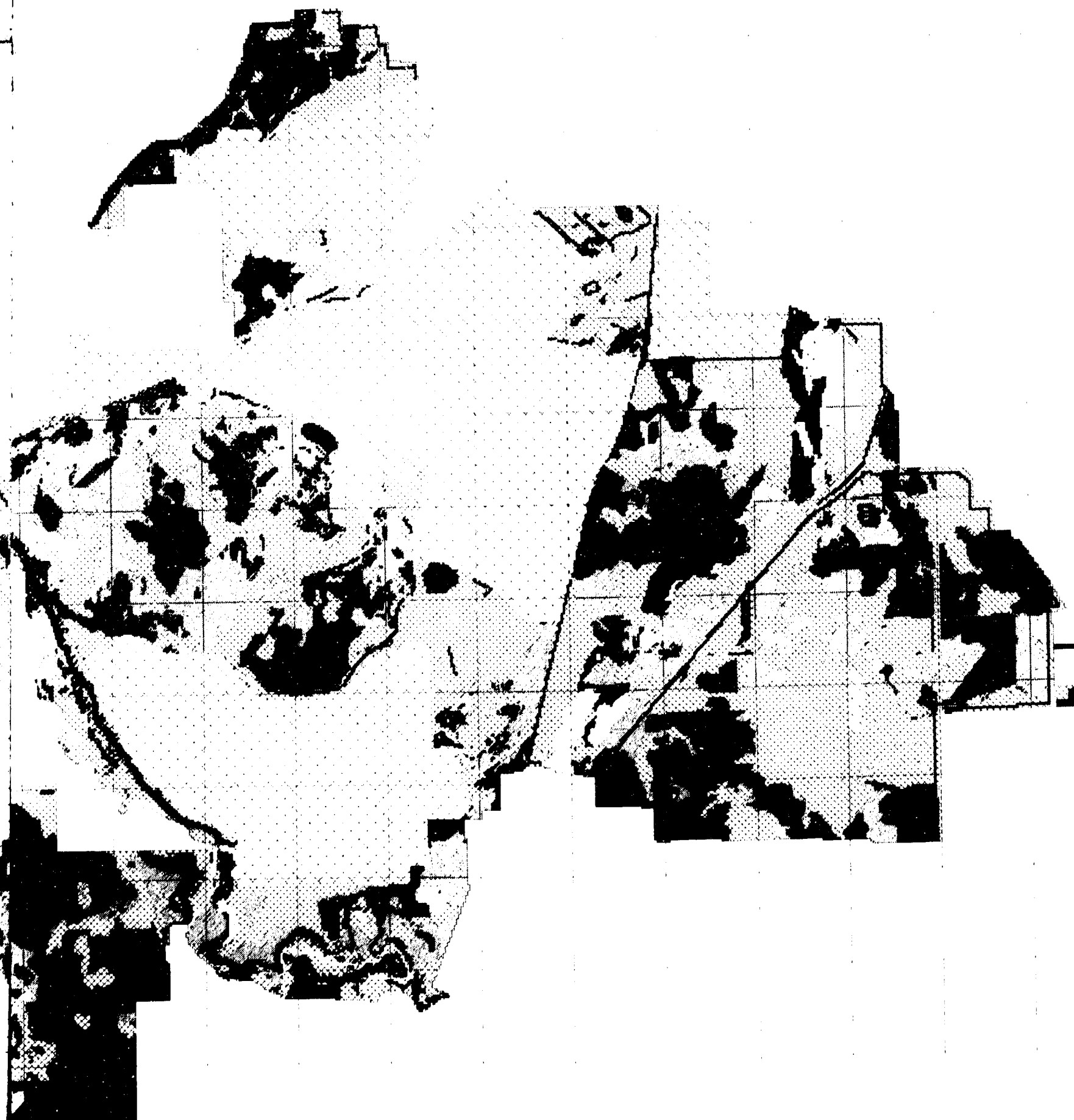
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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED (MPH)

SCALE 1:100000



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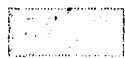
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WATER

URBAN /
OFF LIMITS

FT LEWIS, WASHINGTON

SPEED MAP

HMMWV

WET SEASON

SLIPPERY CONDITION

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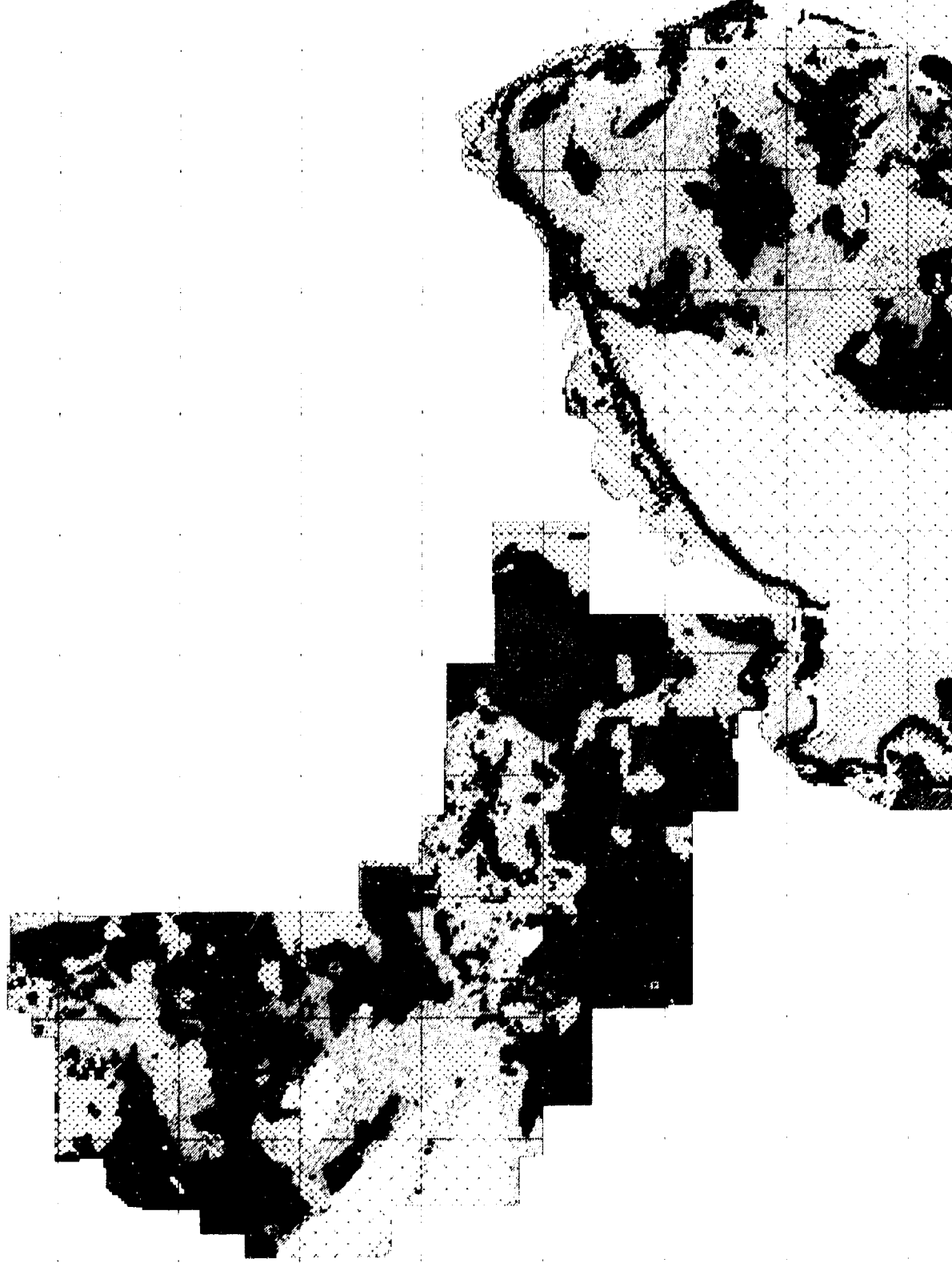
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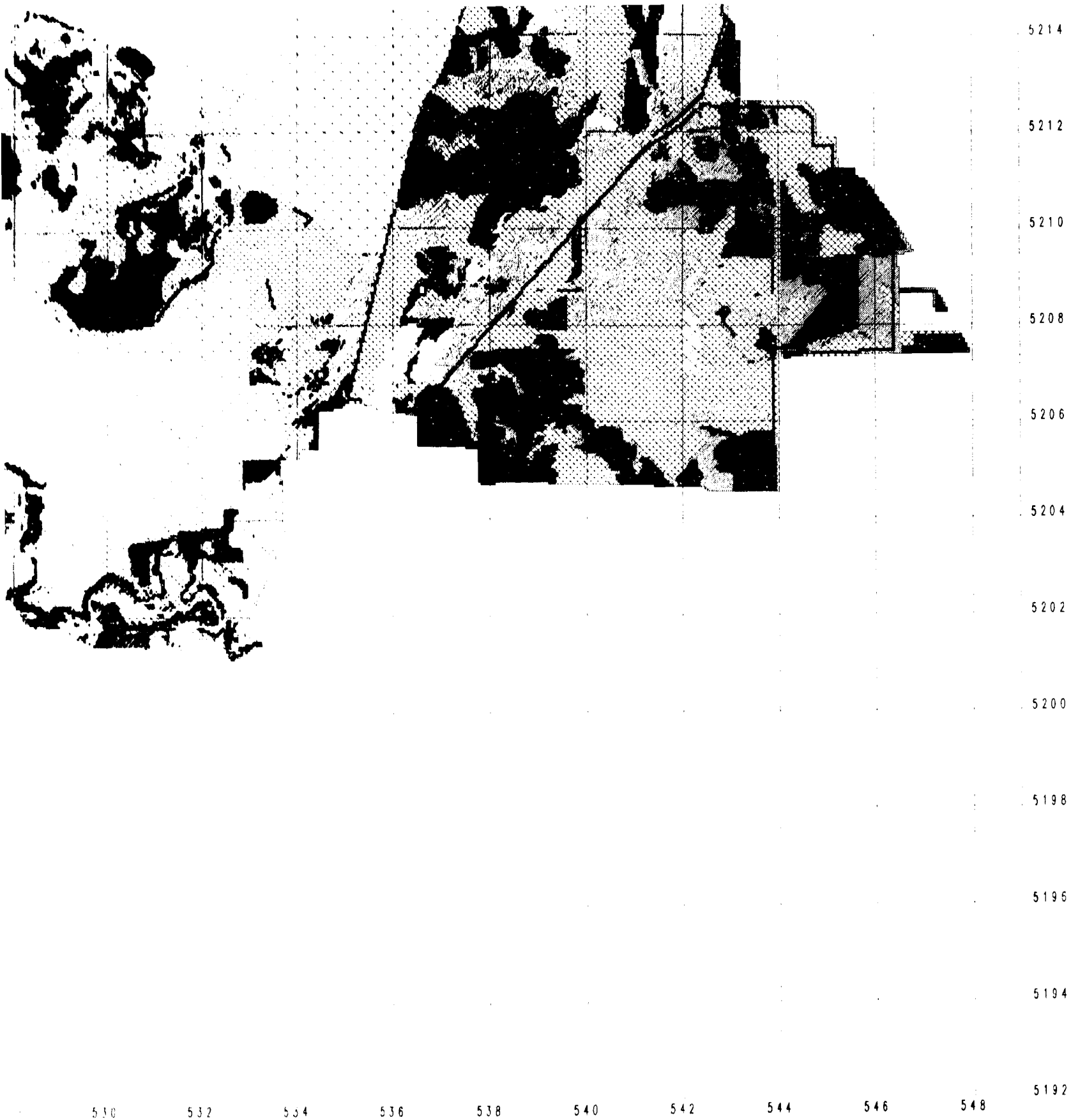


Plate 4. Speed map for M998 (HMMWV) wheeled vehicle in the wet slippery surface condition

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WATER

URBAN /
OFF LIMITS

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FT LEWIS, WASHINGTON

SPEED MAP

HMMWV

WET SEASON

SLIPPERY CONDITION

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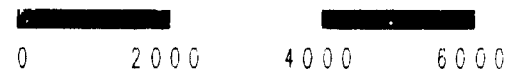
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ry surface condition

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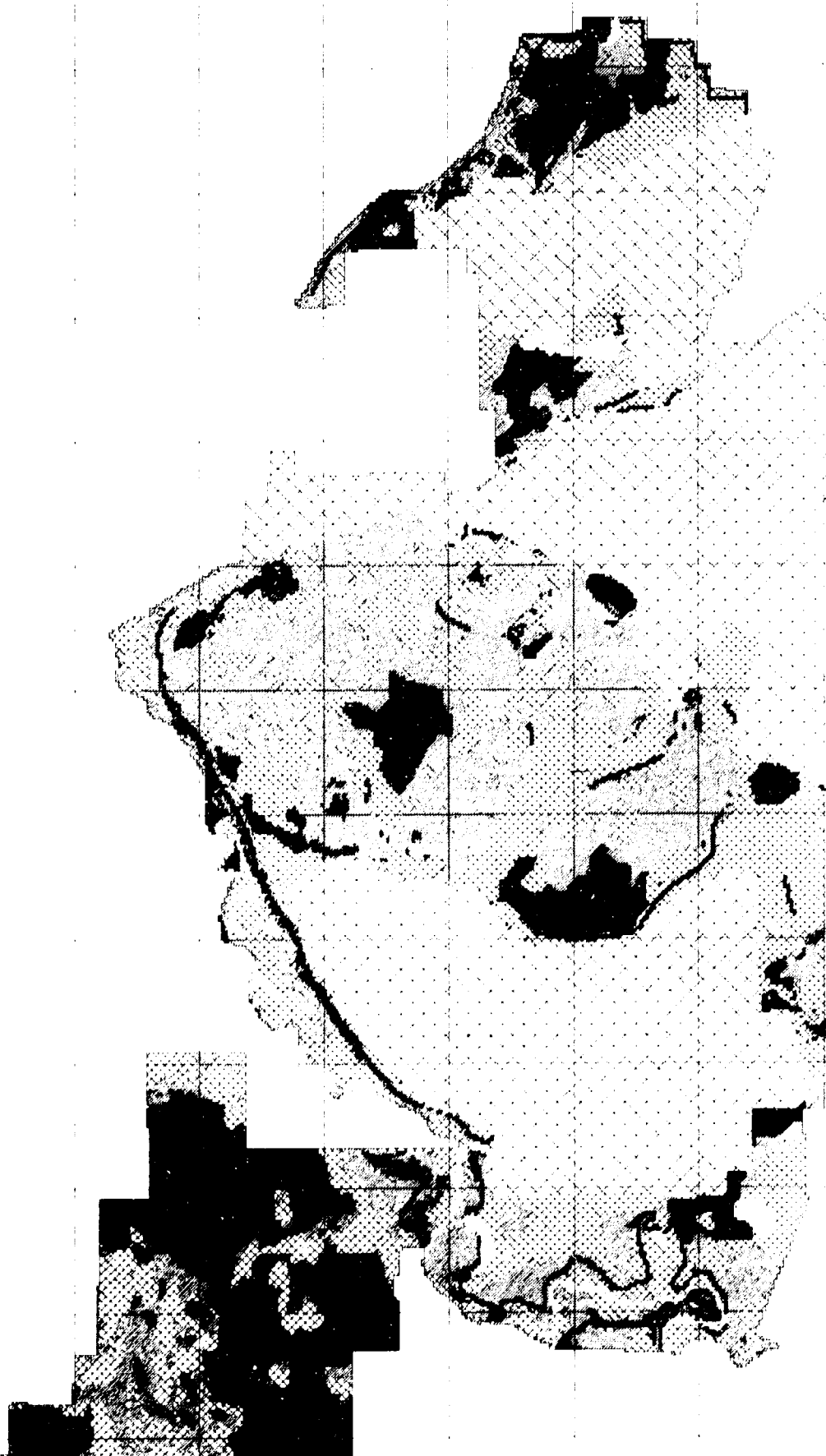
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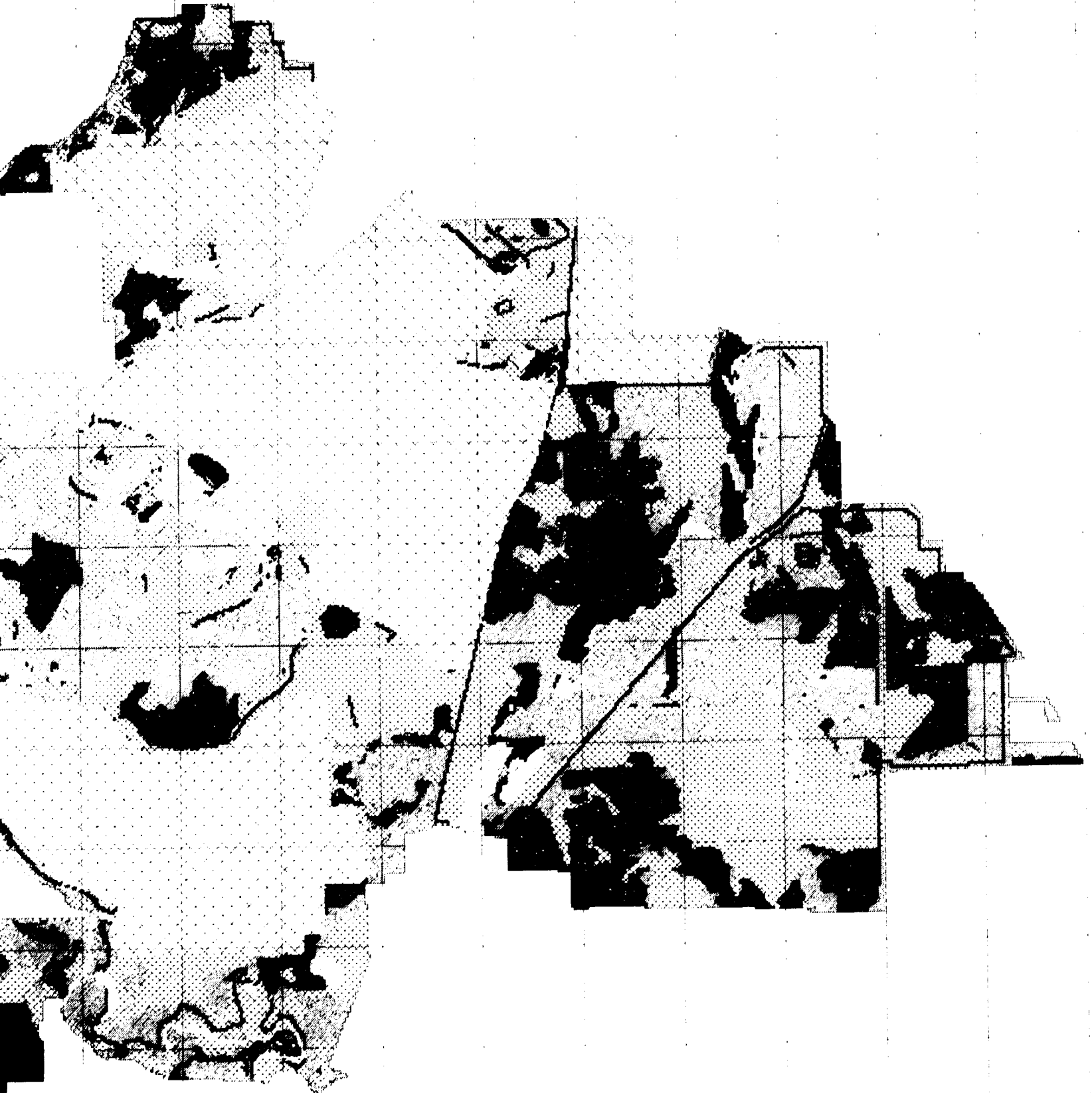
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U. S. Army Corps of Engineers
Waterways
Experiment
Station

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SPEED (MPH)

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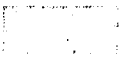
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WATER

URBAN /
OFF LIMITS

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FT LEWIS, WASHINGTON

SPEED MAP

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8X8 WHEELED COMBAT VEHICLE
DRY SEASON
NORMAL CONDITION

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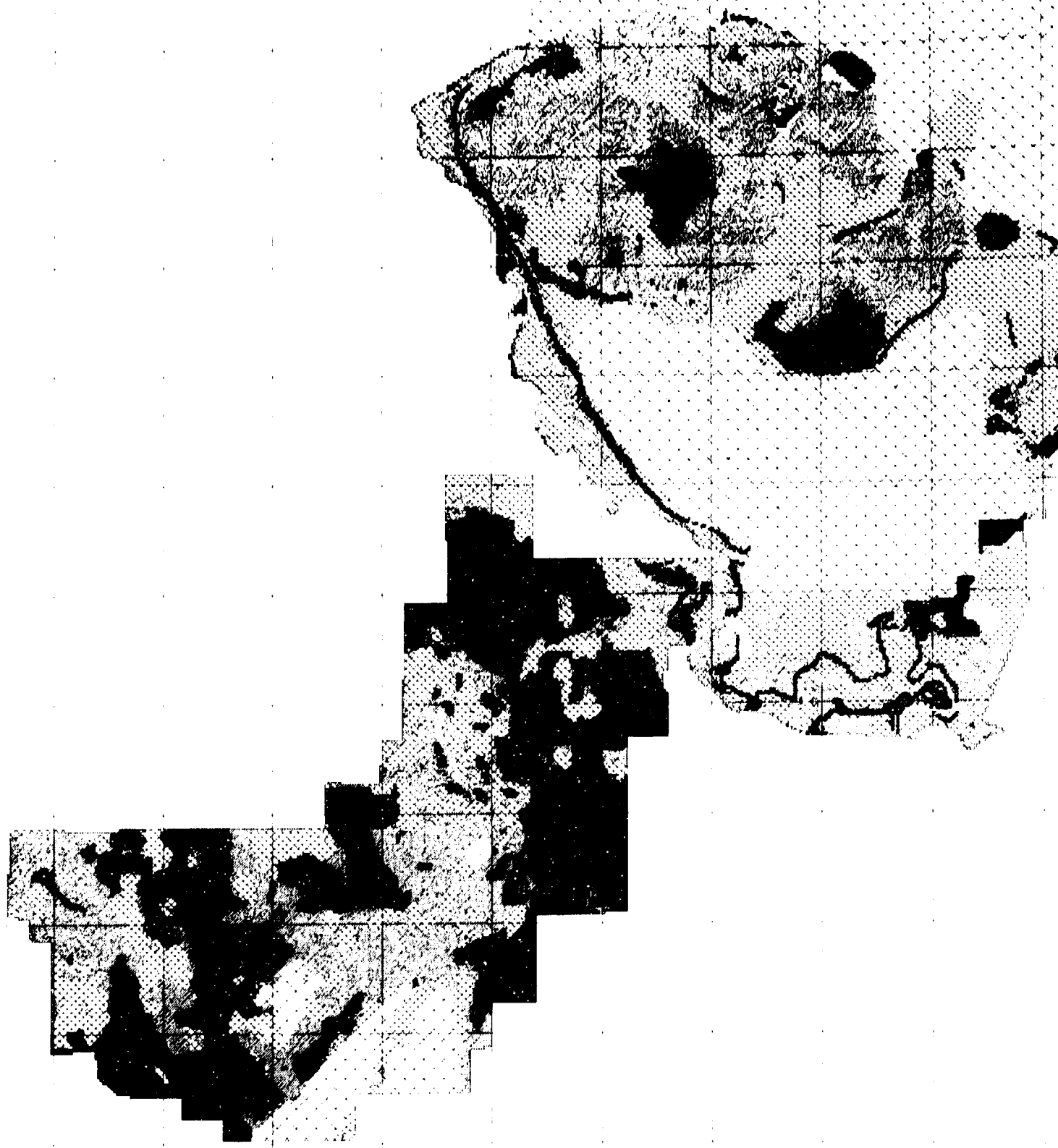
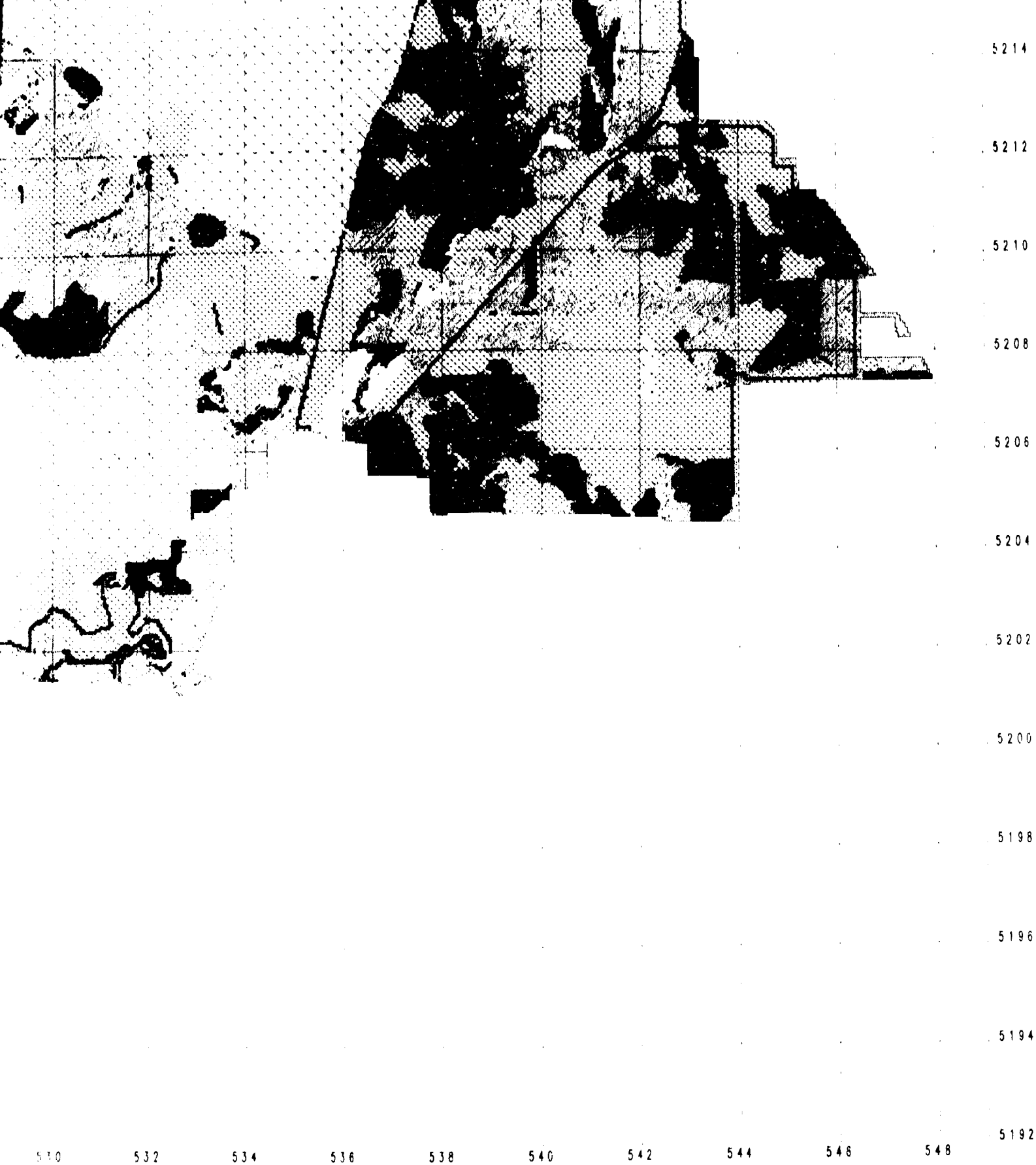


Plate 5. Speed map for 8.



5. Speed map for 8X8 wheeled combat vehicle in the dry normal surface condition

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WATER

URBAN /
OFF LIMITS

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FT LEWIS, WASHINGTON

SPEED MAP

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8X8 WHEELED COMBAT VEHICLE

DRY SEASON

NORMAL CONDITION

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METERS

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ce condition

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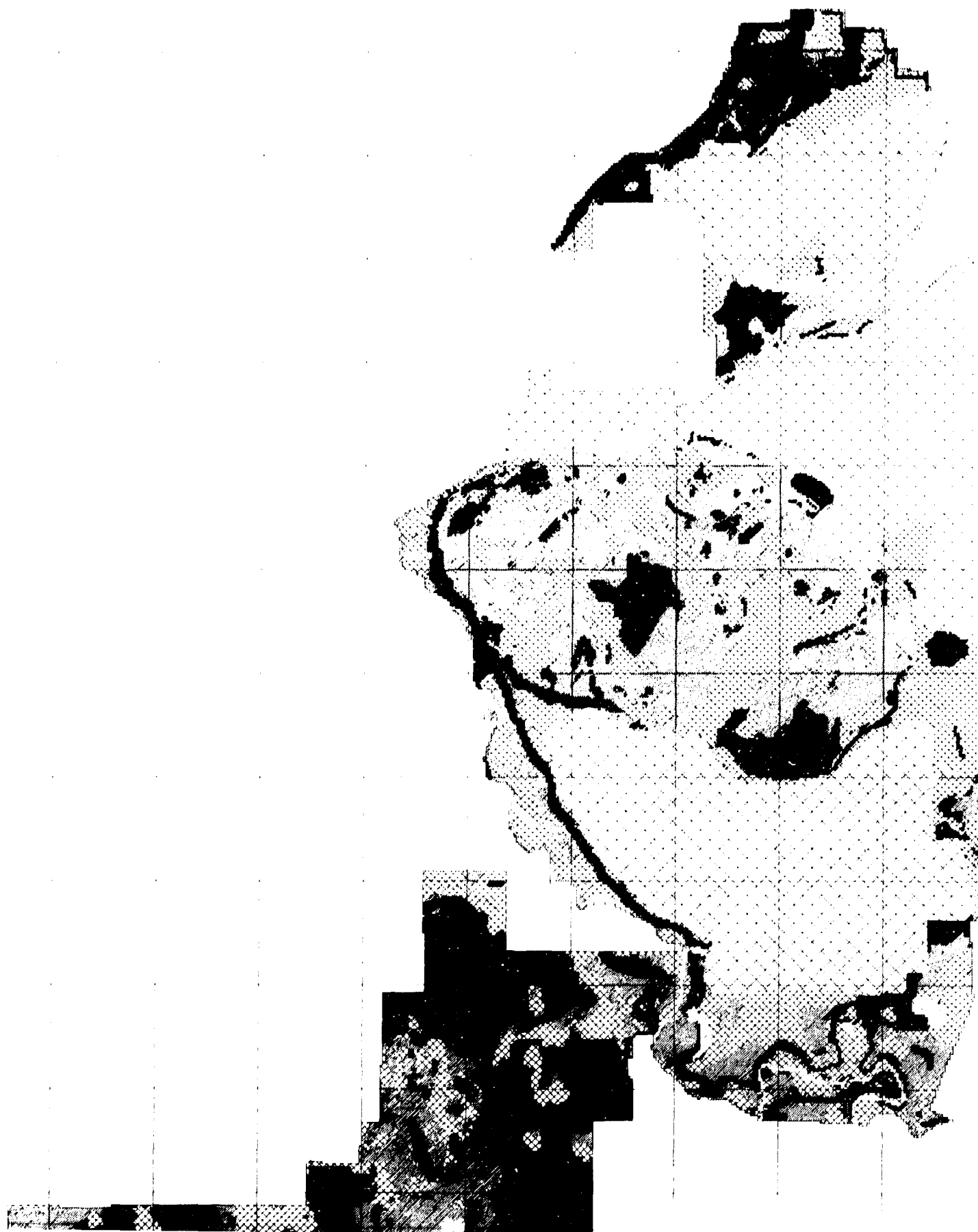
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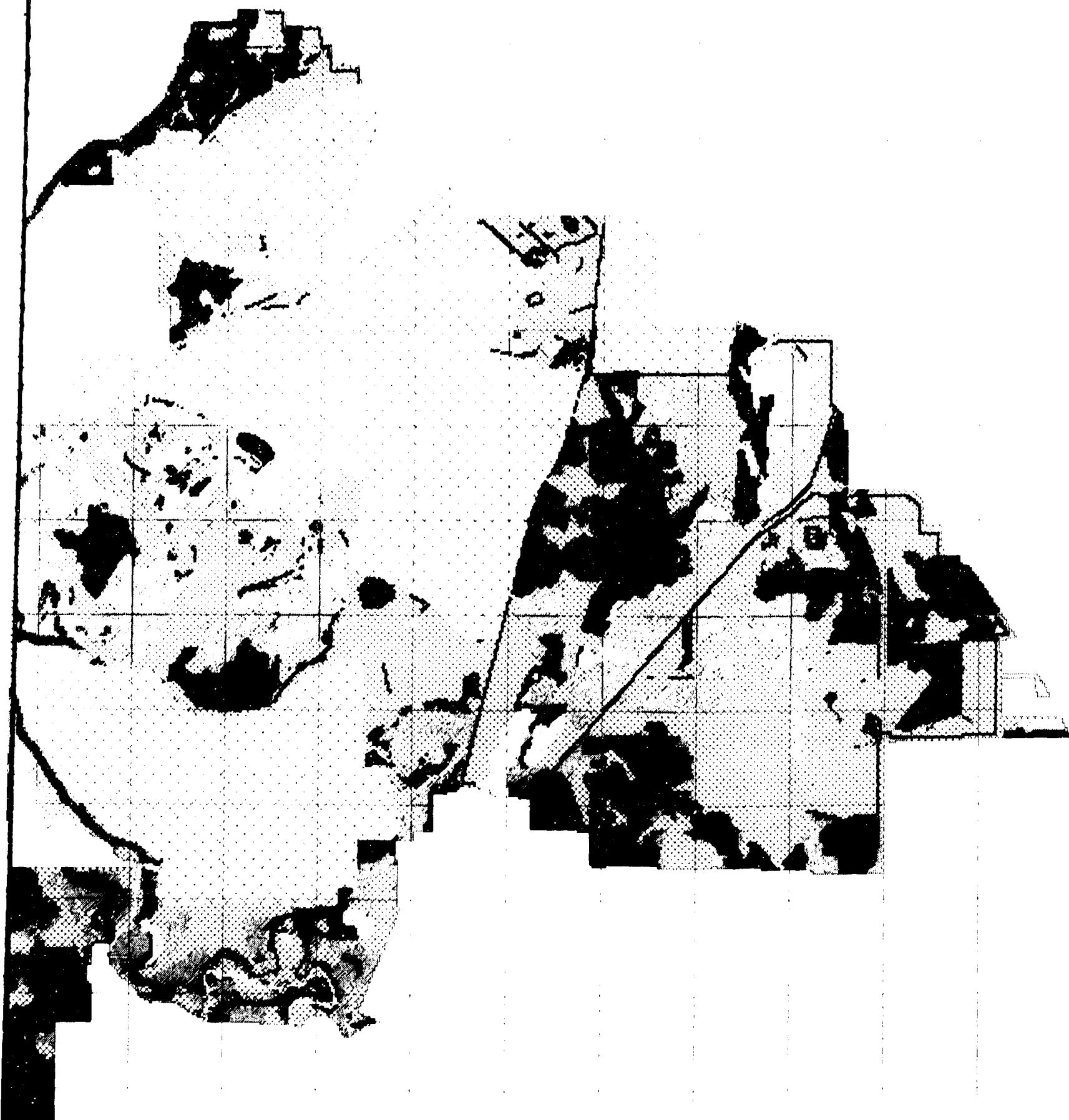
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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED (MPH)

SCALE 1:100000

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WATER



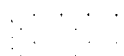
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URBAN /
OFF LIMITS

FT LEWIS, WASHINGTON

SPEED MAP

8X8 WHEELED COMBAT VEHICLE

WET SEASON

SLIPPERY CONDITION

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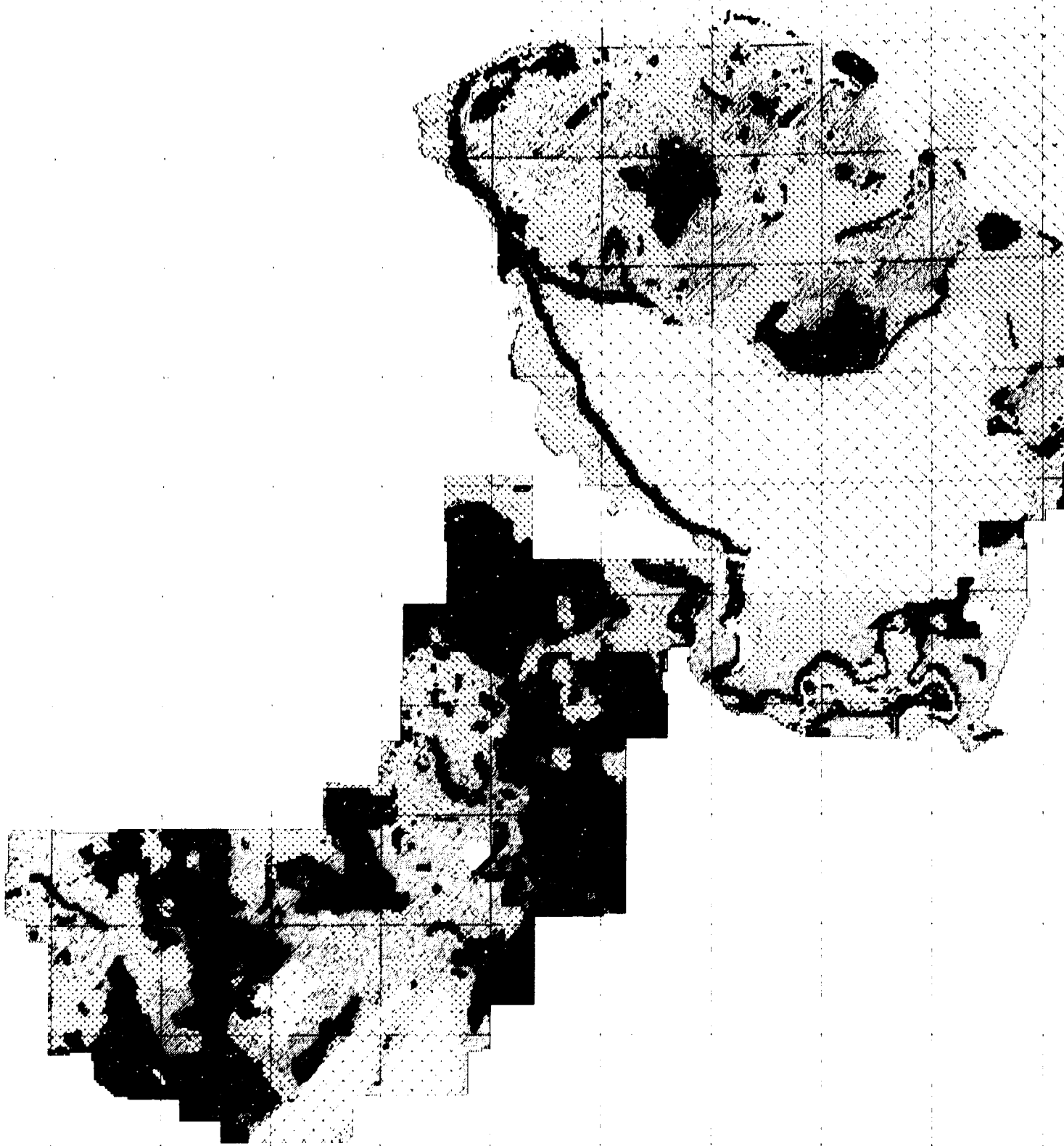
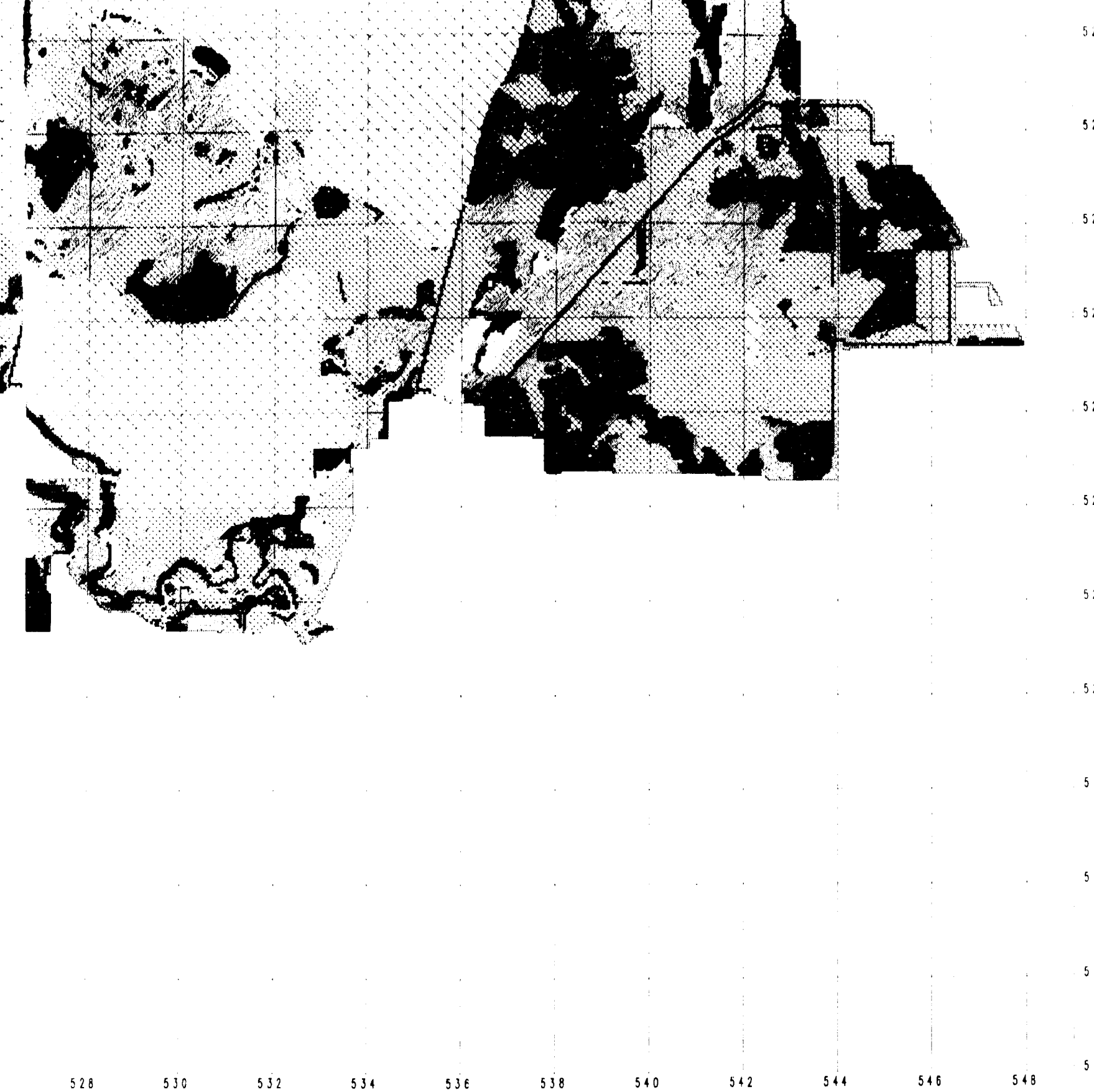


Plate 6. Speed map for 8x



w/ Plate 6. Speed map for 8X8 wheeled combat vehicle in the wet slippery surface condition

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WATER

URBAN /
OFF LIMITS

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FT LEWIS, WASHINGTON

SPEED MAP

8X8 WHEELED COMBAT VEHICLE

WET SEASON

SLIPPERY CONDITION

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METERS

0 2000 4000 6000

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surface condition

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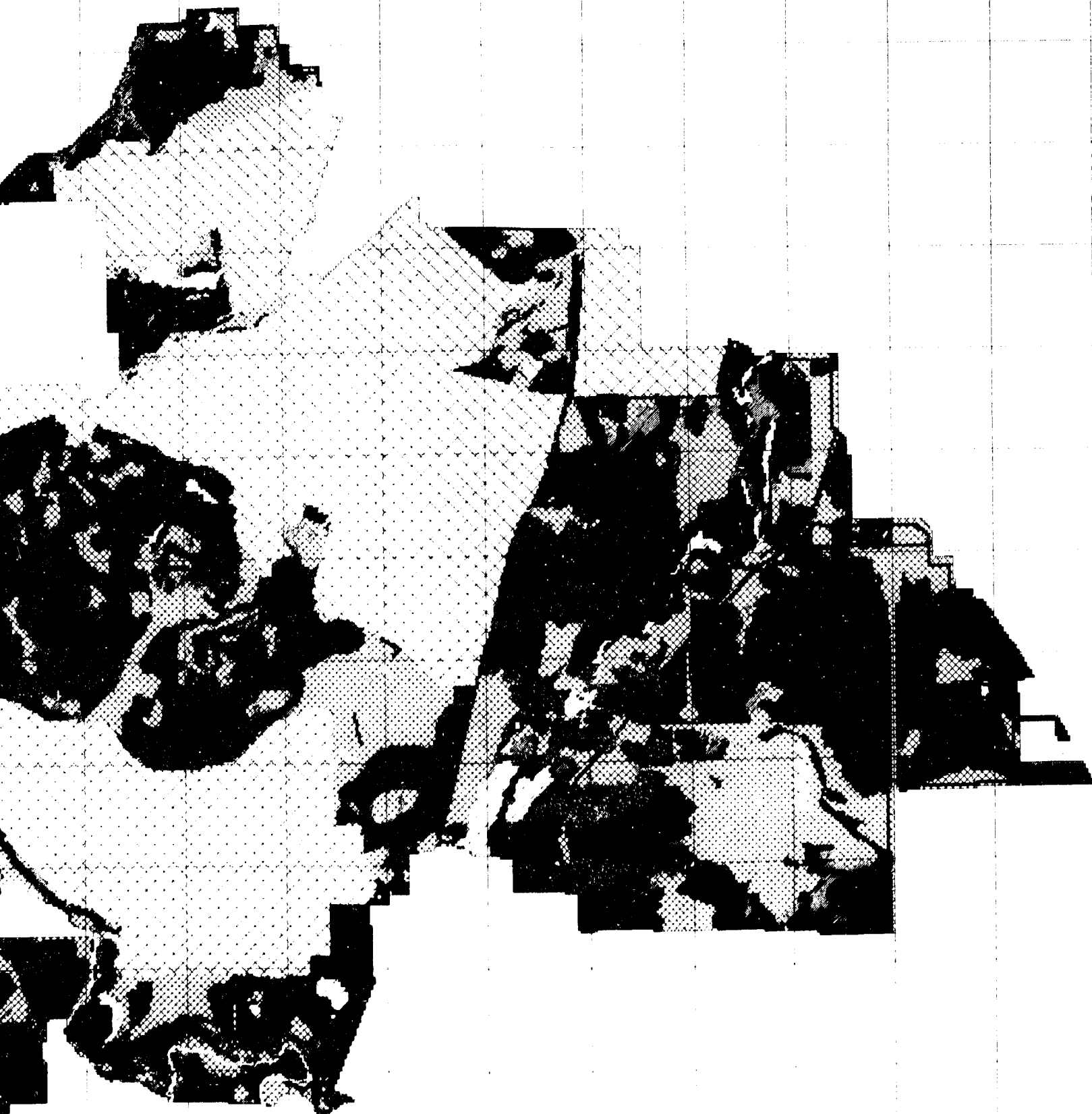
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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED (MPH)

SCALE 1:100000



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WATER



URBAN /
OFF LIMITS

FT LEWIS, WASHINGTON

SPEED MAP

M60A3

DRY SEASON

NORMAL CONDITION

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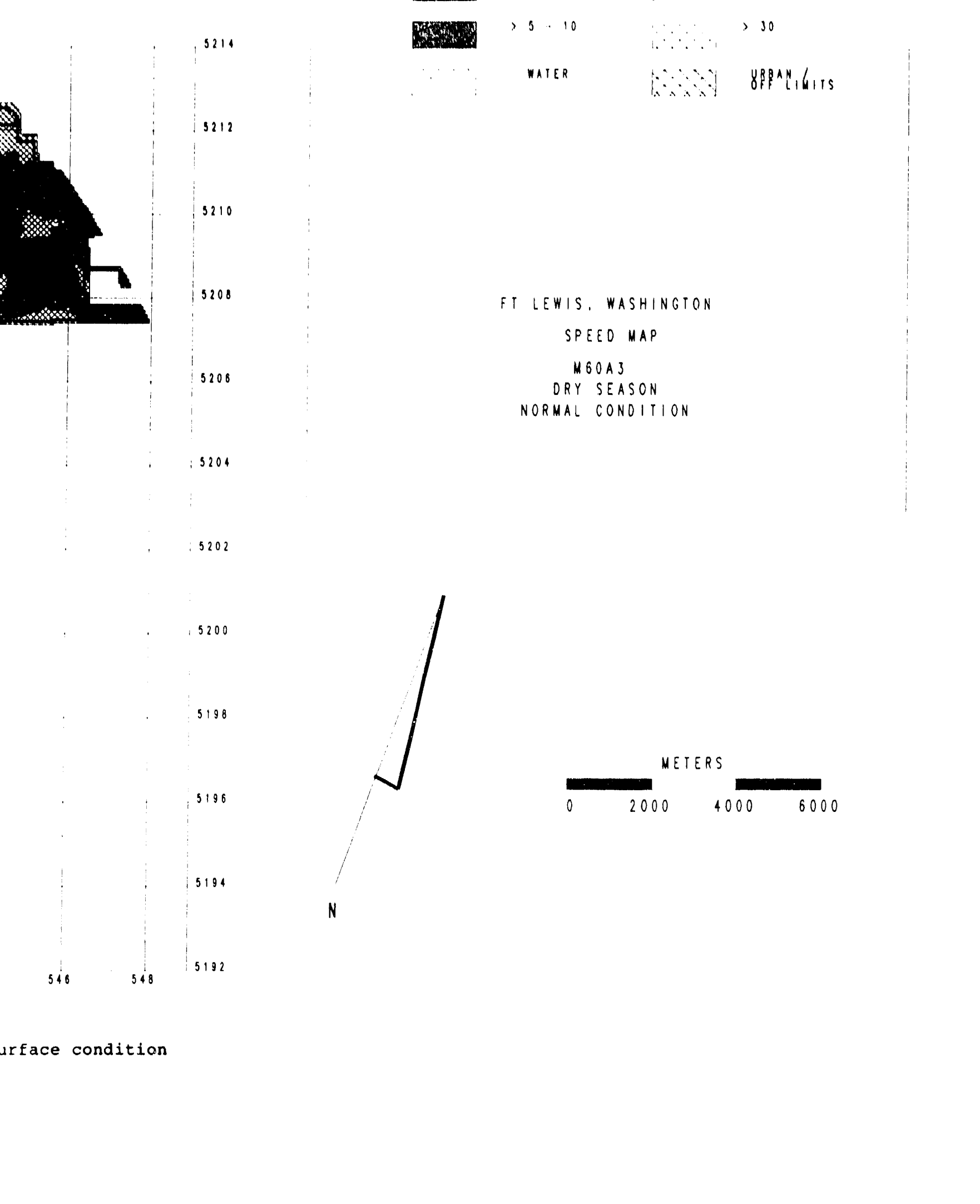
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Plate 7. Speed ma



Plate 7. Speed map for M60A3 combat tank in the dry normal surface condition



surface condition

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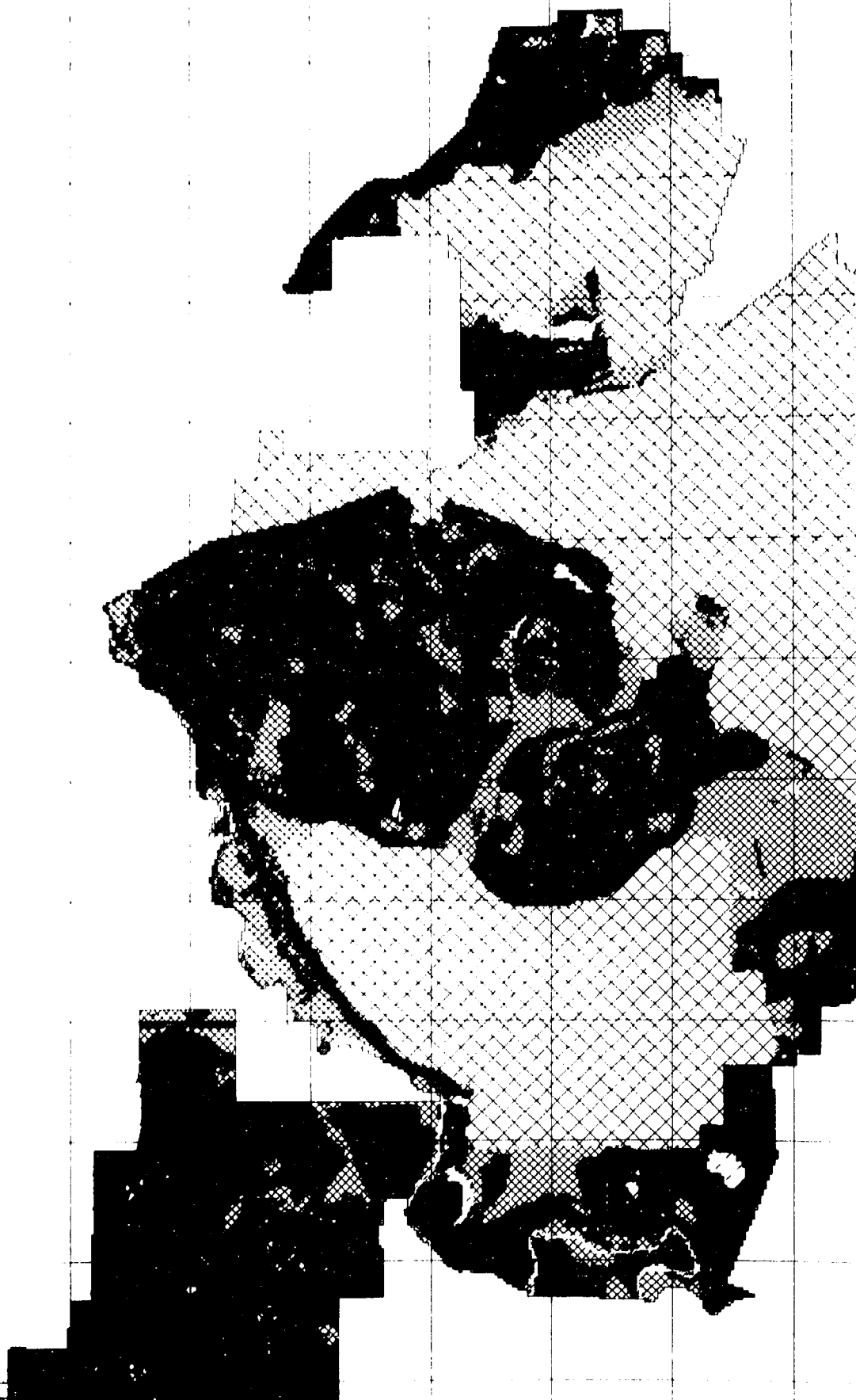
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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED (MPH)

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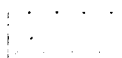
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WATER



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URBAN /
OFF LIMITS

FT LEWIS, WASHINGTON

SPEED MAP

M60A3

WET SEASON

SLIPPERY CONDITION

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Plate 8. Speed map :

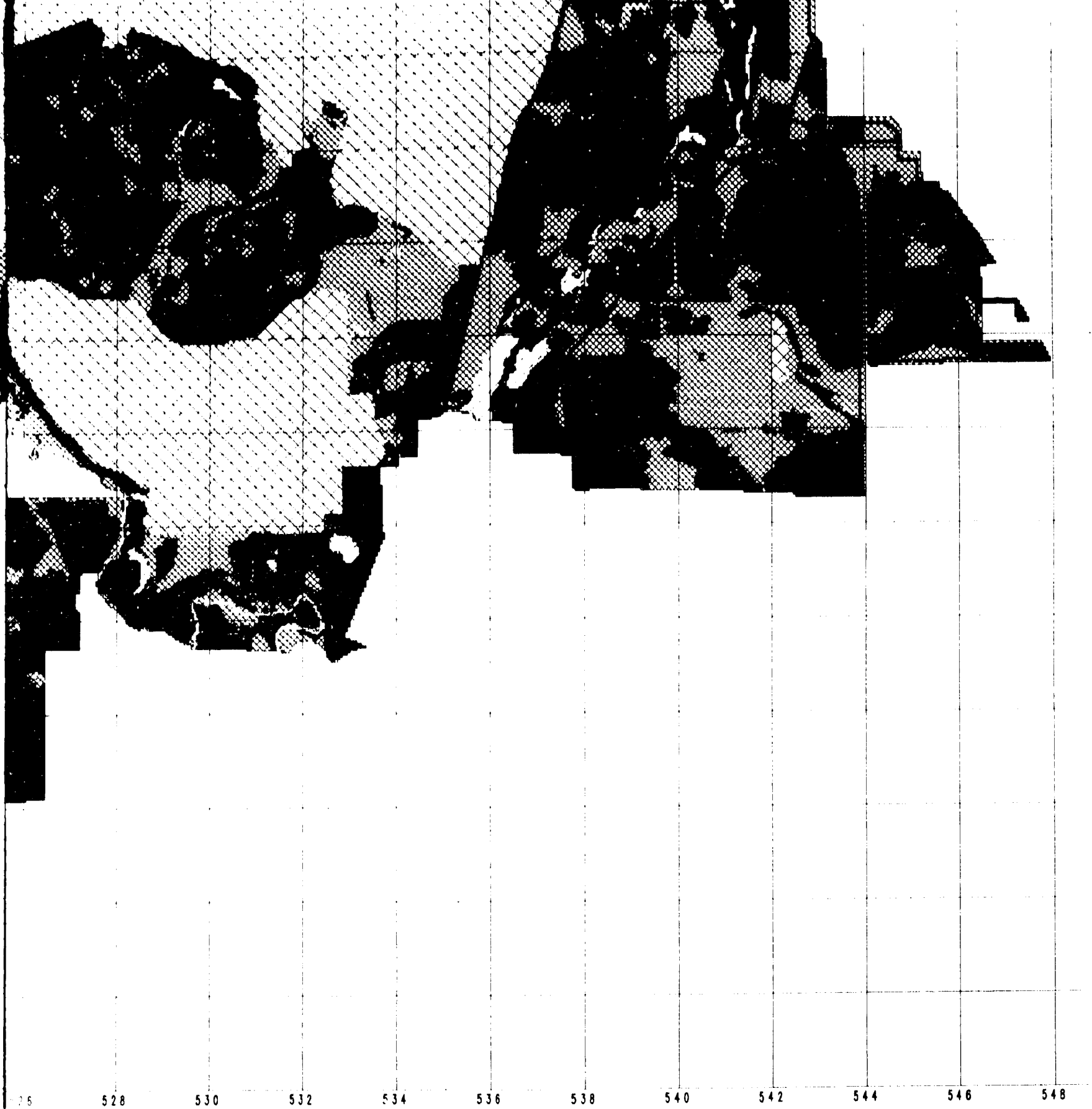
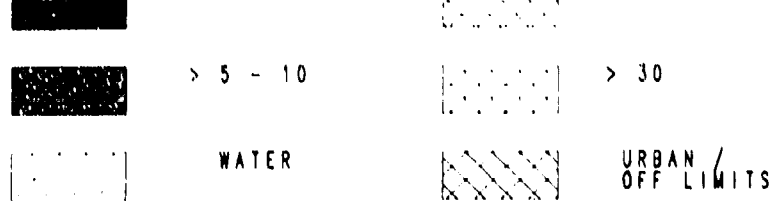
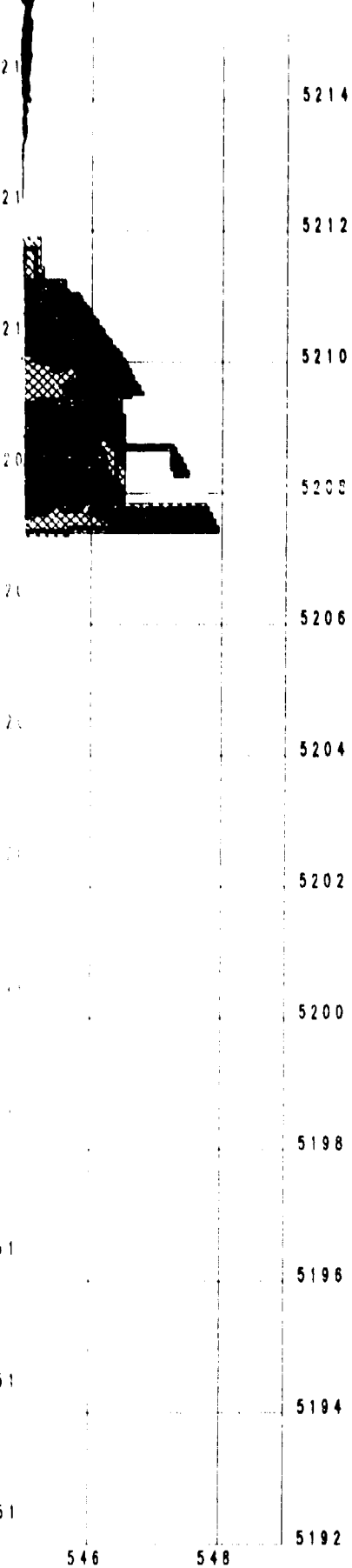
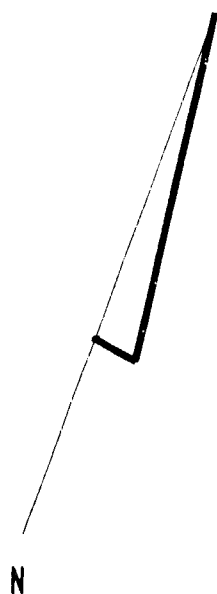


Plate 8. Speed map for M60A3 combat tank in the wet slippery surface condition



FT LEWIS, WASHINGTON
SPEED MAP
M60A3
WET SEASON
SLIPPERY CONDITION



surface condition

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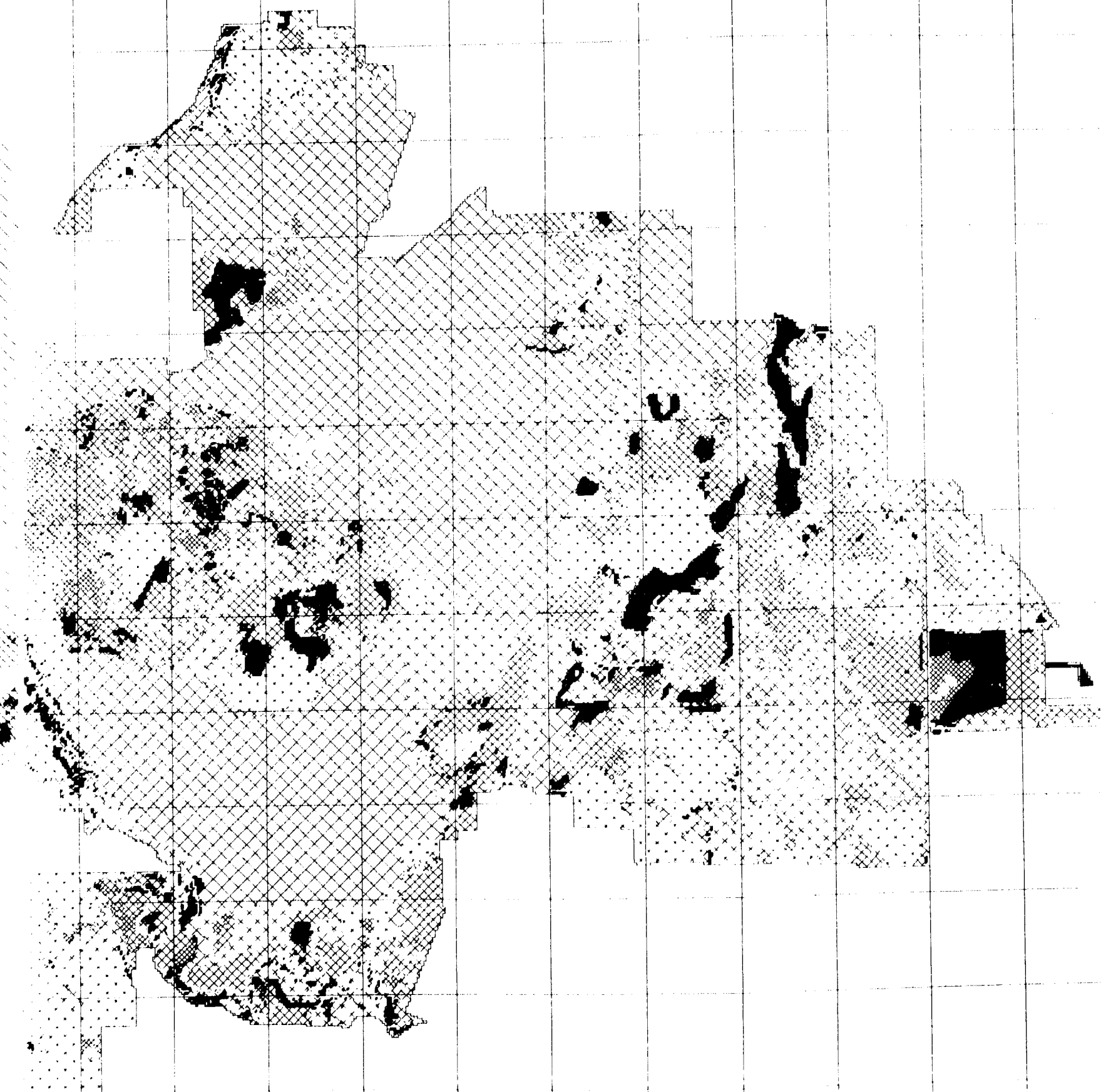
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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED LIMITING REASON

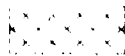
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OBSTACLE



CONE INDEX



VISIBILITY



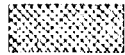
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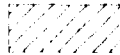
VEGETATION



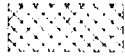
RESISTANCE



ACCELERATION/
DECELERATION



SOIL/SLOPE



MANEUVER



URBAN



RIDE



COMBINATION OF ANY
TWO OR MORE FACTORS

FT. LEWIS, WASHINGTON

HMMWV

DRY SEASON

NORMAL CONDITION

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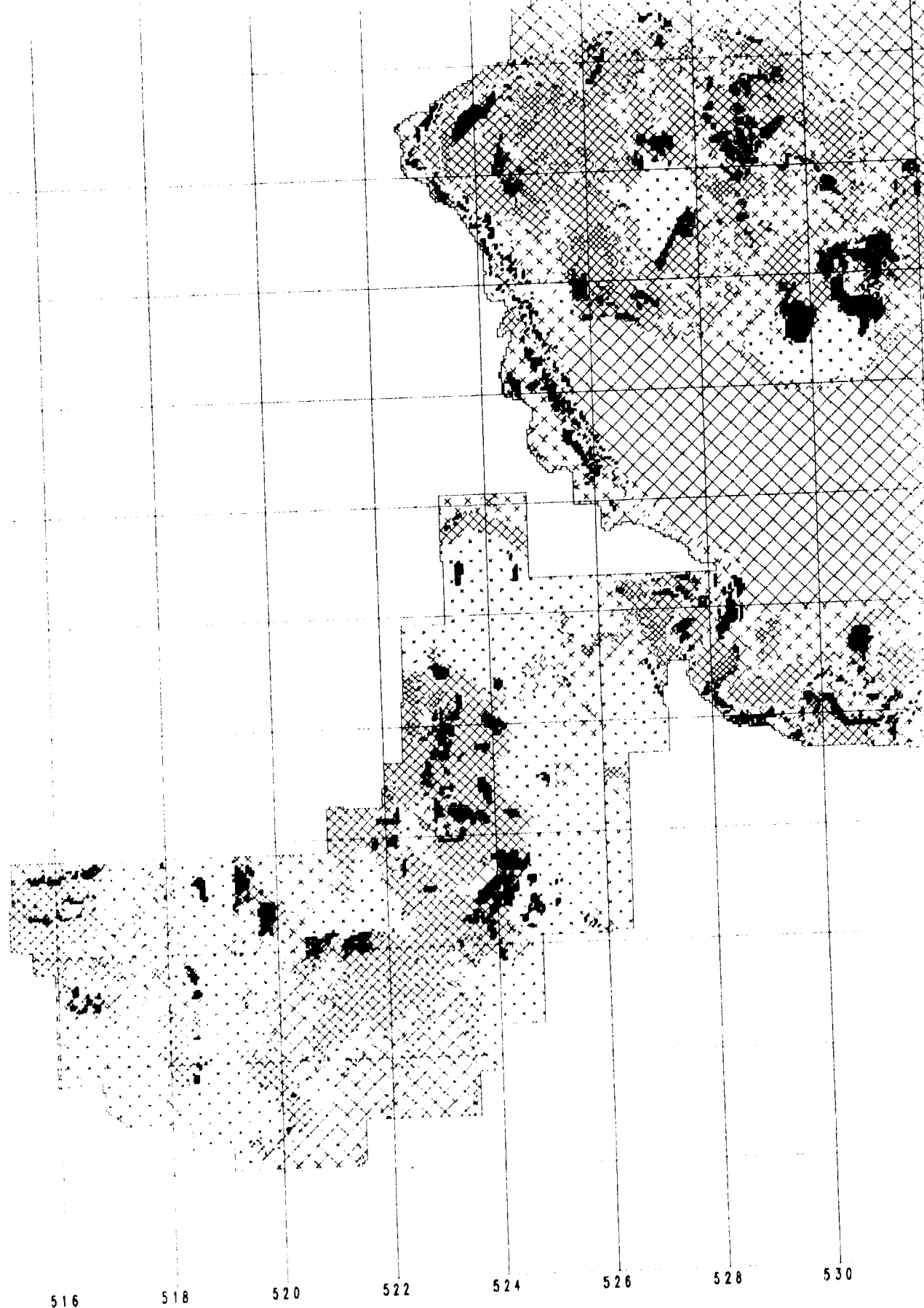


Plate 9. Speed lim

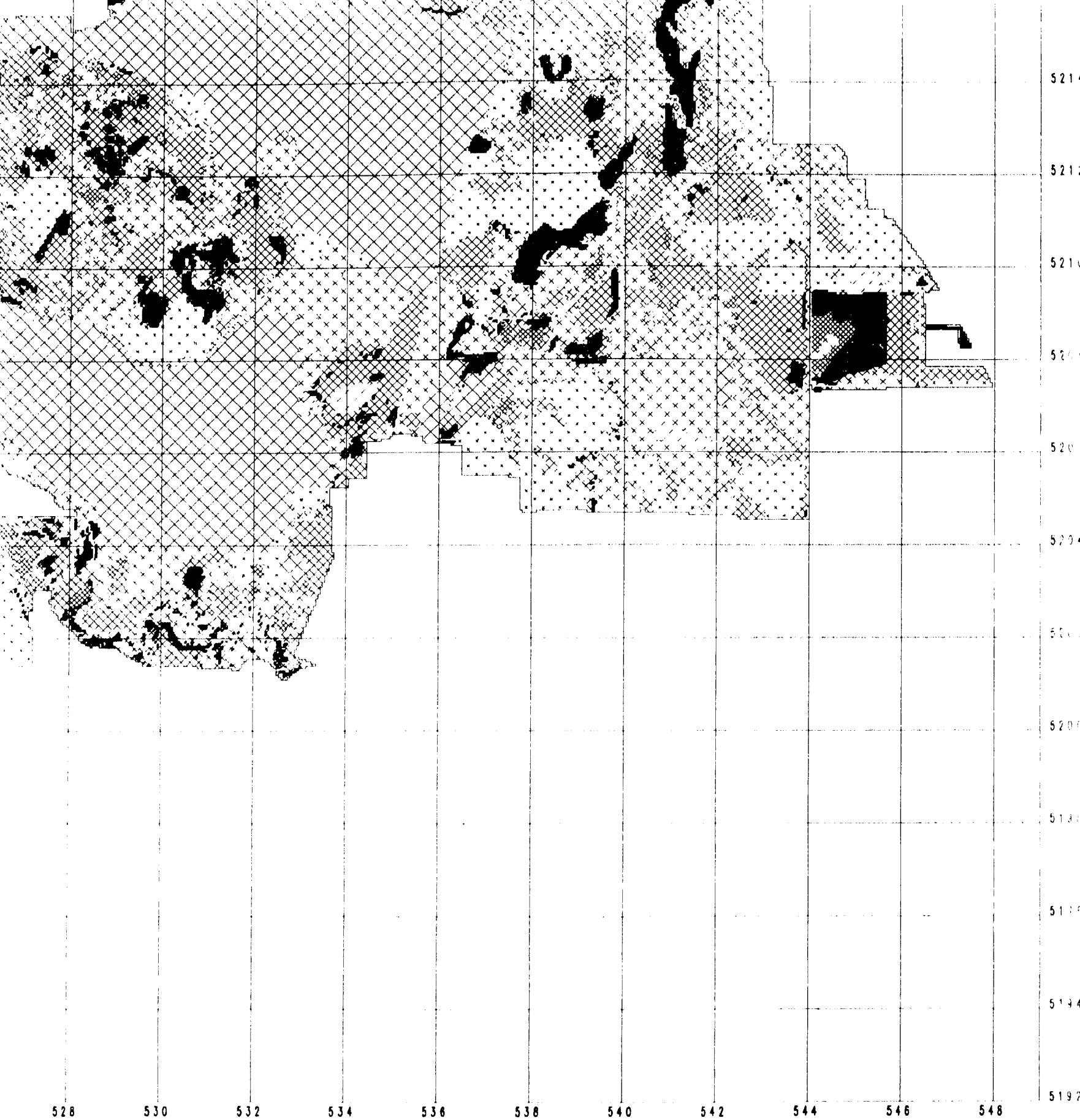
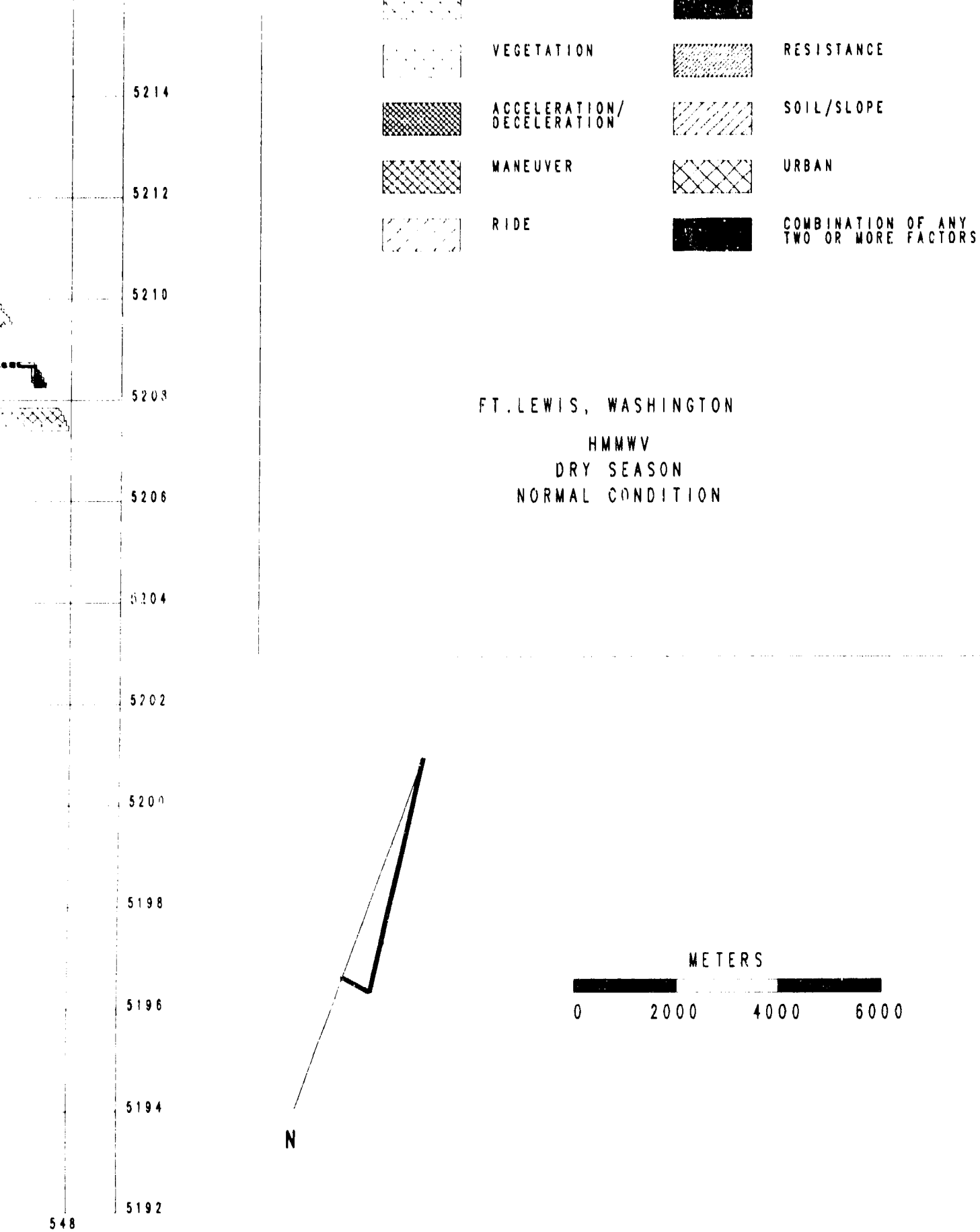


Plate 9. Speed limiting reason map for M998 (HMMWV) wheeled vehicle in the dry normal surface



normal surface condition

5224⁵¹⁴ 516 518 520 522 524 526 528 530 532 5

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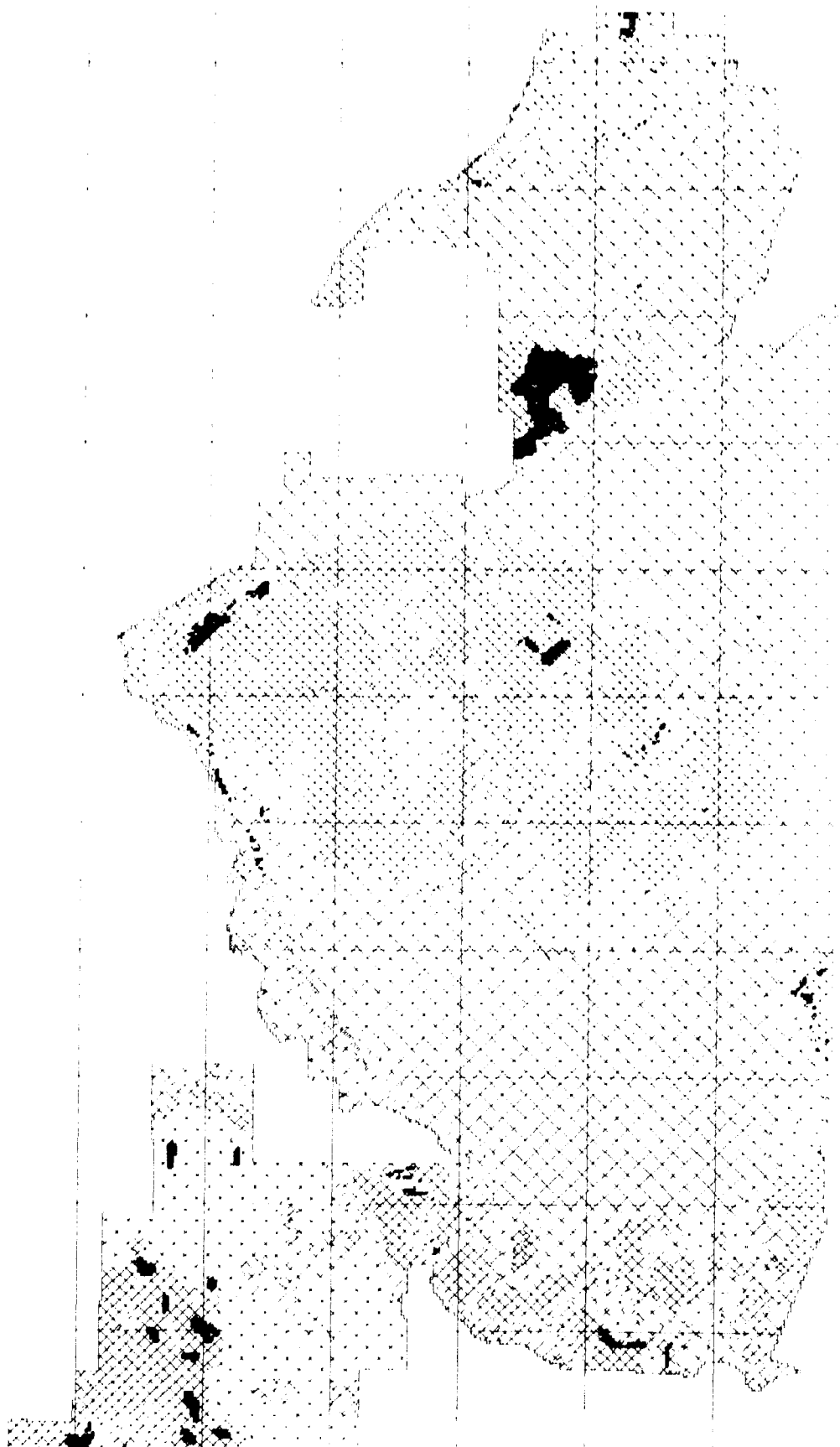
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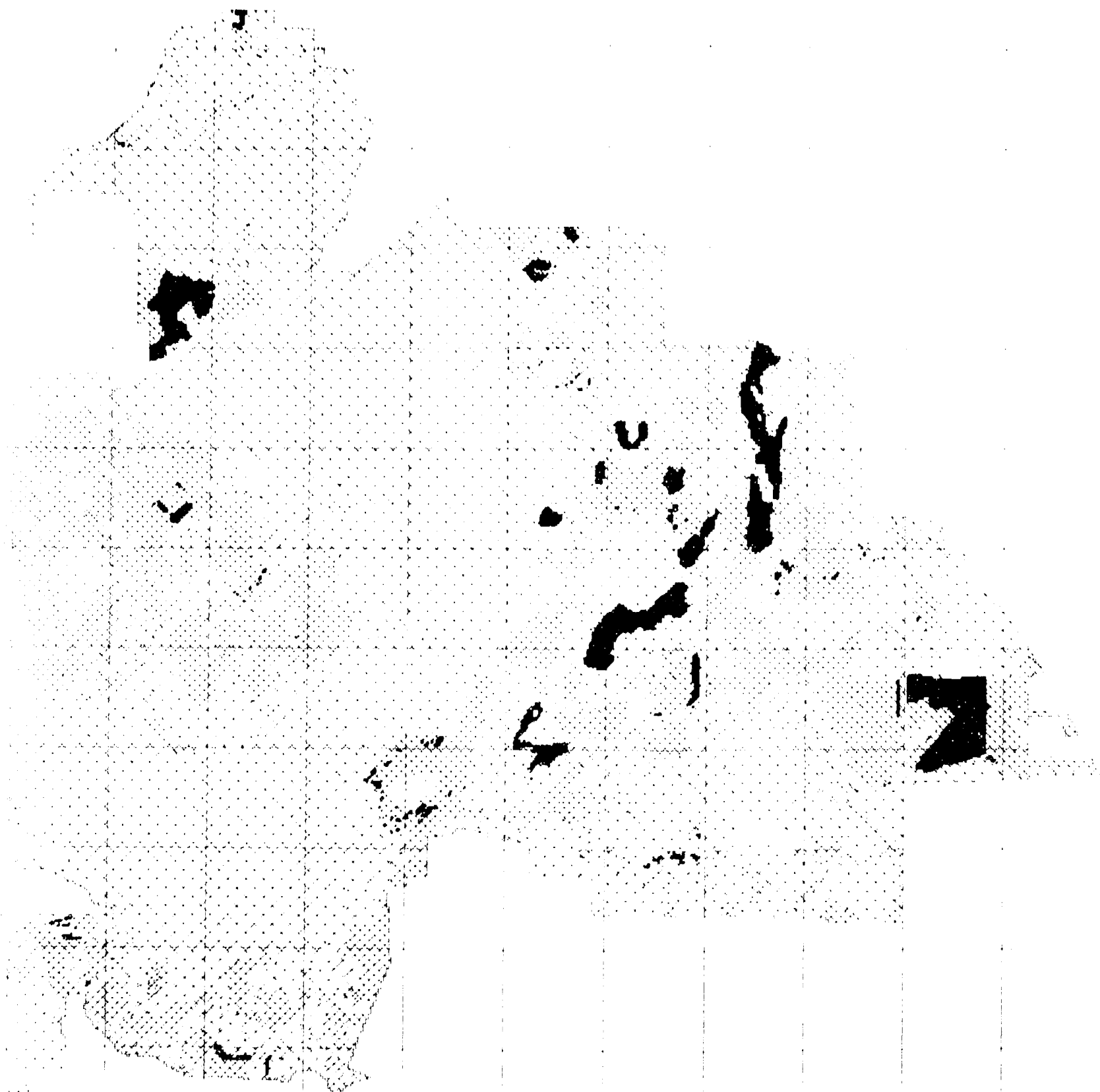
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5224

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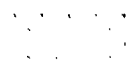


U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED LIMITING REASON

SCALE 1:100000

5218



OBSTACLE



CONE INDEX

5216



VISIBILITY



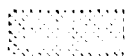
TRACTION

VEGETATION



RESISTANCE

5214



ACCELERATION/
DECELERATION



SOIL/SLOPE

5212



MANEUVER



URBAN

RIDE



COMBINATION OF ANY
TWO OR MORE FACTORS

5210

5208

FT. LEWIS, WASHINGTON

8X8 WHEELED COMBAT VEHICLE

DRY SEASON

5206

NORMAL CONDITION

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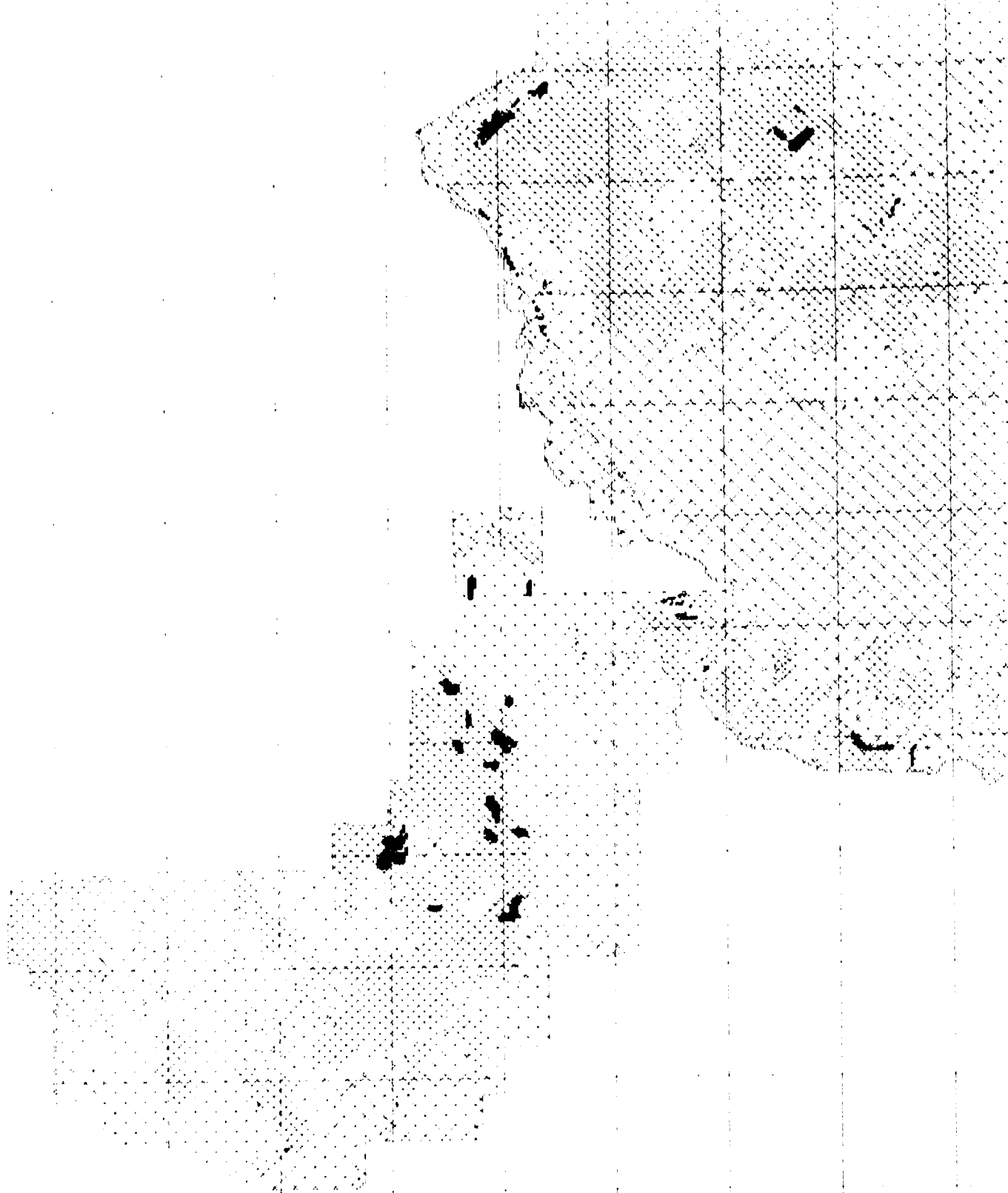
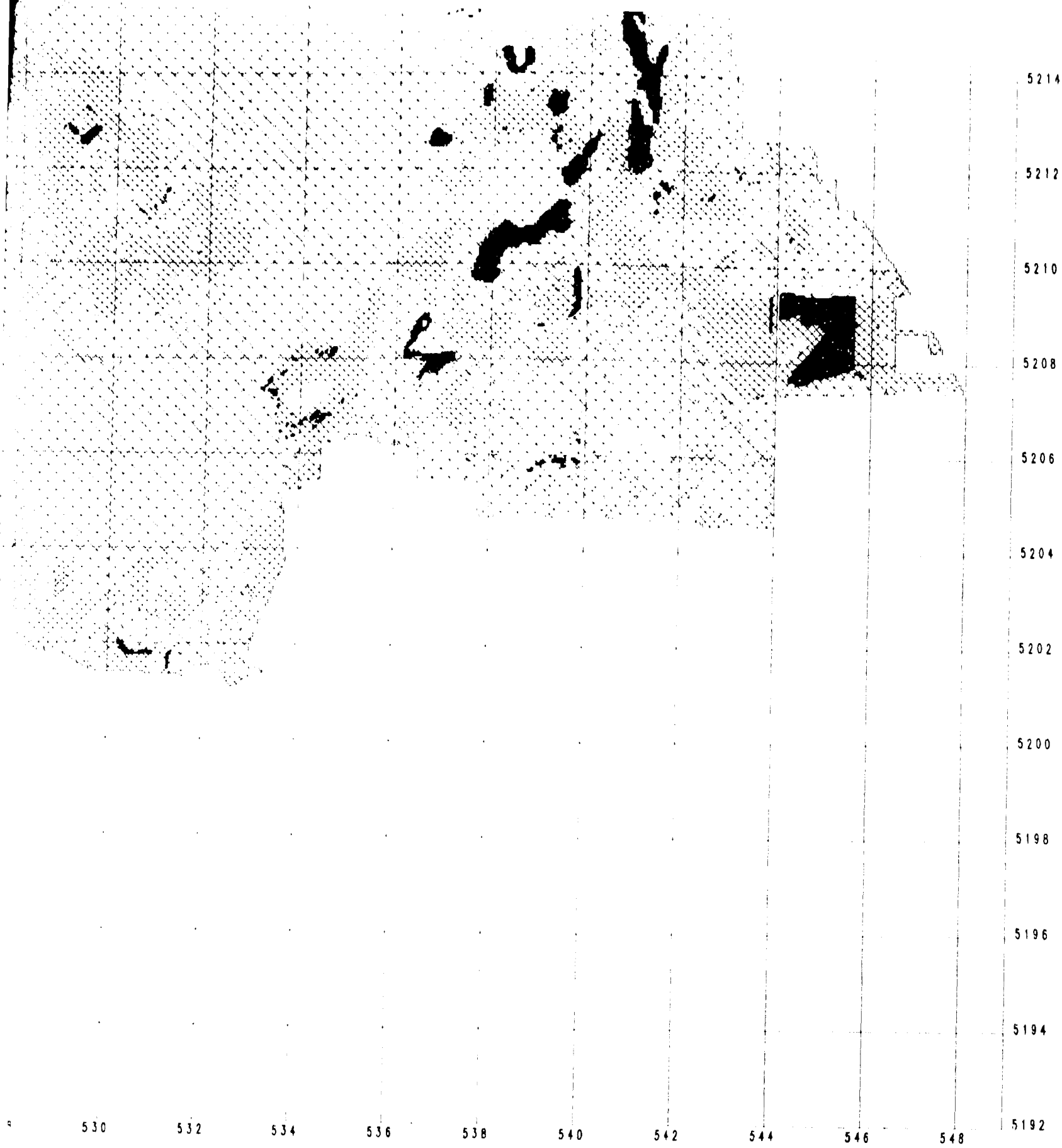


Plate 10. Speed limiting reason



Speed limiting reason map for 8X8 wheeled combat vehicle in the dry normal surface conditio

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VEGETATION

ACCELERATION/
DECELERATION

MANEUVER

RIDE

RESISTANCE

SOIL/SLOPE

URBAN

COMBINATION OF ANY
TWO OR MORE FACTORS

FT. LEWIS, WASHINGTON

8X8 WHEELED COMBAT VEHICLE

DRY SEASON

NORMAL CONDITION

METERS

0 2000 4000 6000

N

al surface condition

5224⁵¹⁴

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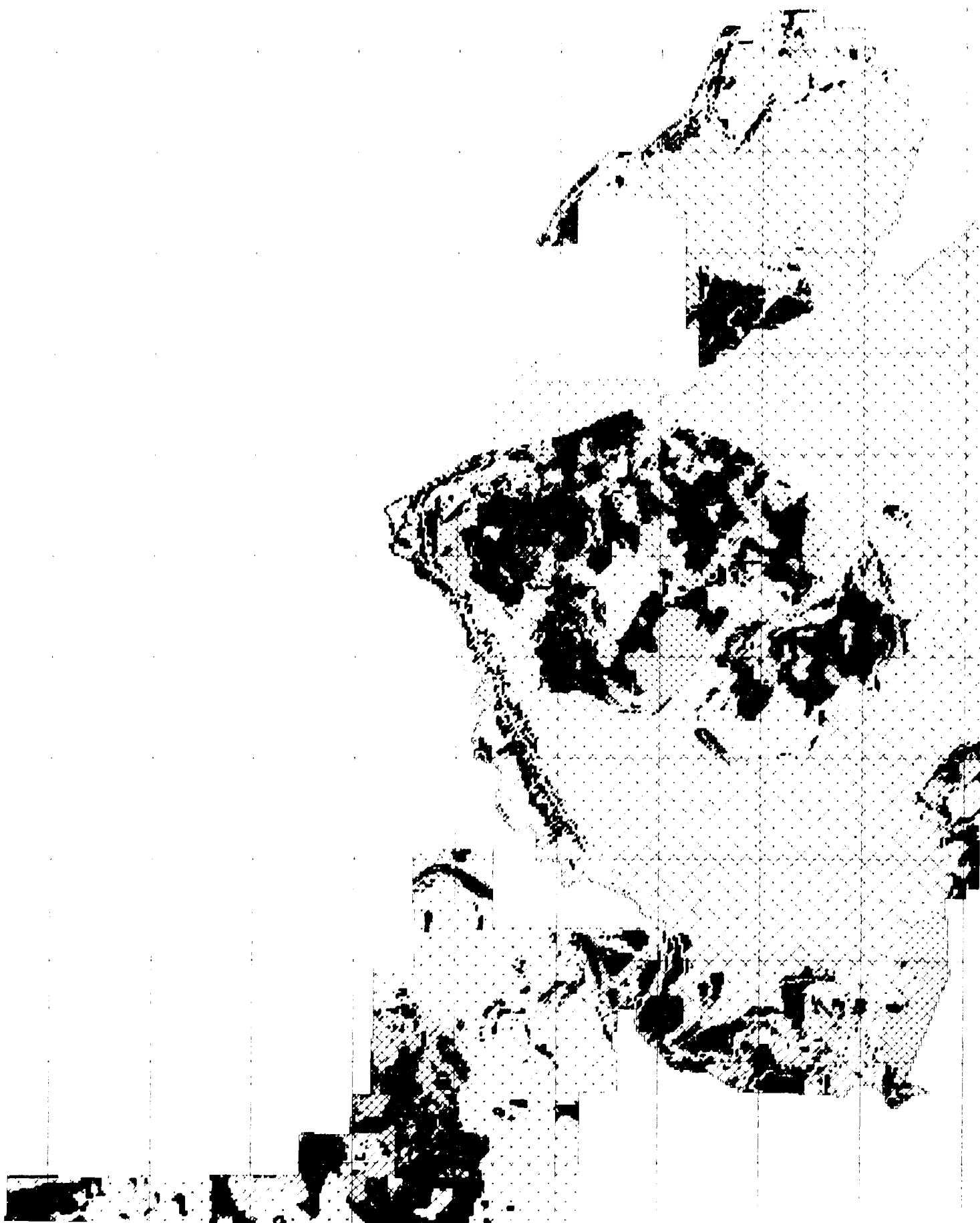
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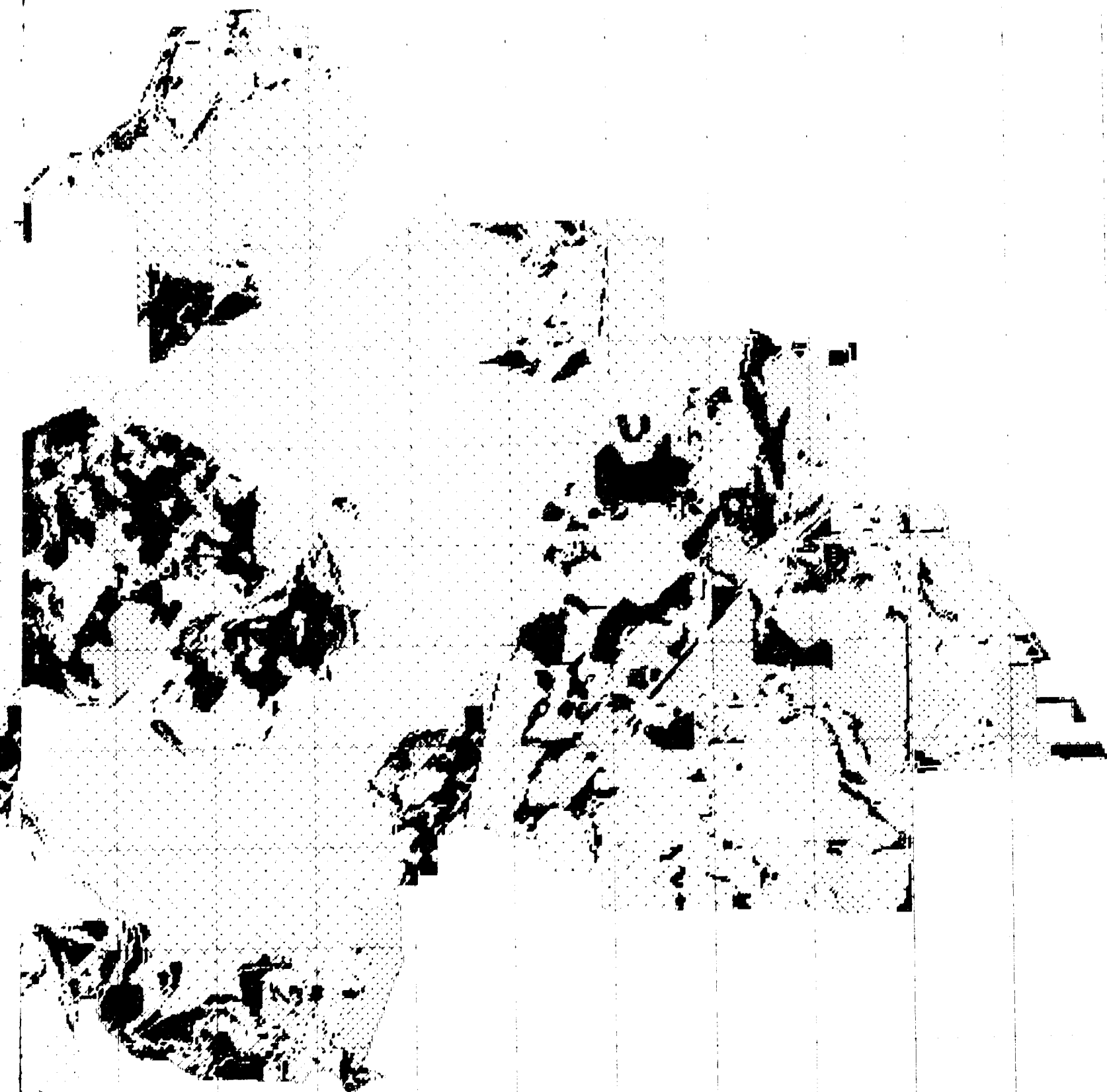
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5224

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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED LIMITING REASON

SCALE 1:100000



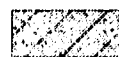
OBSTACLE



CONE INDEX



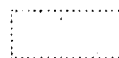
VISIBILITY



TRACTION



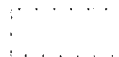
VEGETATION



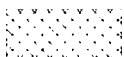
RESISTANCE



ACCELERATION/
DECELERATION



SOIL/SLOPE



MANEUVER



URBAN



RIDE



COMBINATION OF ANY
TWO OR MORE FACTORS

5218

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5202

5200

FT. LEWIS, WASHINGTON

M60A3

DRY SEASON

NORMAL CONDITION

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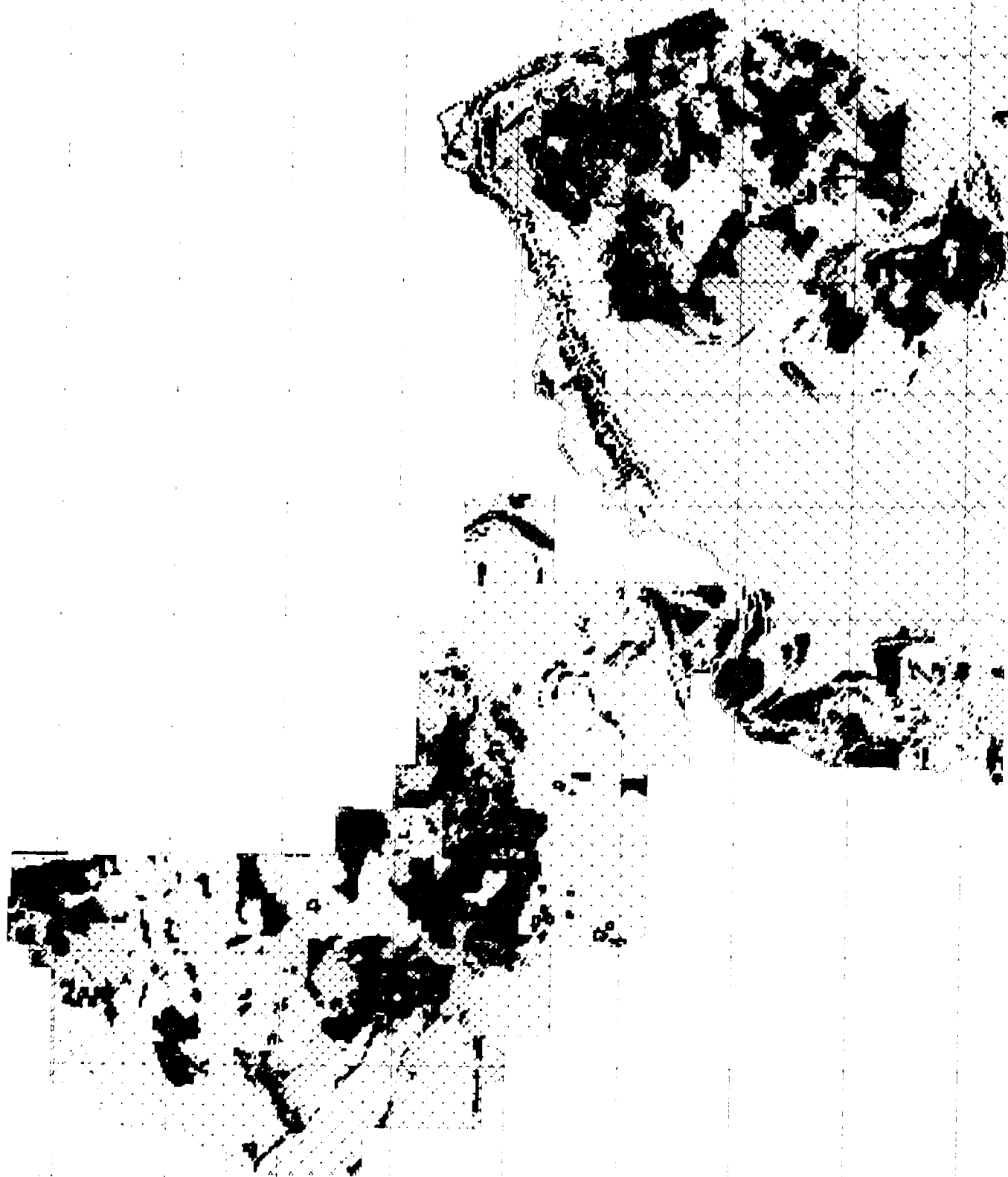
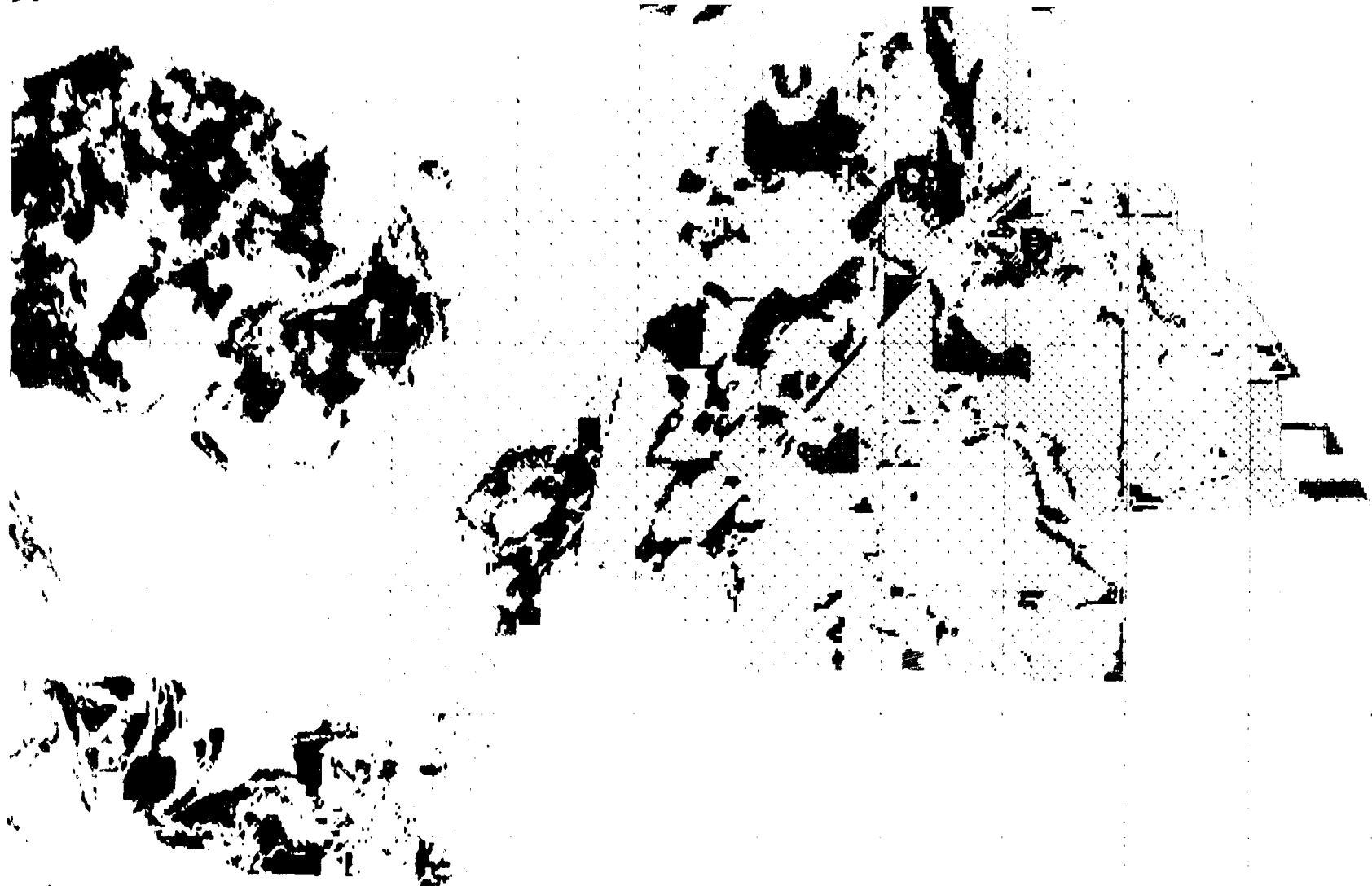


Plate 11. Speed limit



528 530 532 534 536 538 540 542 544 546 548

Plate 11. Speed limiting reason map for M60A3 combat tank in the dry normal surface c

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VISIBILITY

VEGETATION

ACCELERATION/
DECELERATION

MANEUVER

RIDE

TRACTION

RESISTANCE

SOIL/SLOPE

URBAN

COMBINATION OF ANY
TWO OR MORE FACTORS

FT. LEWIS, WASHINGTON

M60A3

DRY SEASON

NORMAL CONDITION

N

METERS

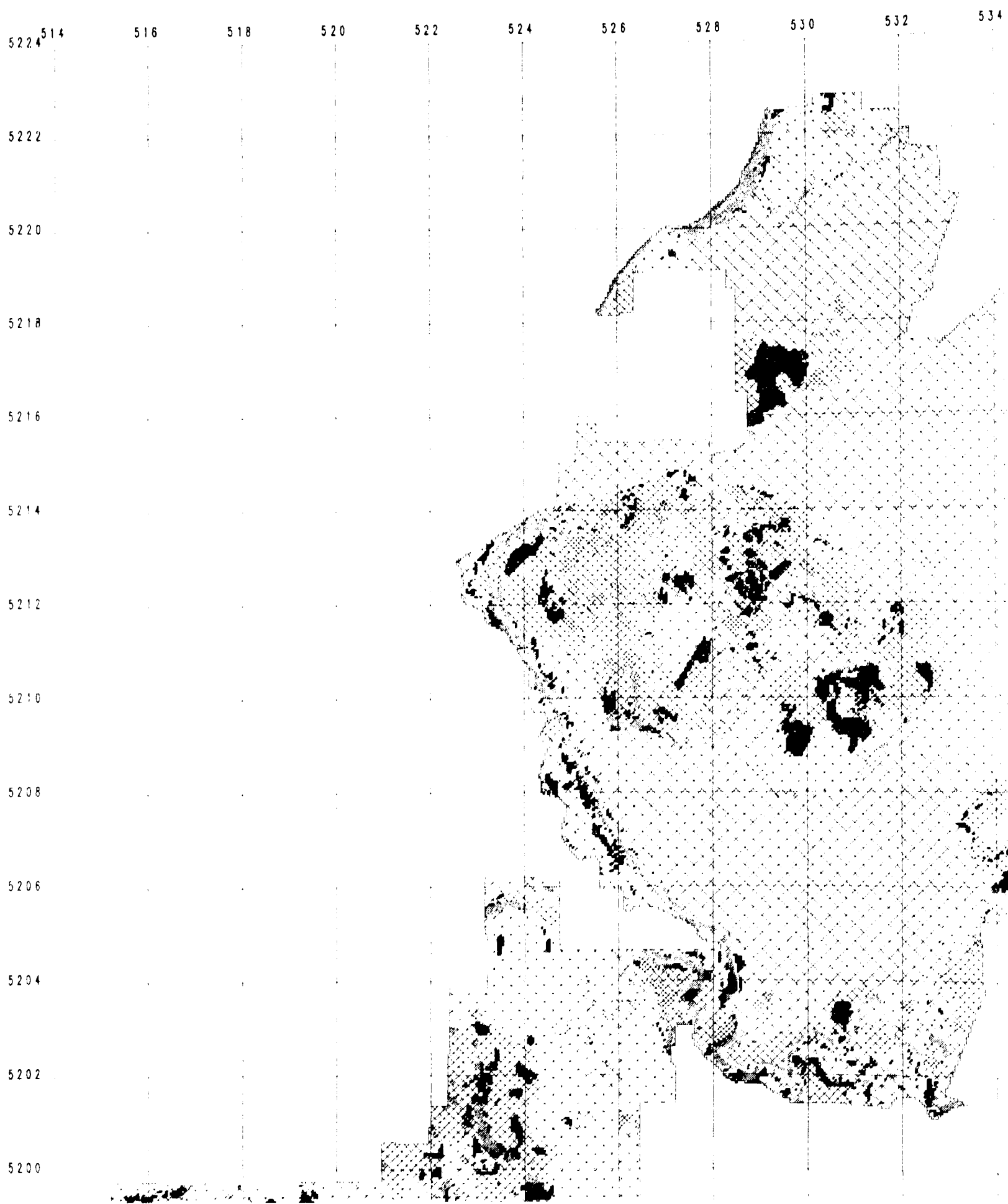
0

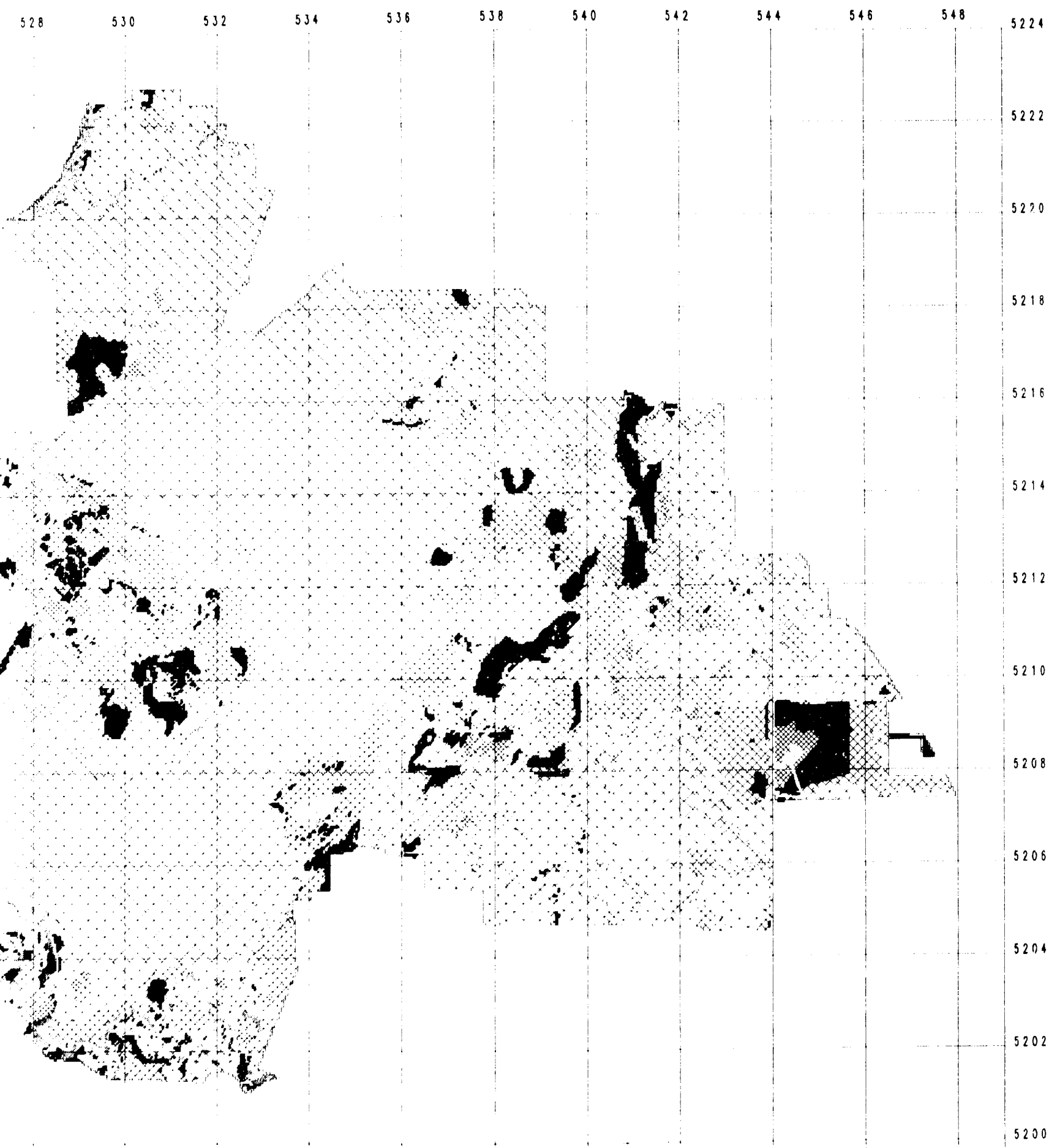
2000

4000

6000

surface condition





5224

5222

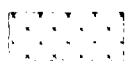
5220



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED LIMITING REASON

SCALE 1:100000



OBSTACLE



CONE INDEX



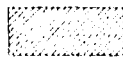
VISIBILITY



TRACTION



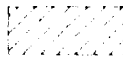
VEGETATION



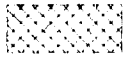
RESISTANCE



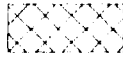
ACCELERATION/
DECELERATION



SOIL/SLOPE



MANEUVER



URBAN



RIDE



COMBINATION OF ANY
TWO OR MORE FACTORS

5218

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5208

FT. LEWIS, WASHINGTON

HMMWV

WET SEASON

SLIPPERY CONDITION

5206

5204

5202

5200

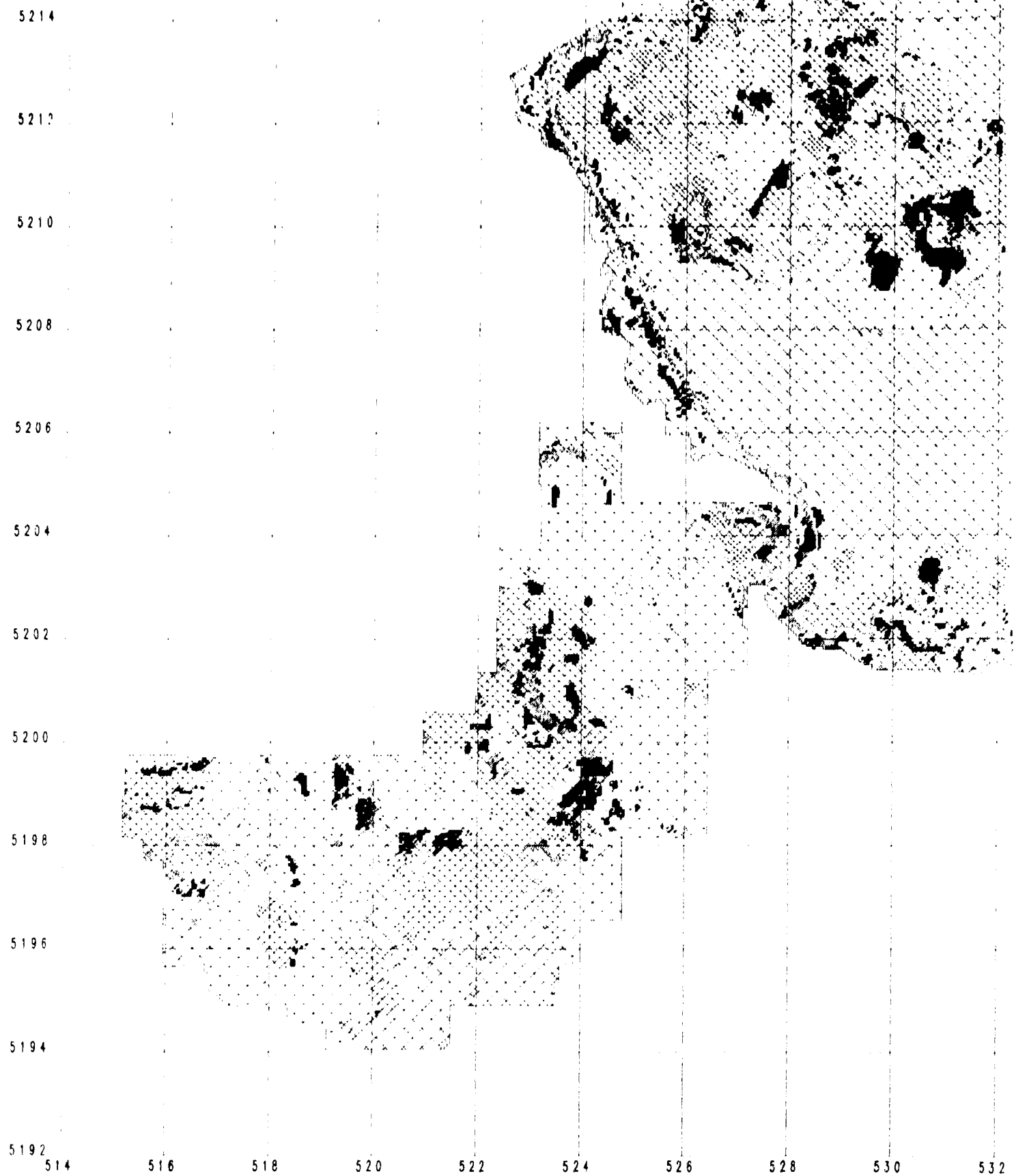
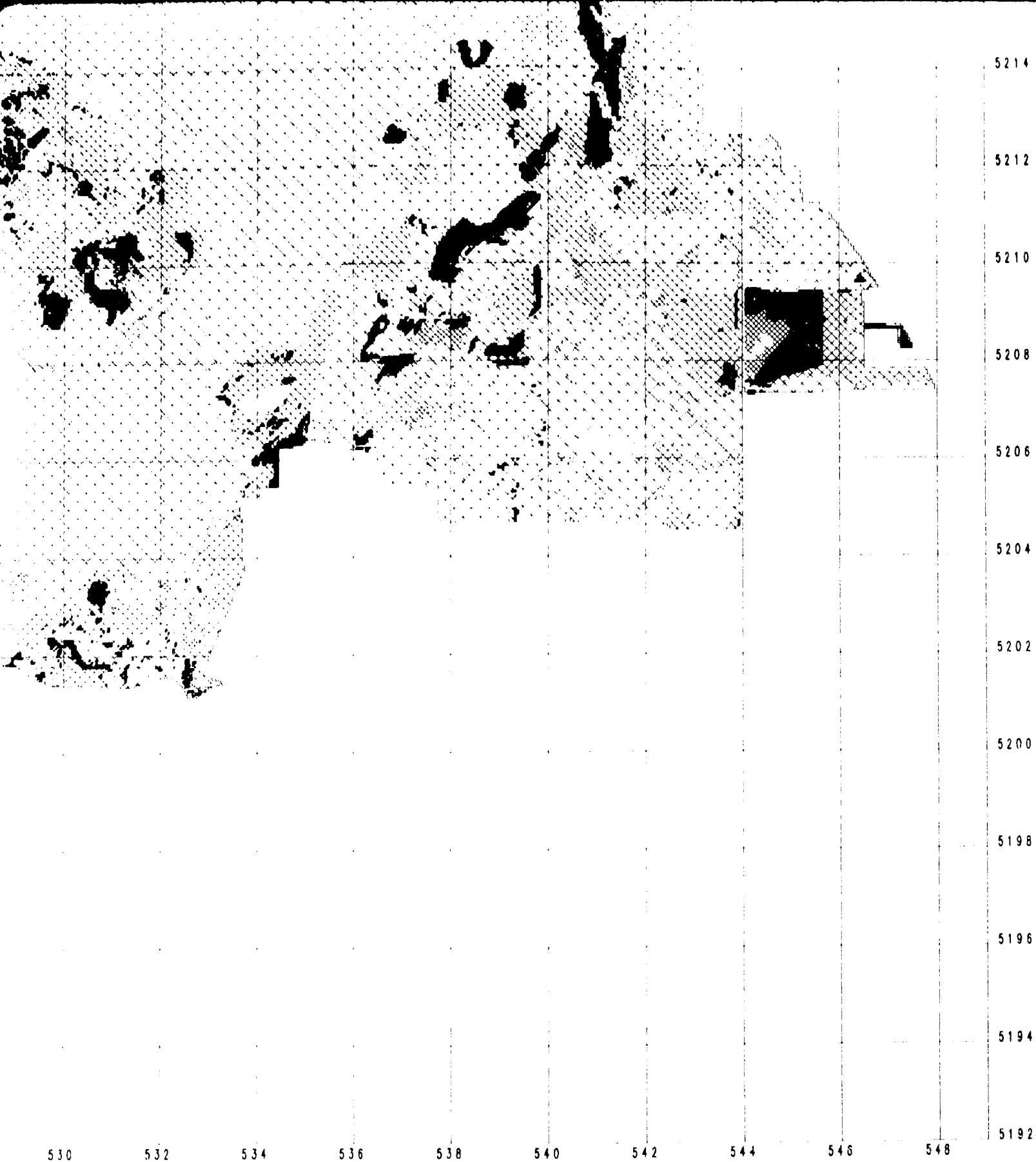


Plate 12. Speed limiting reasons



limiting reason map for M998 (HMMWV) wheeled vehicle in the wet slippery surface condit

5216

VISIBILITY

TRACTION

VEGETATION

RESISTANCE

5214

ACCELERATION/
DECELERATION

SOIL/SLOPE

5212

MANEUVER

URBAN

RIDE

COMBINATION OF ANY
TWO OR MORE FACTORS

5210

5208

FT. LEWIS, WASHINGTON

MMWV

WET SEASON

5206

SLIPPERY CONDITION

5204

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5200

5198

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5192

N

METERS

0 2000 4000 6000

t slippery surface condition

5224⁵¹⁴ 516 518 520 522 524 526 528 530 532 534

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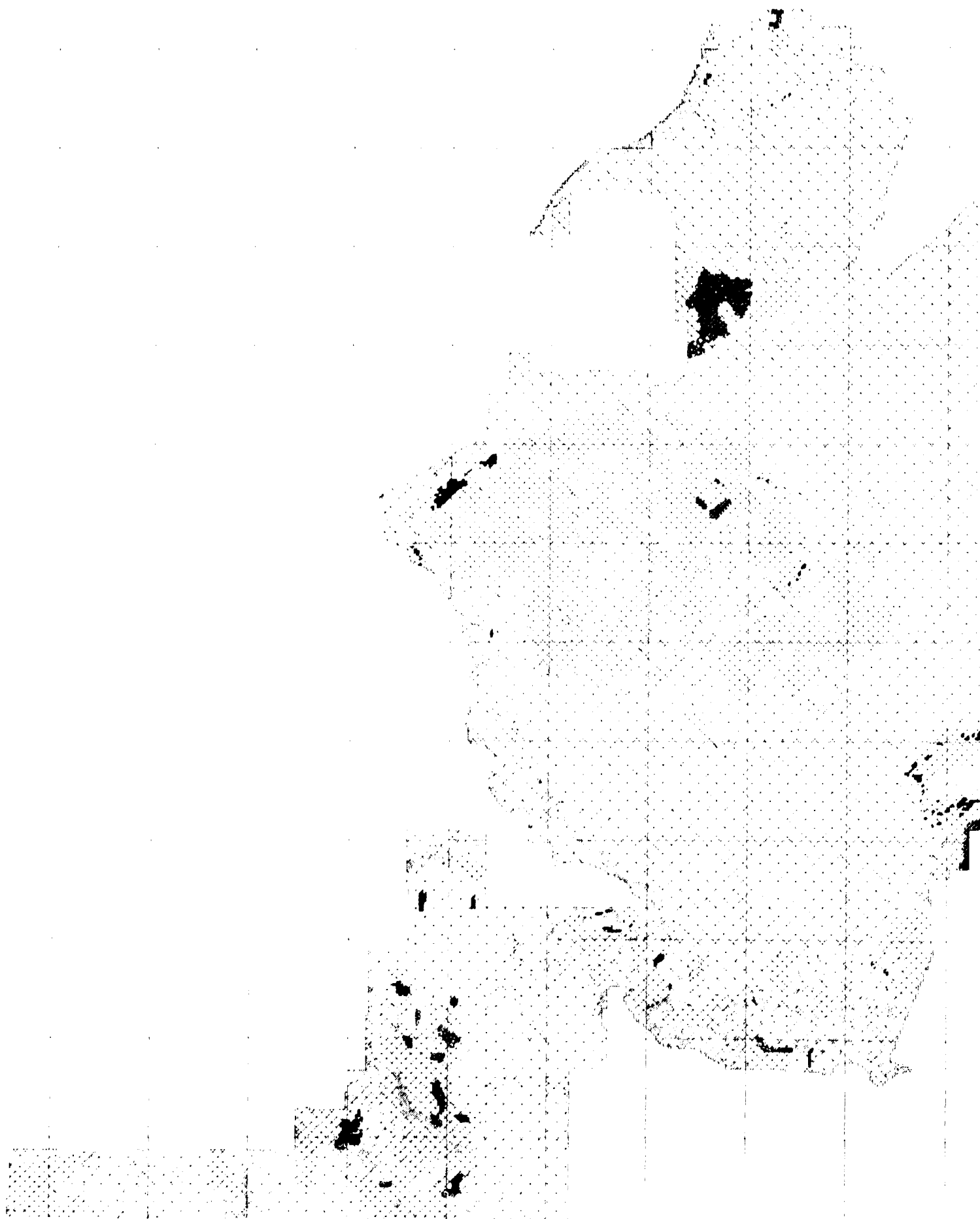
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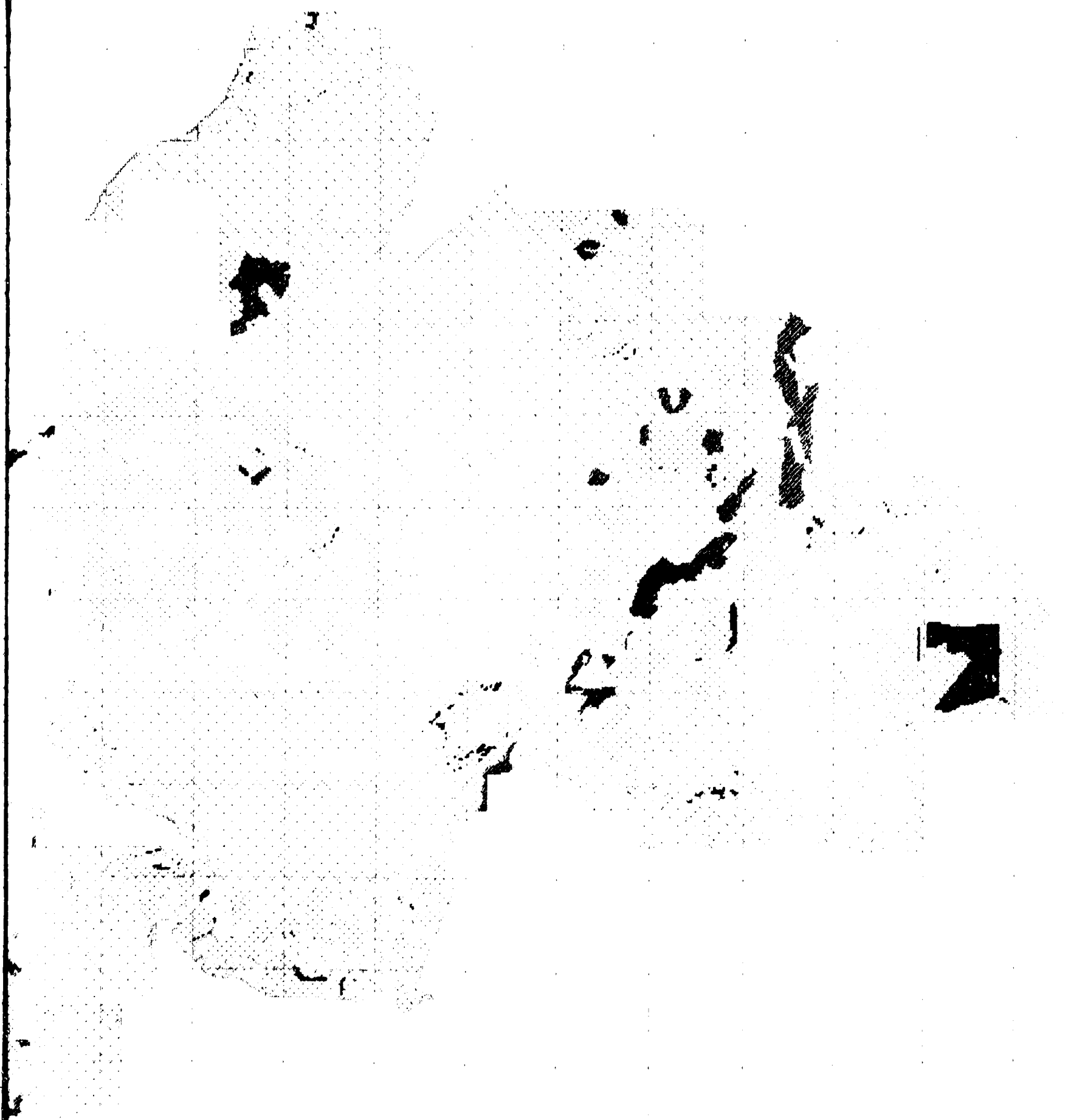
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5224



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Waterways
Experiment
Station

5222

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SPEED LIMITING REASON

SCALE 1:100000

5218

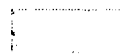
OBSTACLE



CONE INDEX

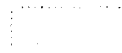
5216

VISIBILITY



TRACTION

VEGETATION



RESISTANCE

5214

ACCELERATION/
DECELERATION



SOIL/SLOPE

5212

MANEUVER



URBAN

RIDE



COMBINATION OF ANY
TWO OR MORE FACTORS

5210

5208

FT. LEWIS, WASHINGTON

8X8 WHEELED COMBAT VEHICLE

WET SEASON

5206

SLIPPERY CONDITION

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Plate 13. Speed limiting r

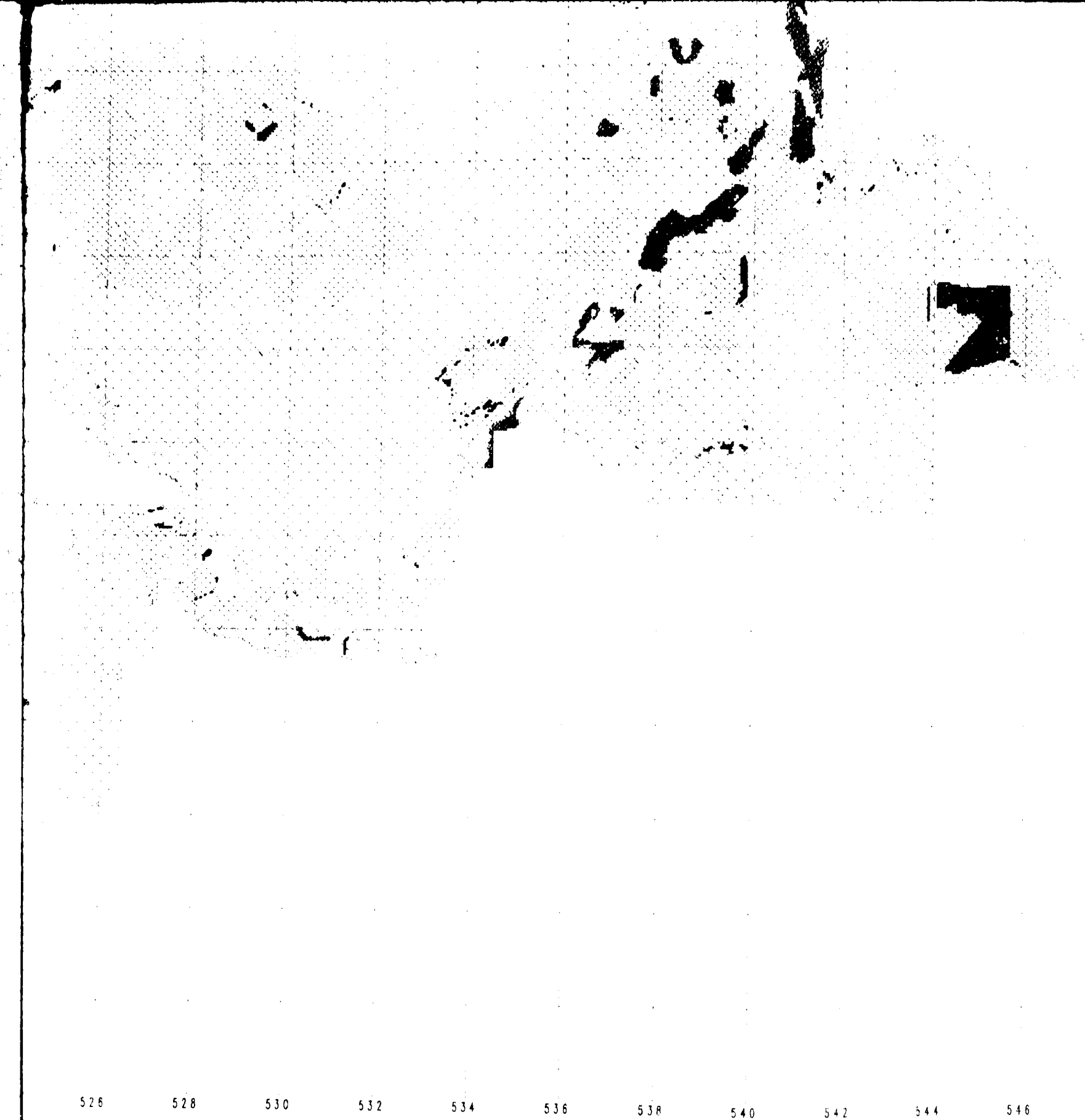


Table 13. Speed limiting reason map for 8X8 wheeled combat vehicle in the wet slippery

5214
5212
5210
5208
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5202
5200
5198
5196
5194
5192



VEGETATION

RESISTANCE

SOIL/SLOPE

URBAN

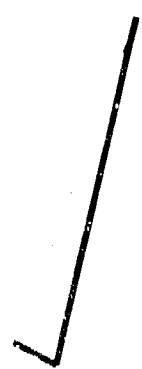
COMBINATION OF ANY TWO OR MORE FACTORS

FT. LEWIS, WASHINGTON

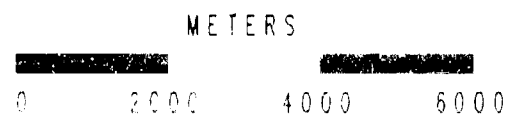
8X8 WHEELED COMBAT VEHICLE

WET SEASON

SLIPPERY CONDITION



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slippery surface condition

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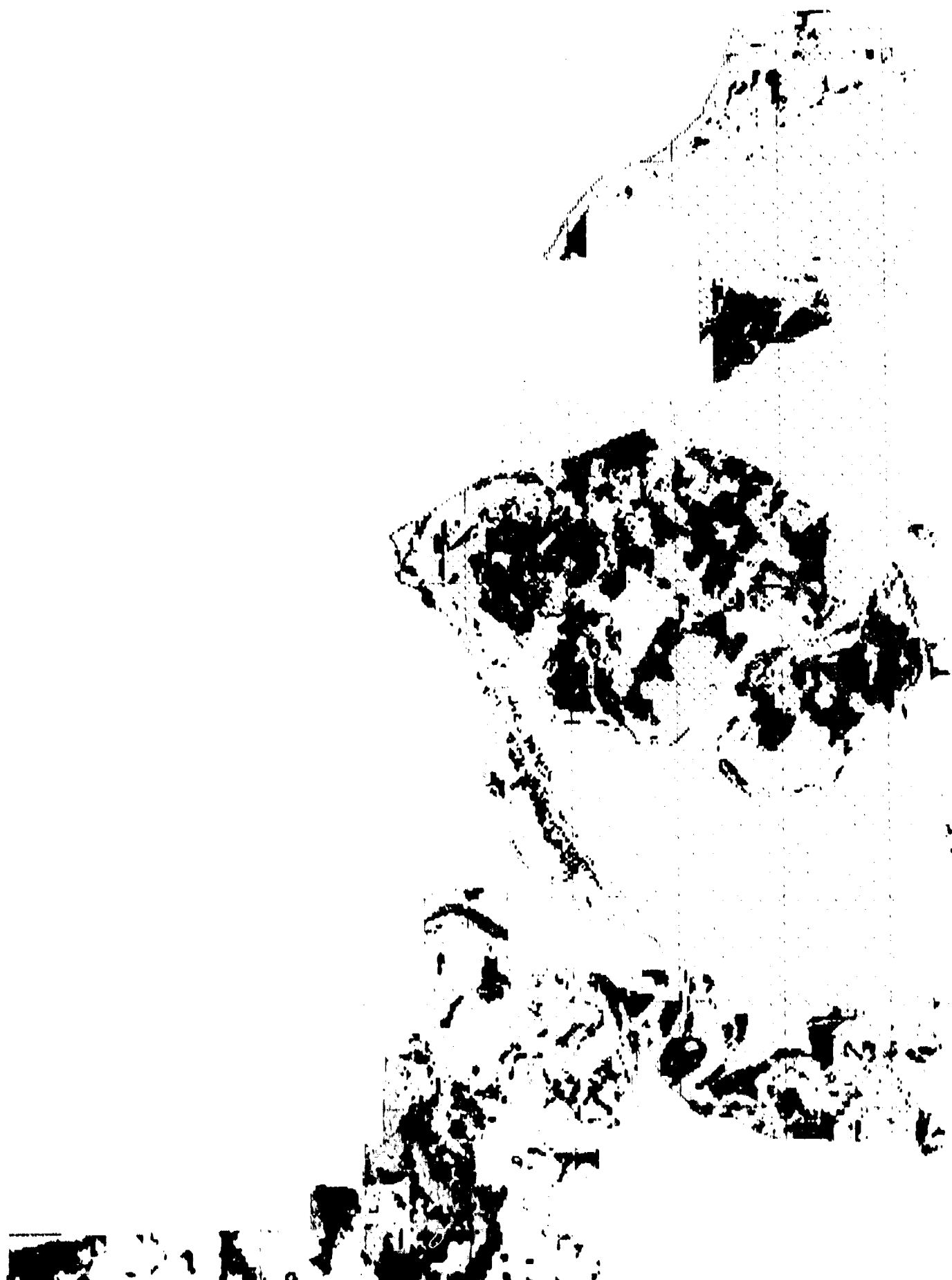
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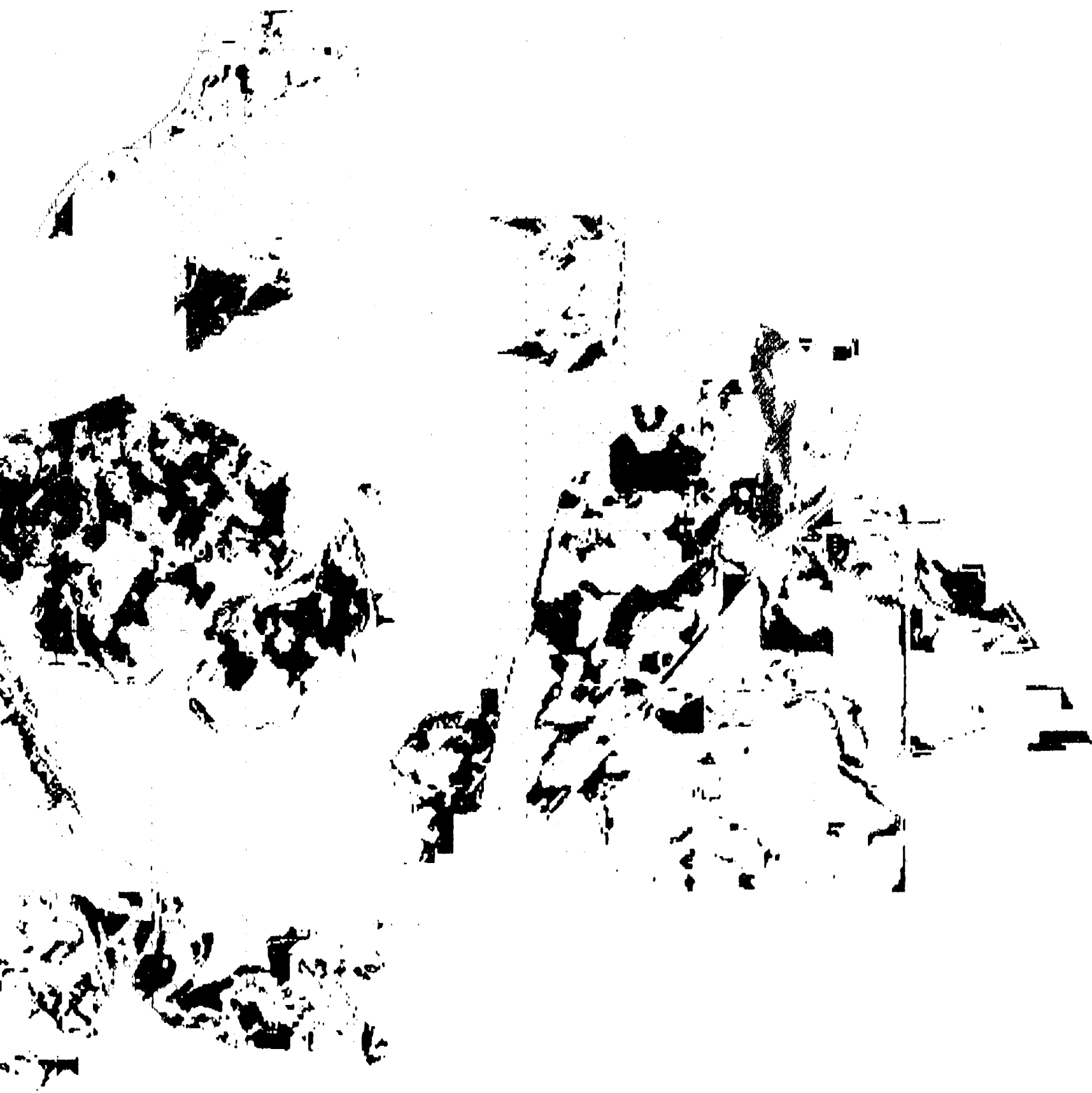
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5224



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Waterways
Experiment
Station

5222

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SPEED LIMITING REASON

SCALE 1:100000

5218

OBSTACLE

CONCRETE INDEX

5215

VISIBILITY

TRACTION

VEGETATION

RESISTANCE

5214

ACCELERATION/
DECELERATION

SOIL/SLOPE

MANEUVER

URBAN

5212

RIDE

COMBINATION OF ANY
TWO OR MORE FACTORS

5210

5208

FT LEWIS, WASHINGTON

M6043

WET SEASON

5206

SLIPPERY CONDITION

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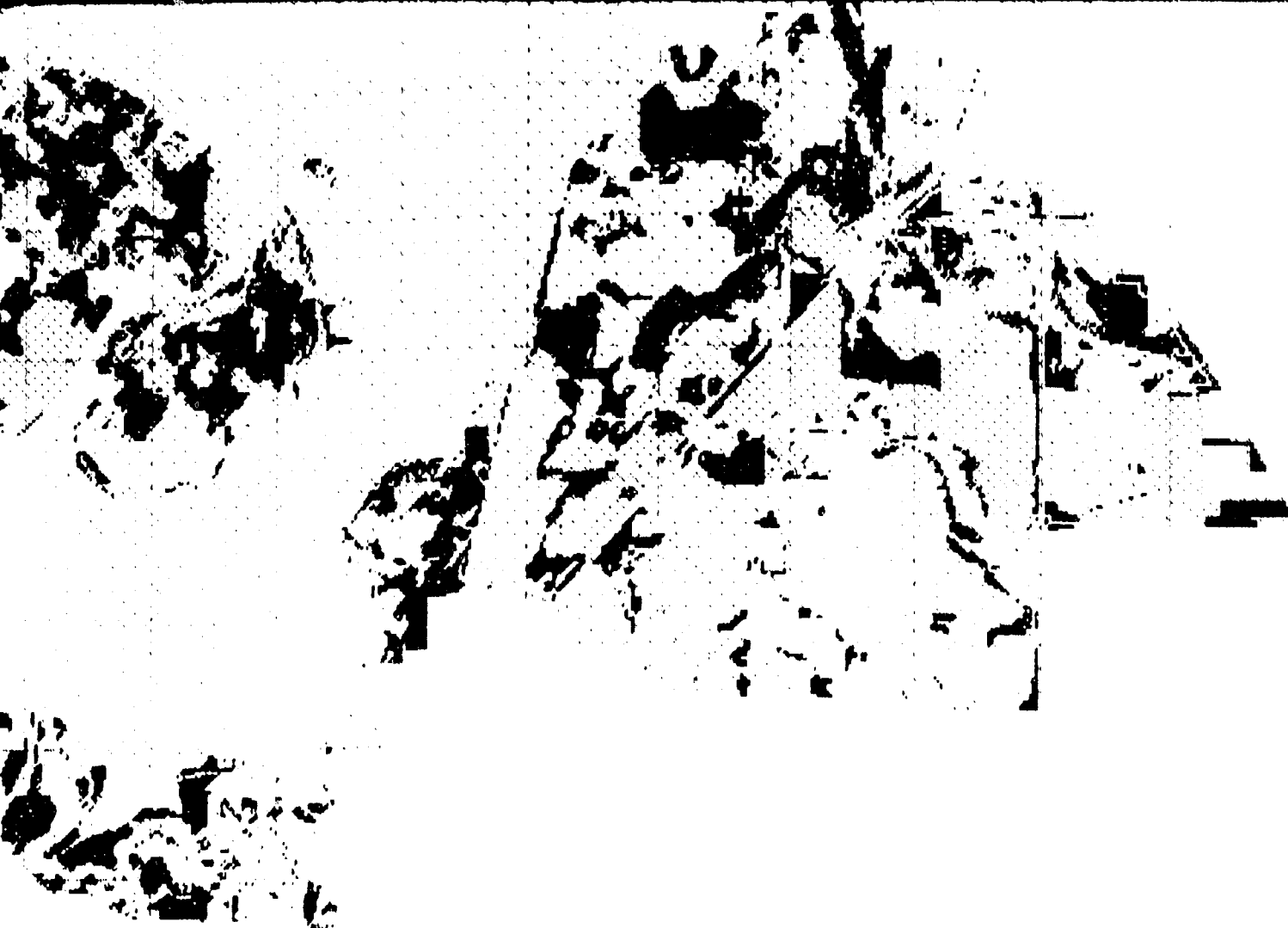
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plate 14. Speed



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Figure 14. Speed limiting reason map for M60A3 combat tank in the wet slippery surface condition

VEGETATION

RESISTANCE

5214



ACCELERATION/
DECELERATION

SOIL/SLOPE

5212



MANEUVER

URBAN

RIDE

COMBINATION OF ANY
TWO OR MORE FACTORS

521

5208

FT. LEWIS, WASHINGTON

M60A3

WET SEASON

5206

SLIPPERY CONDITION

5204

5202

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METERS

0 2000 4000 6000

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5192

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ly surface condition

5224⁵¹⁴

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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGG



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



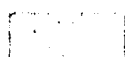
SEVERE
(>12 in)



SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(2-5 in)

WATER

FT LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

10 PASSES

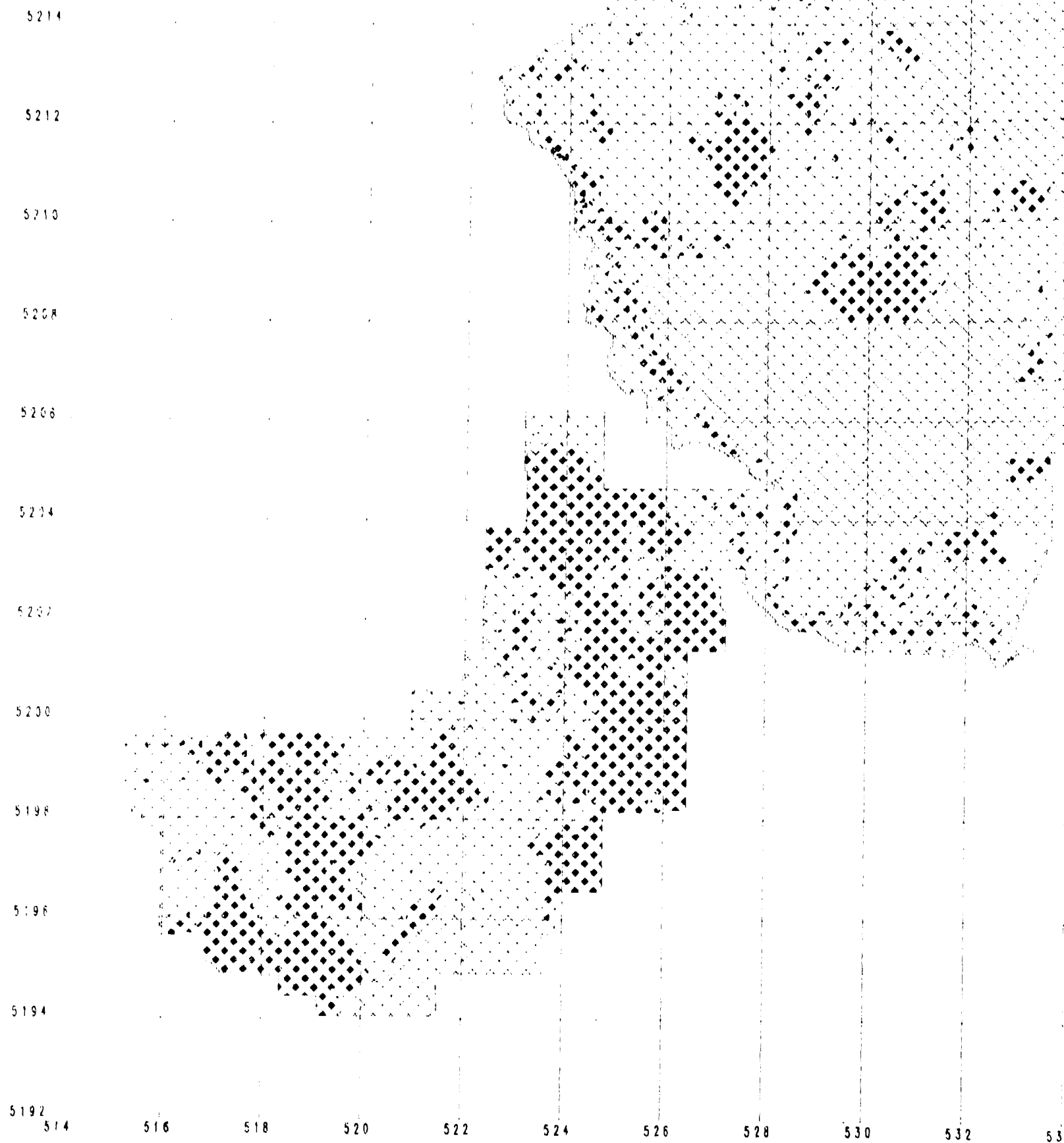
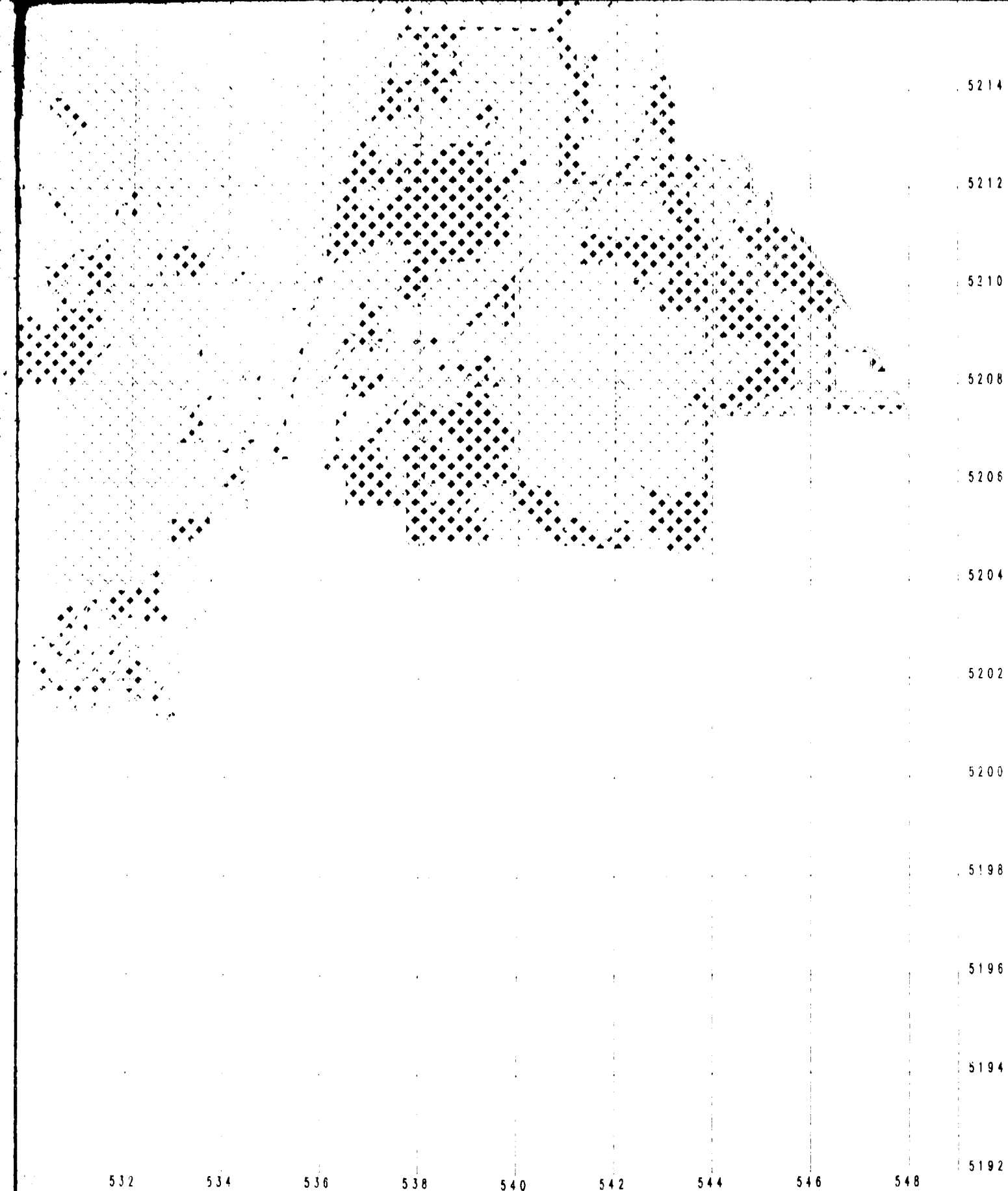


Plate 15. Ten pass soil disturbance level map for



Force level map for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal surface condition

SLIGHT
(.5-2 in)

URBAN/
OFF LIMITS

MODERATE
(2-5 in)

WATER

5214

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FT LEWIS, WASHINGTON
3-3-5 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
10 PASSES

METERS

0 2000 4000 6000

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dry normal surface condition

5224⁵¹⁴

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546 548

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U. S. Army Corps of Engineers Waterways Experiment Station

SOIL DISTURBANCE LEVELS

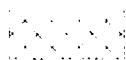
SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



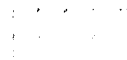
SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

50 PASSES

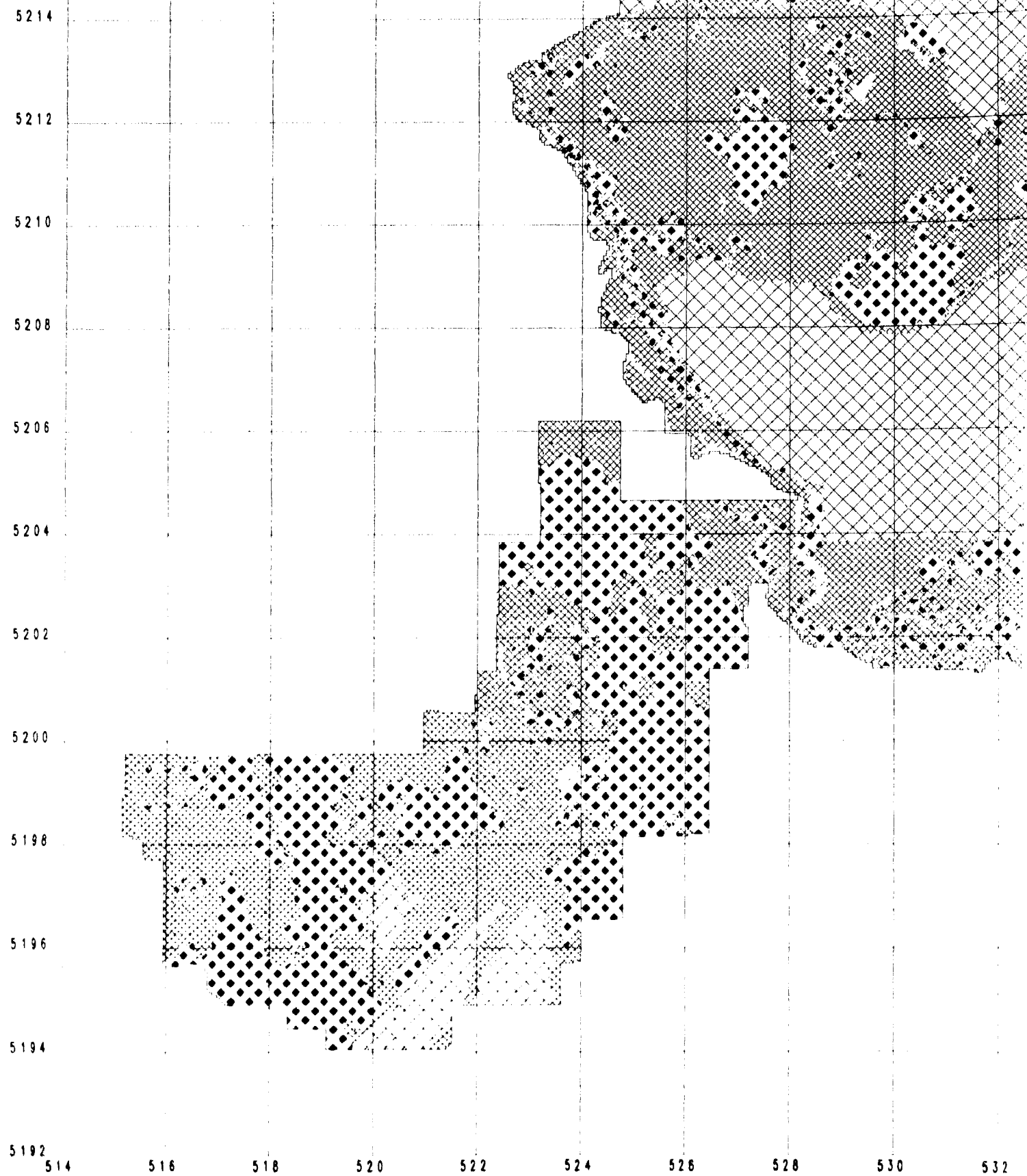
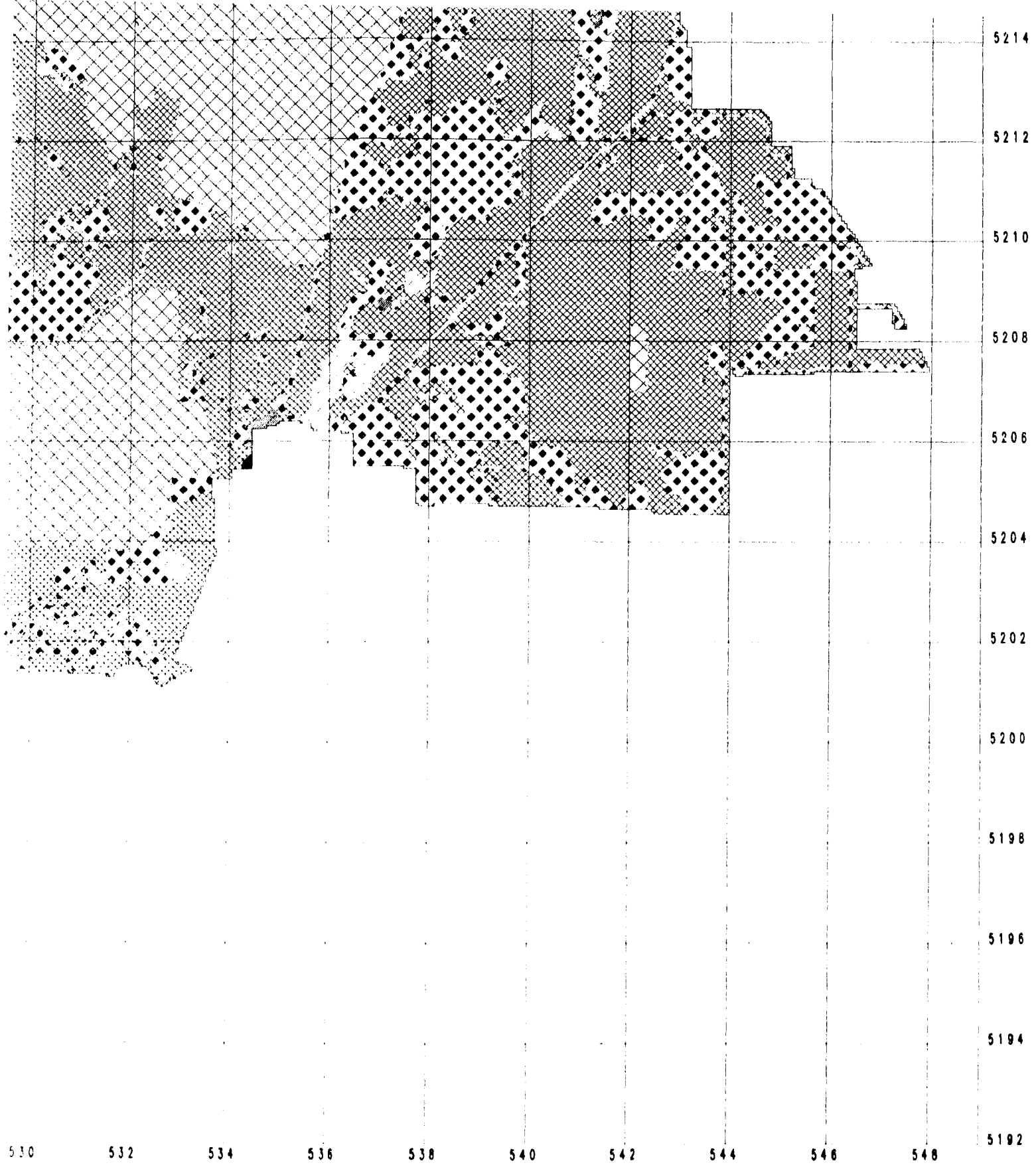
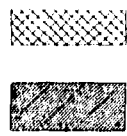
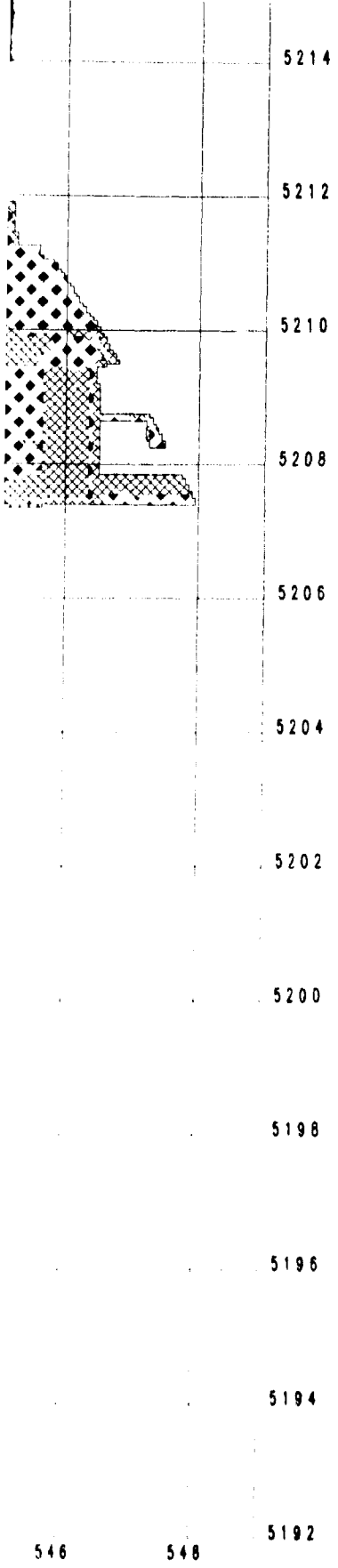


Plate 16. Fifty pass soil disturbance leve

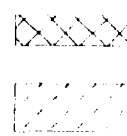


N

rbance level map for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal surface cor



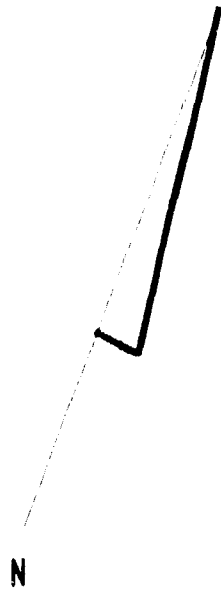
(>1.5-2 in)
MODERATE
(>2-5 in)



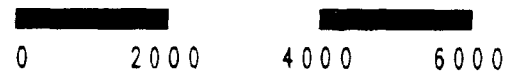
OFF LIMITS
WATER

FT LEWIS, WASHINGTON
3-3-5 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
50 PASSES

5214
5212
5210
5208
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5202
5200
5198
5196
5194
5192



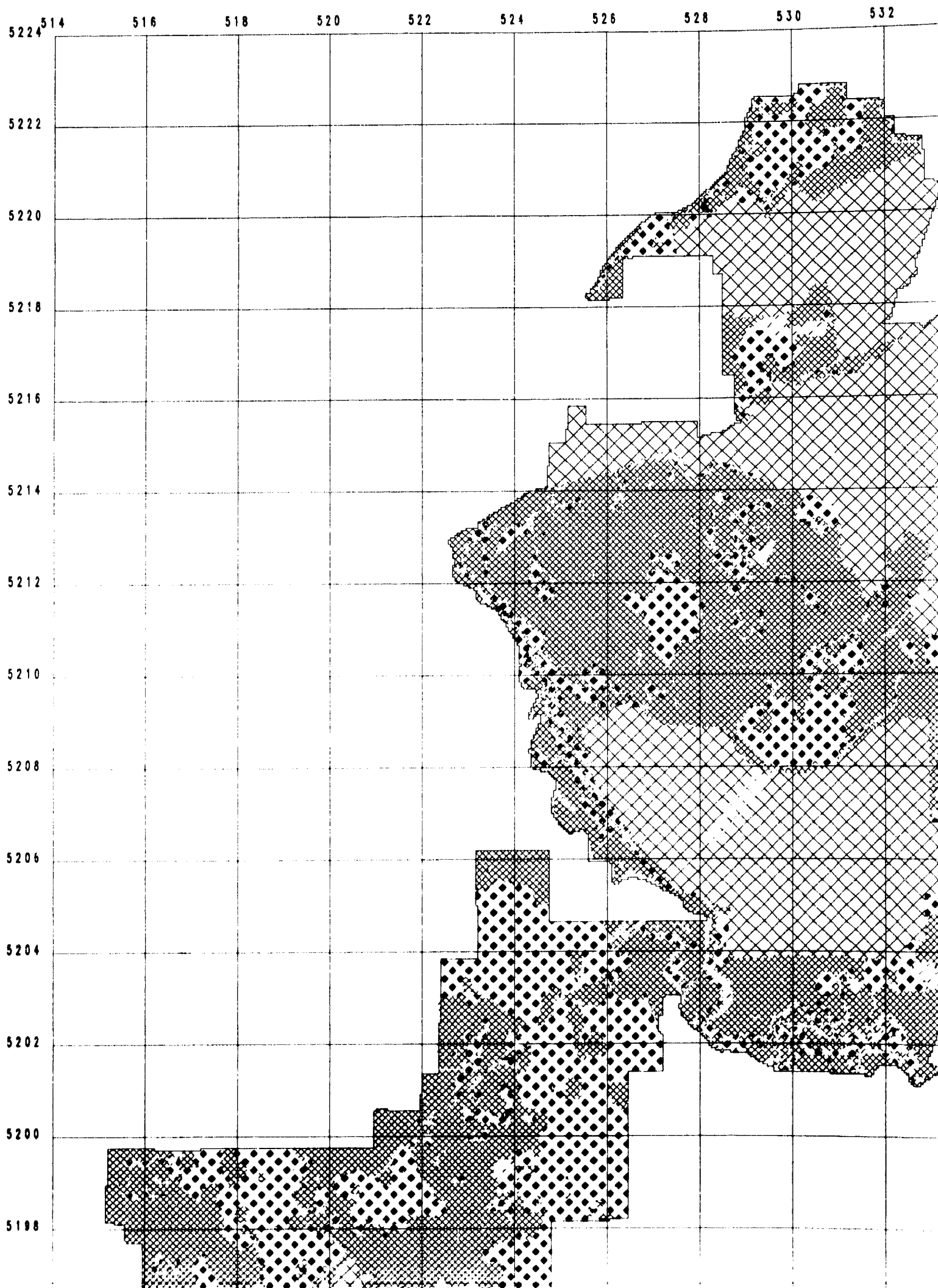
METERS



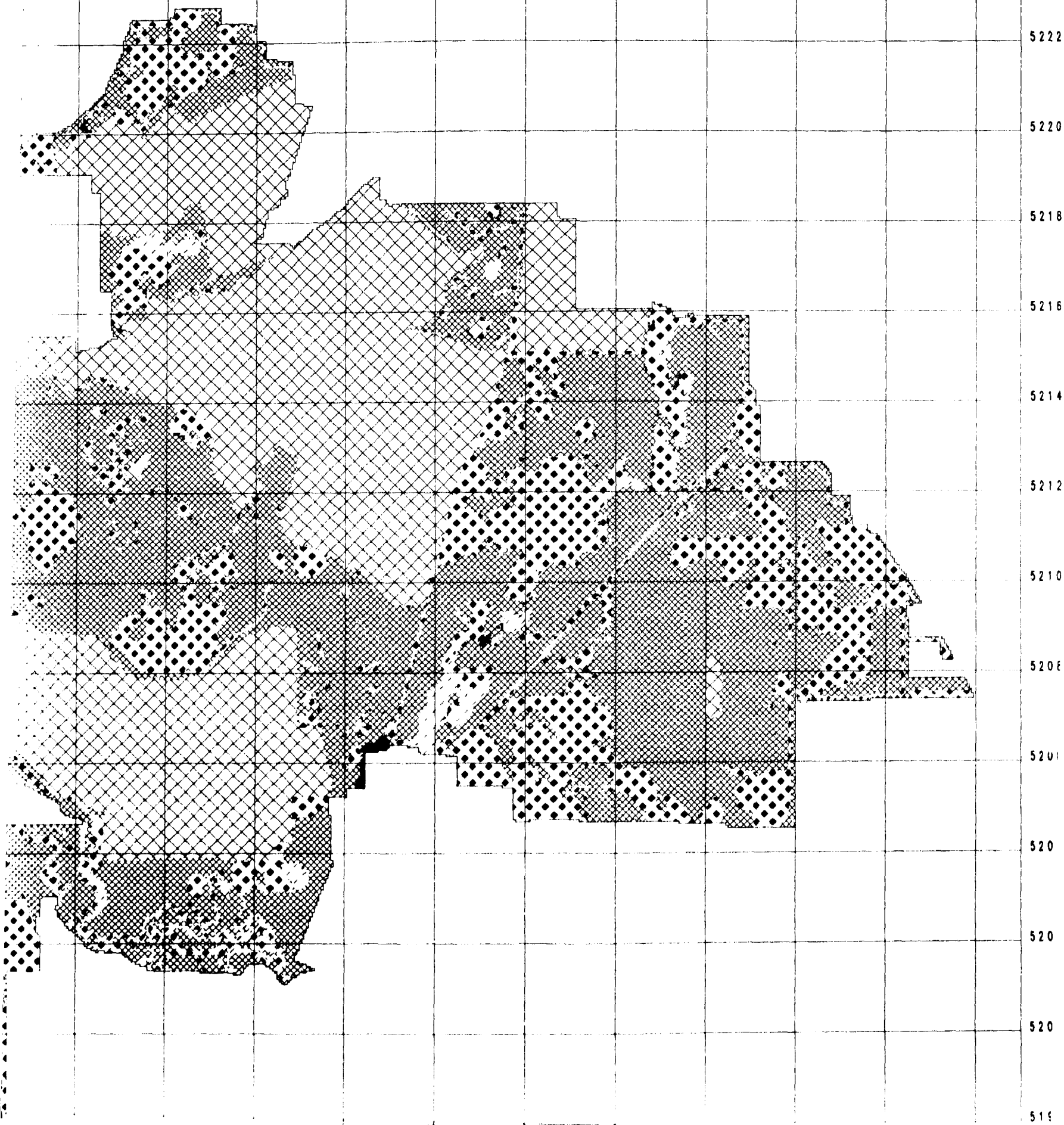
546

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in the dry normal surface condition



528 530 532 534 536 538 540 542 544 546 548 5224



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5224

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5202

5200

5198



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Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

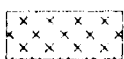
SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

1000 PASSES

METERS

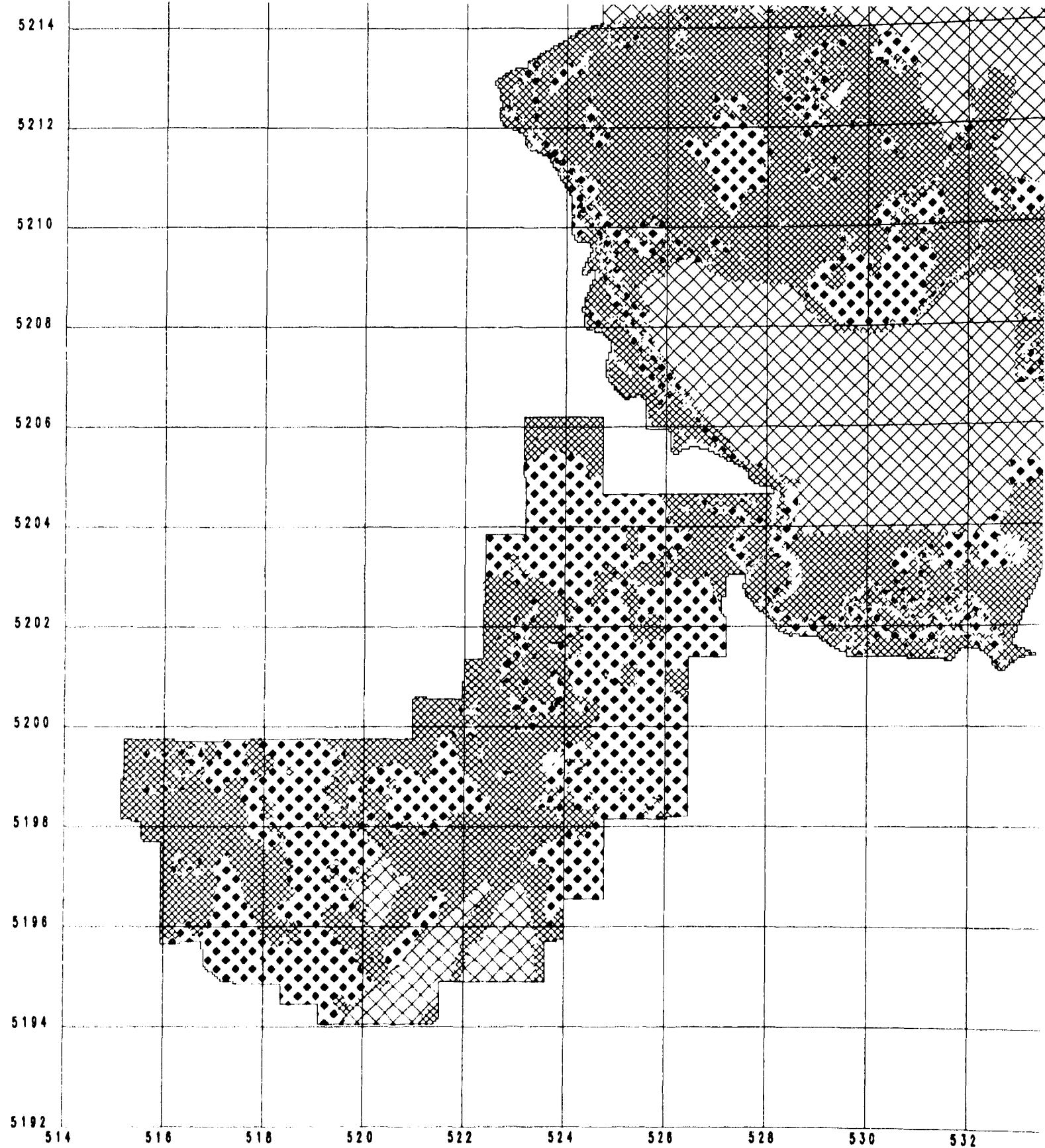
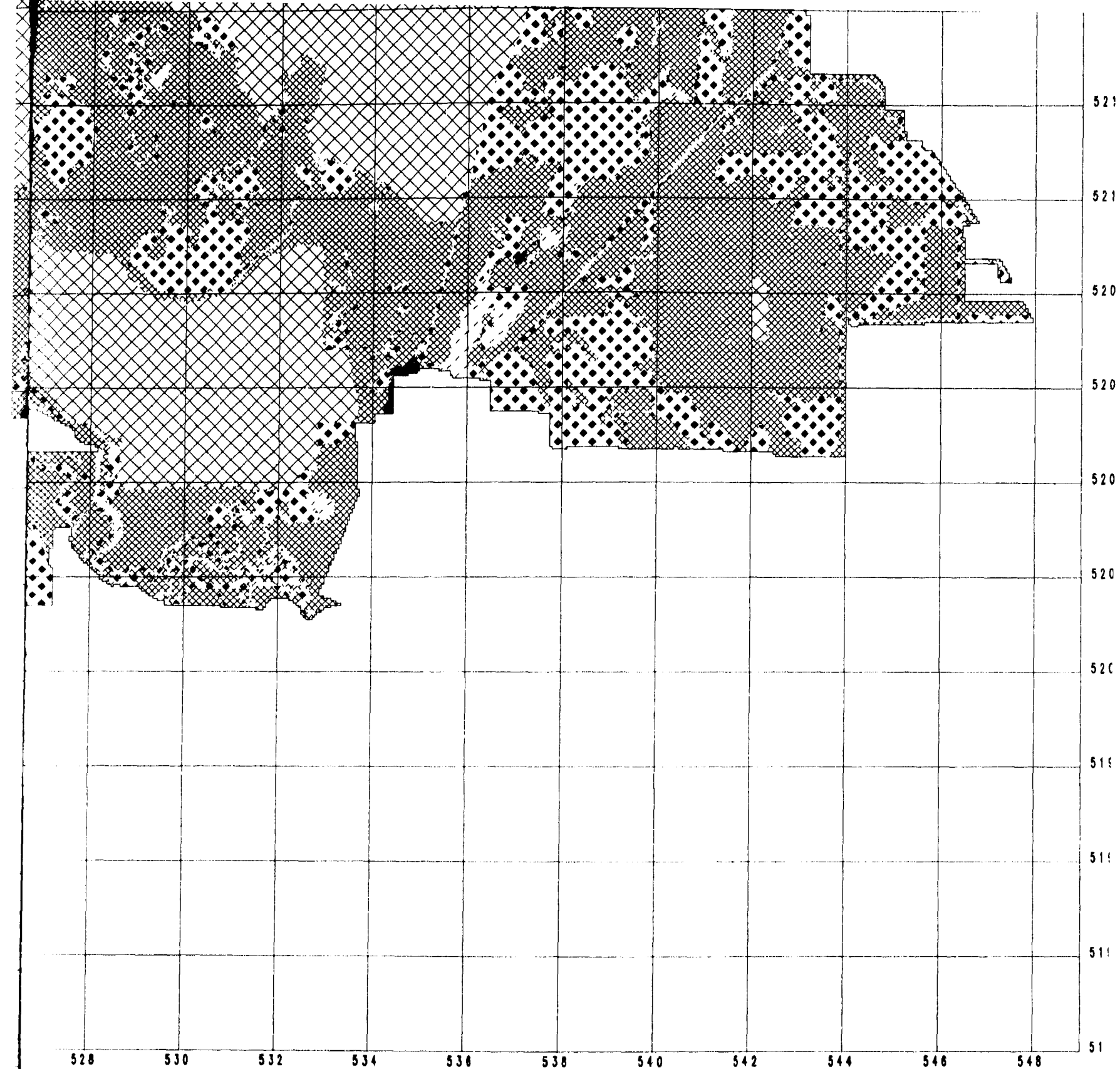
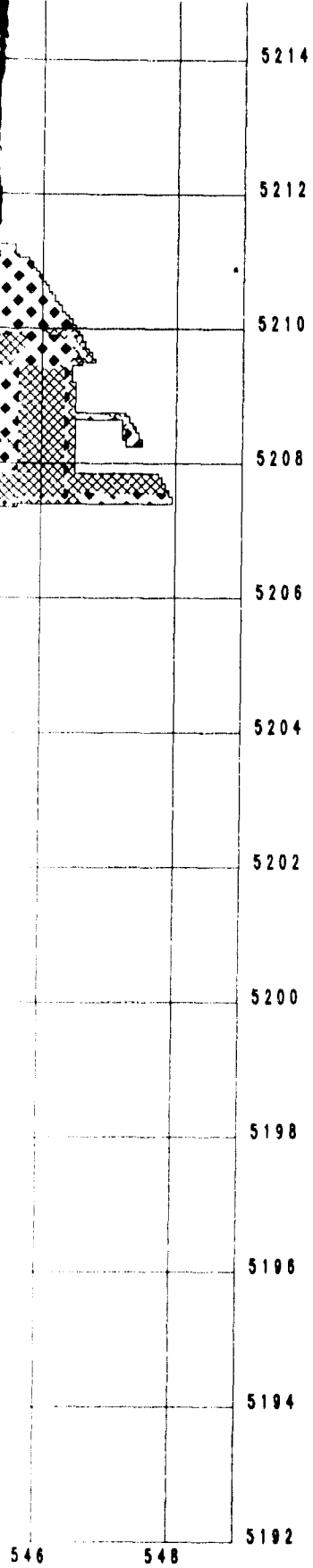


Plate 17. One thousand pass soil disturbance level m



s soil disturbance level map for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal



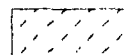
(1.5-2 in)



OFF LIMITS



MODERATE
(2-5 in)



WATER

FT LEWIS, WASHINGTON
3-3-5 FORCE STRUCTURE

DRY SEASON
NORMAL CONDITION
1000 PASSES

5202

5200

5198

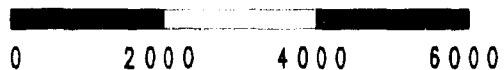
5196

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N

METERS



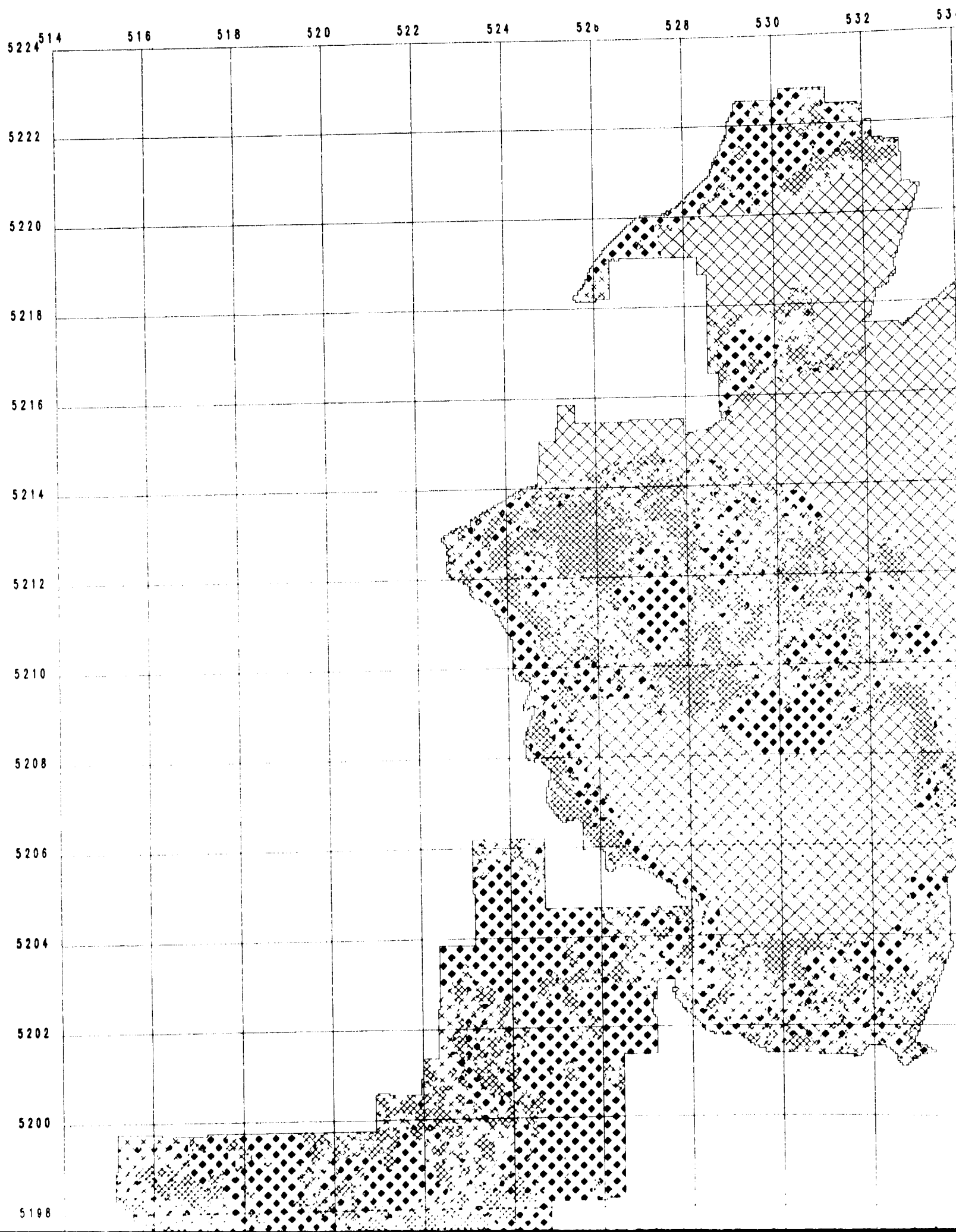
0

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6000

in the dry normal surface condition



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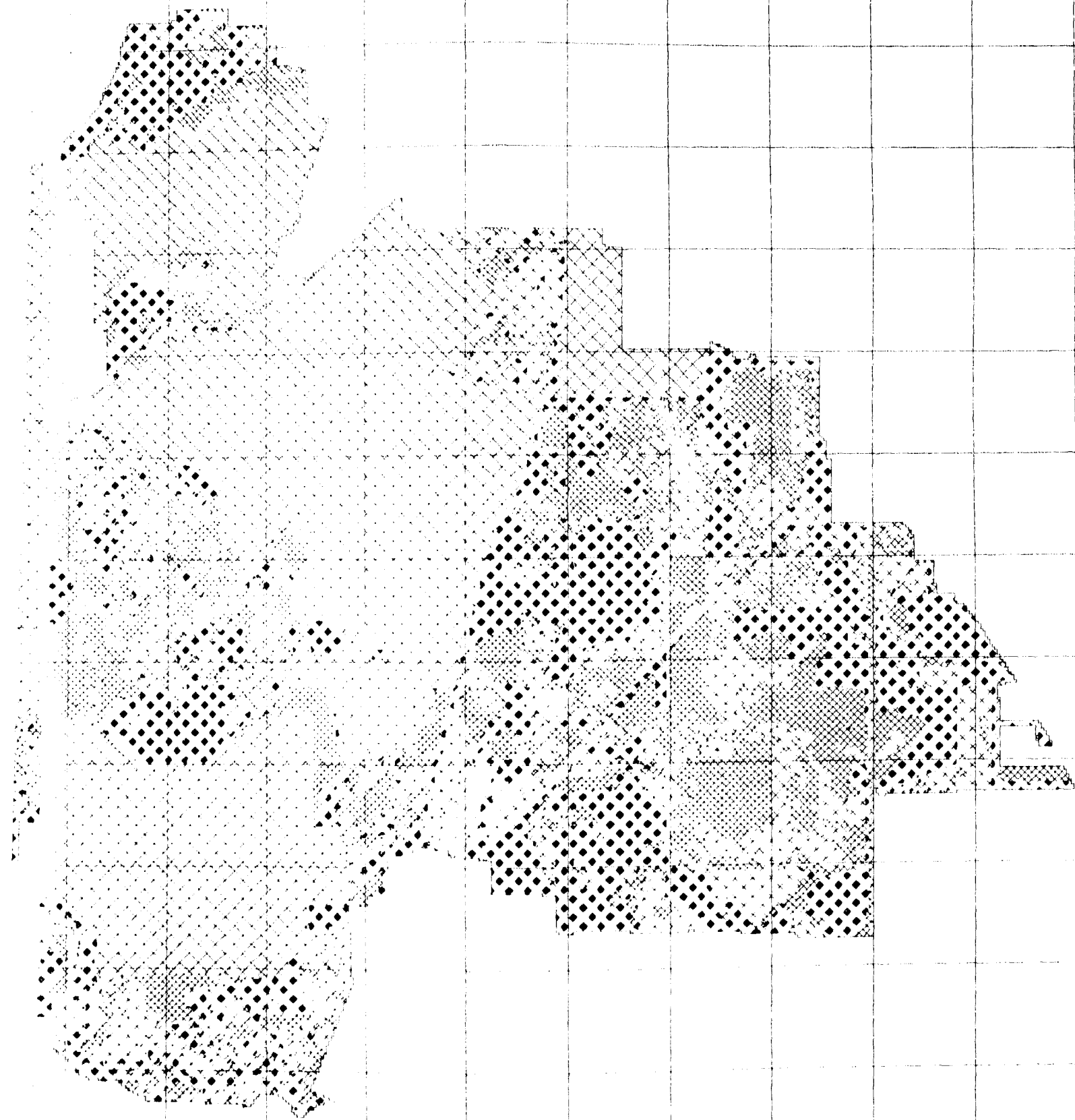
5206

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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



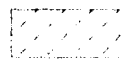
SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

10 PASSES

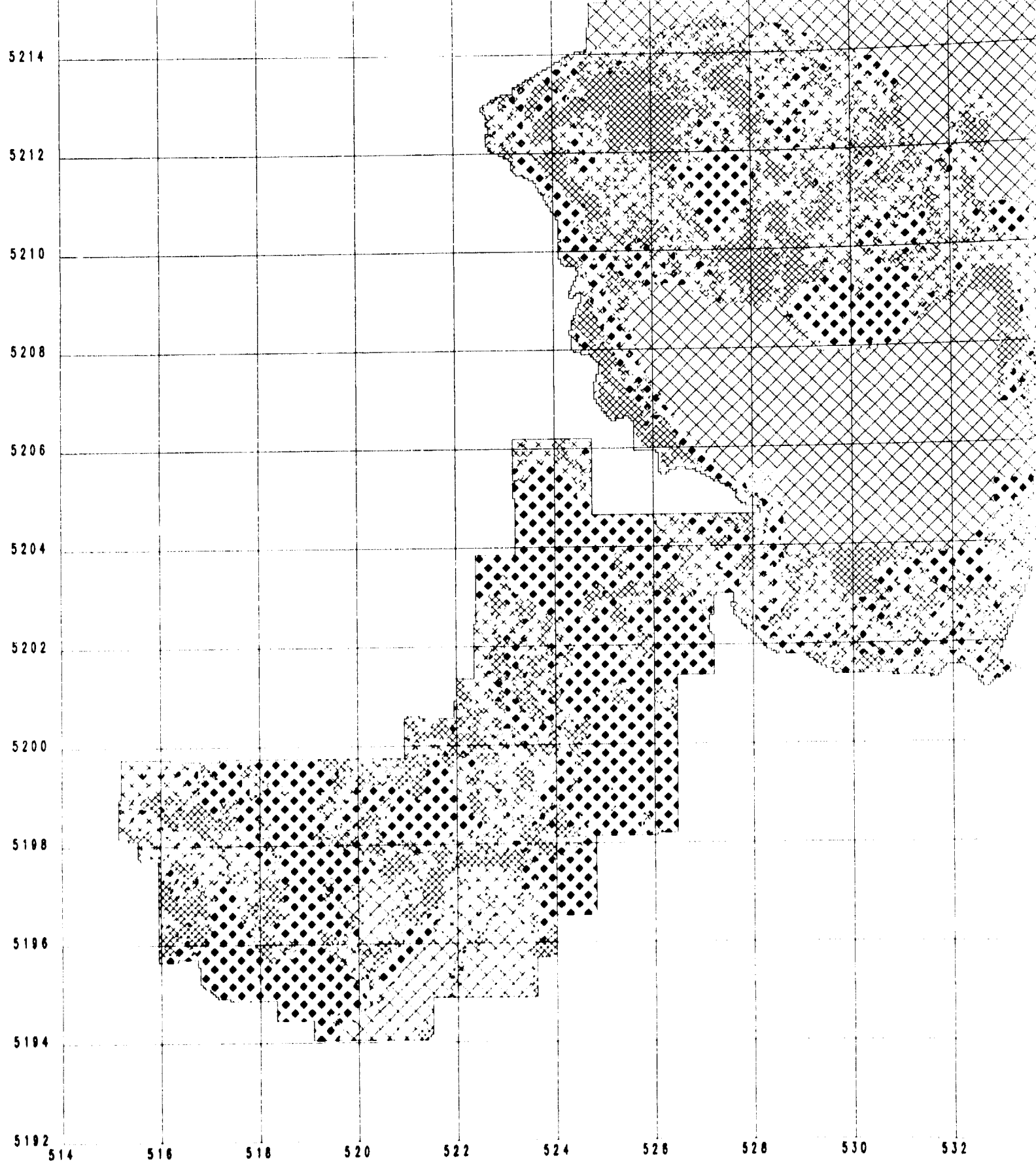
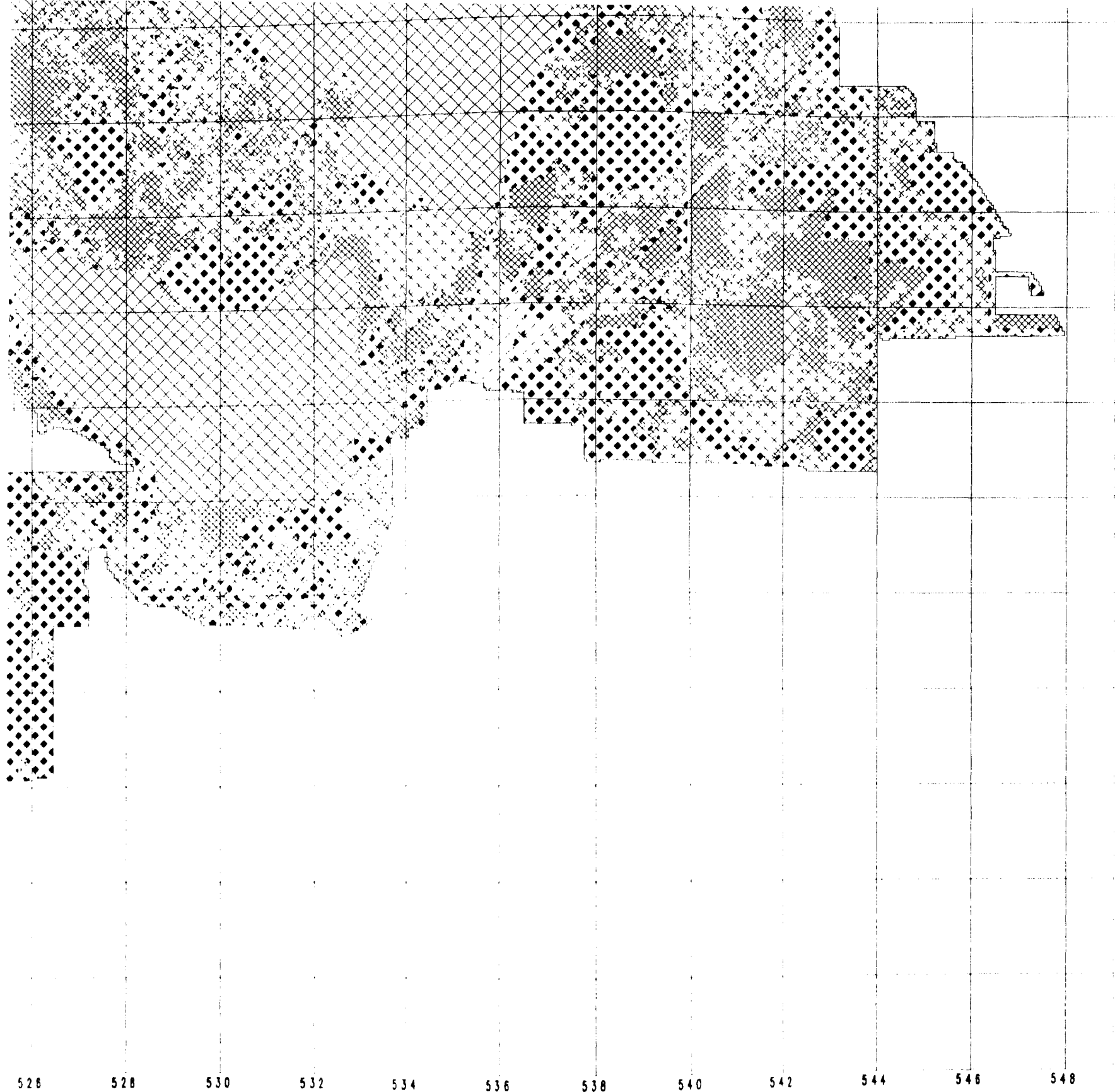
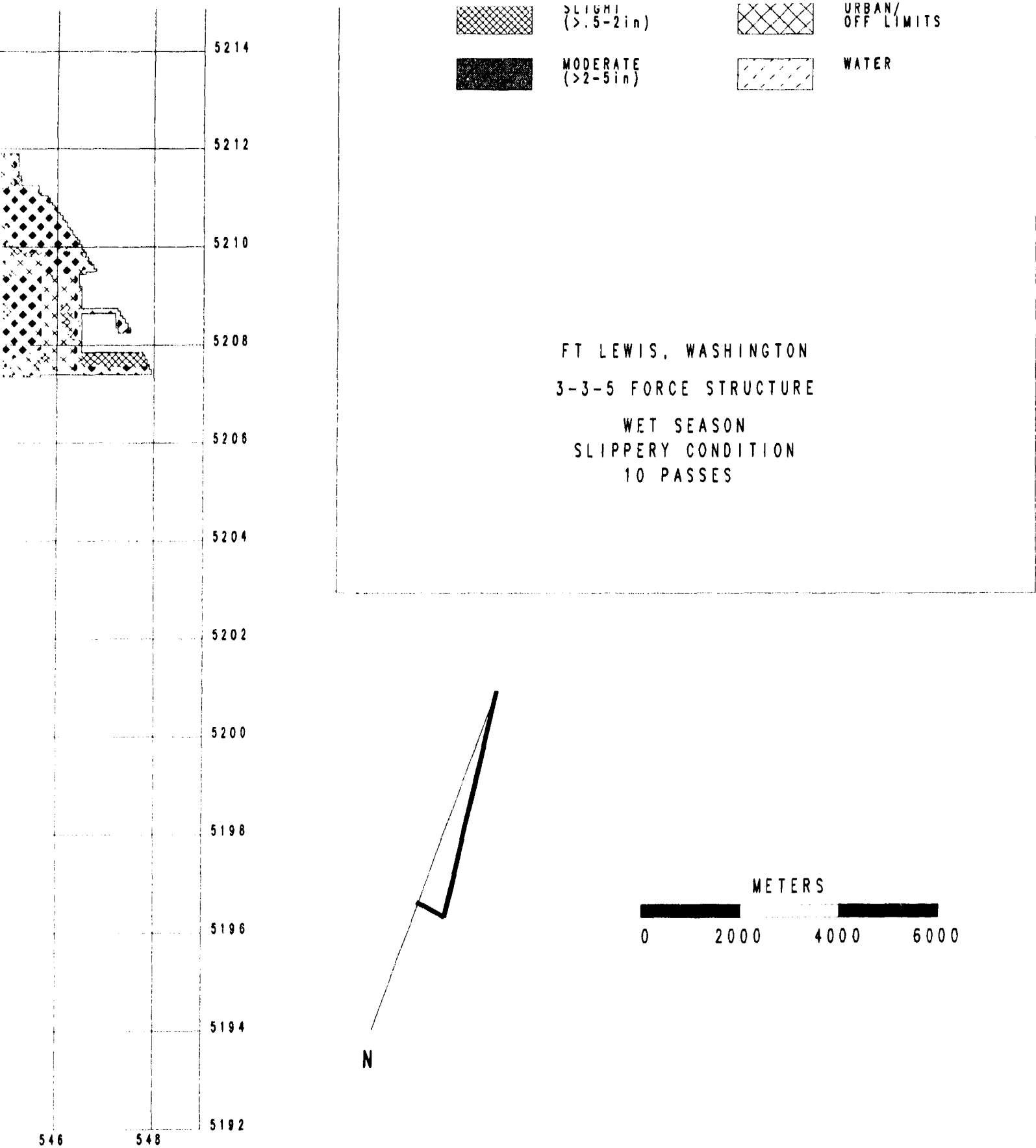


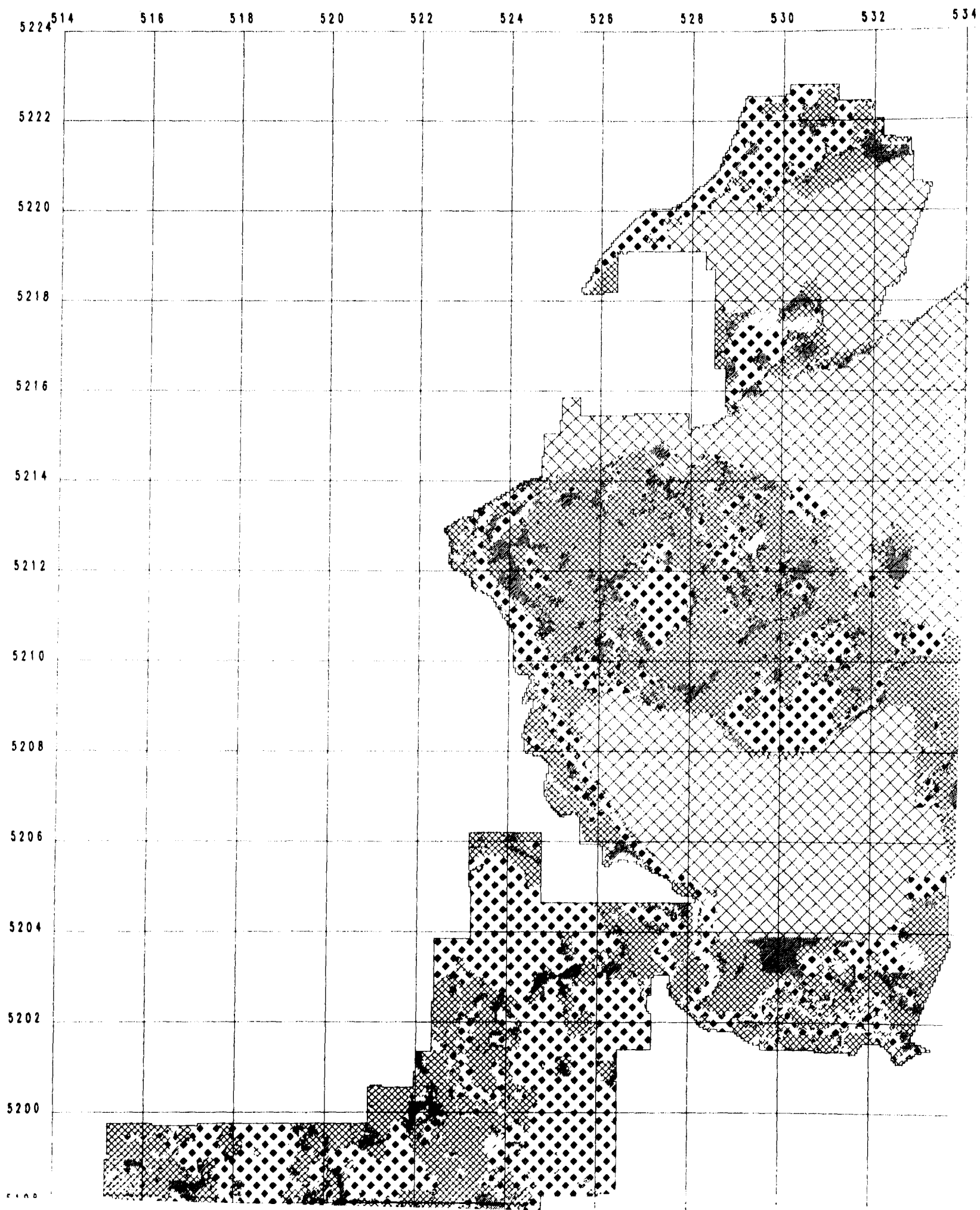
Plate 18. Ten pass soil disturbance le



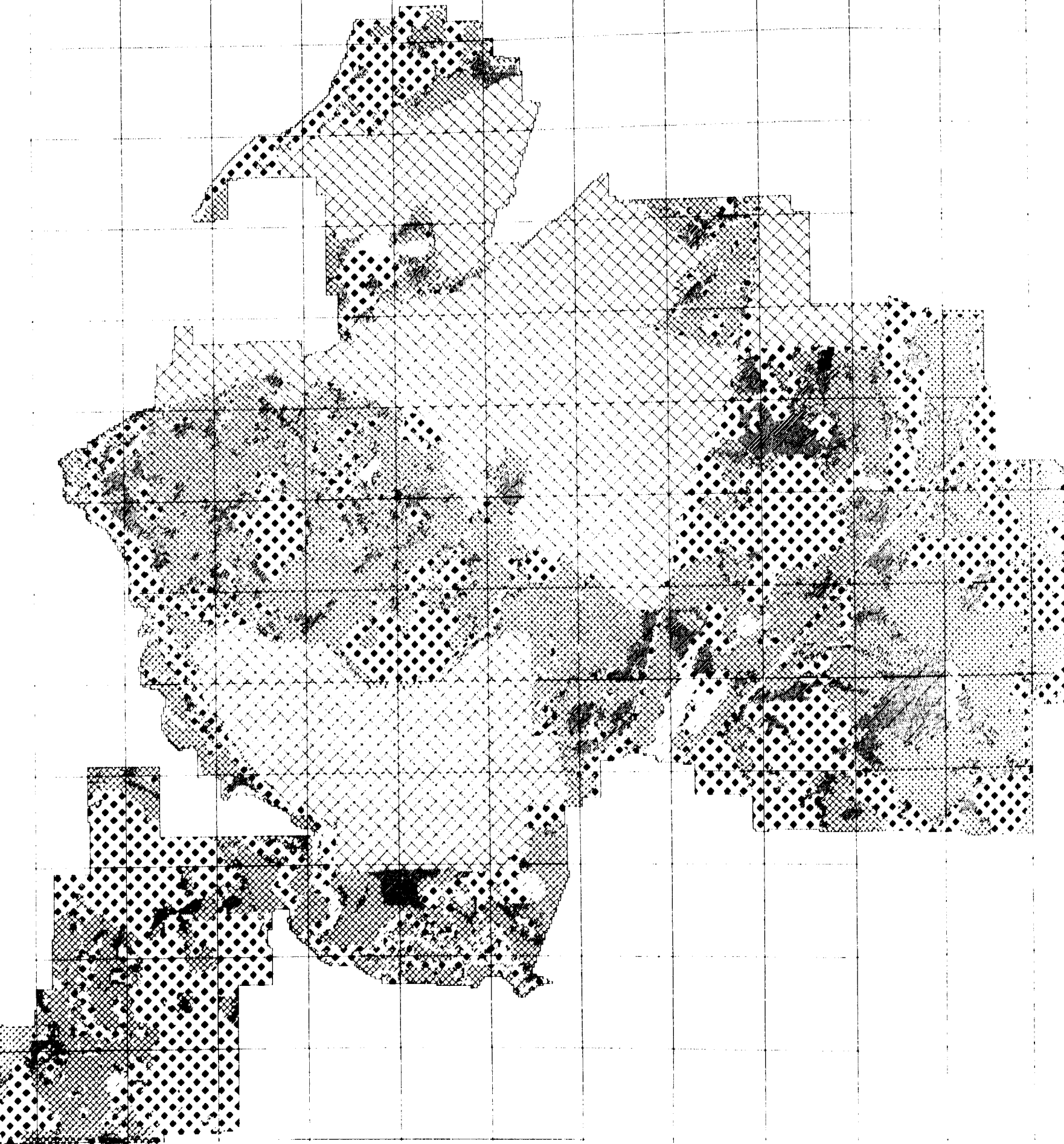
18. Ten pass soil disturbance level map for 3-3-5 and 4-3-3 (HMMWV) force structures in the w



ictures in the wet slippery surface condition



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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

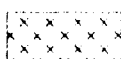
SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



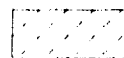
SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

50 PASSES

METERS

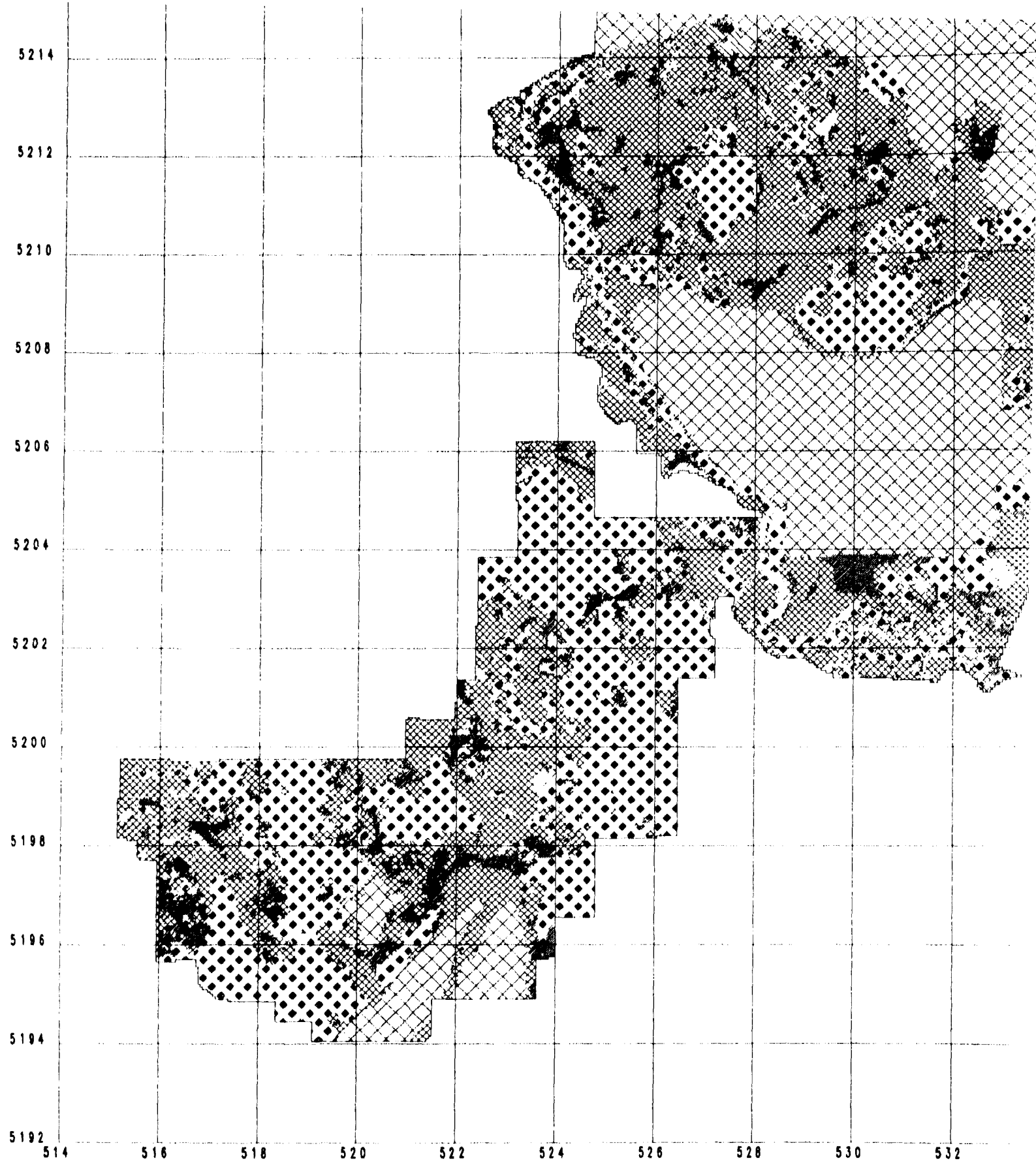


Plate 19. Fifty pass soil disturbance 1

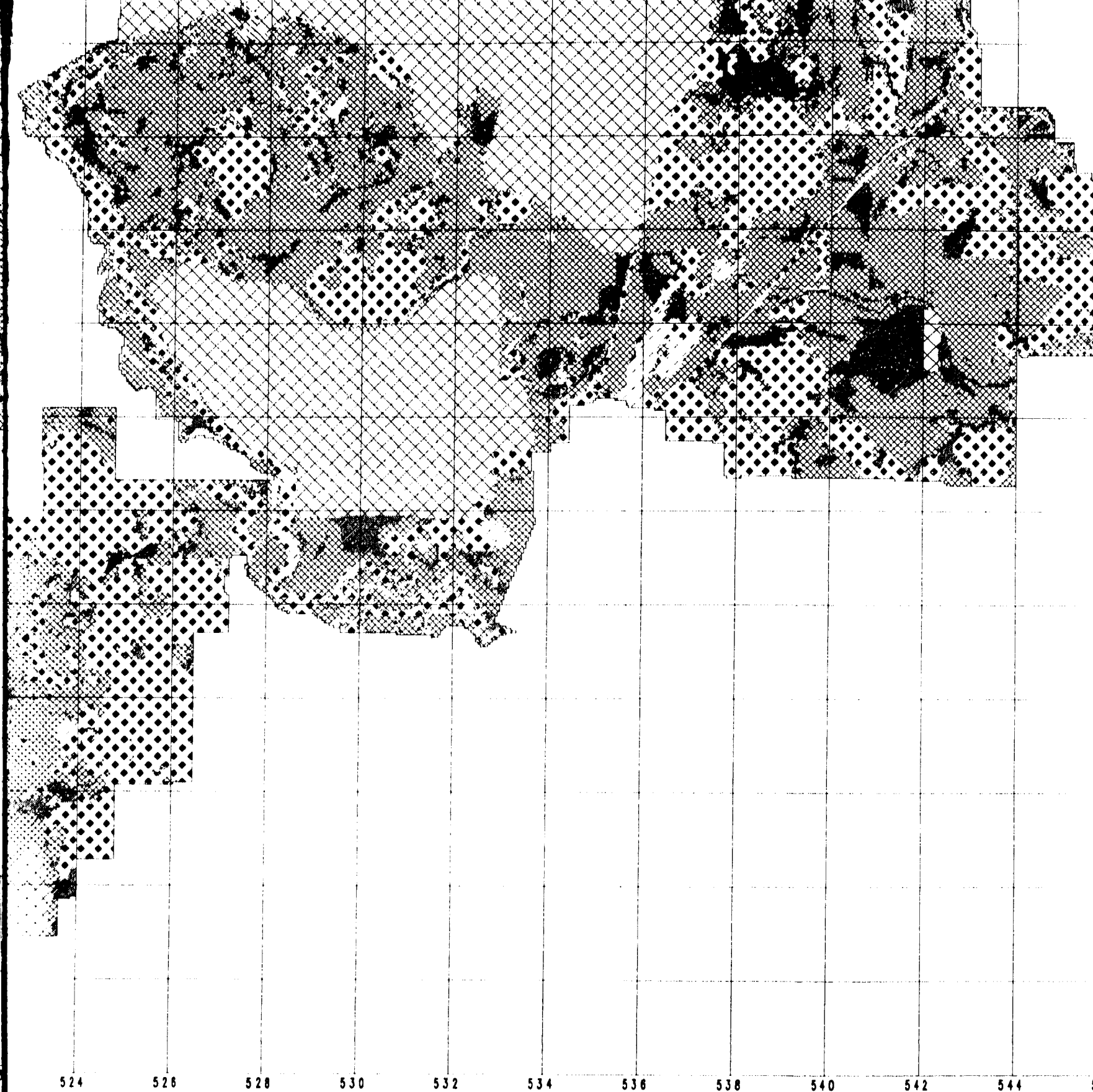
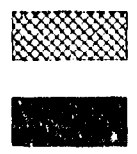
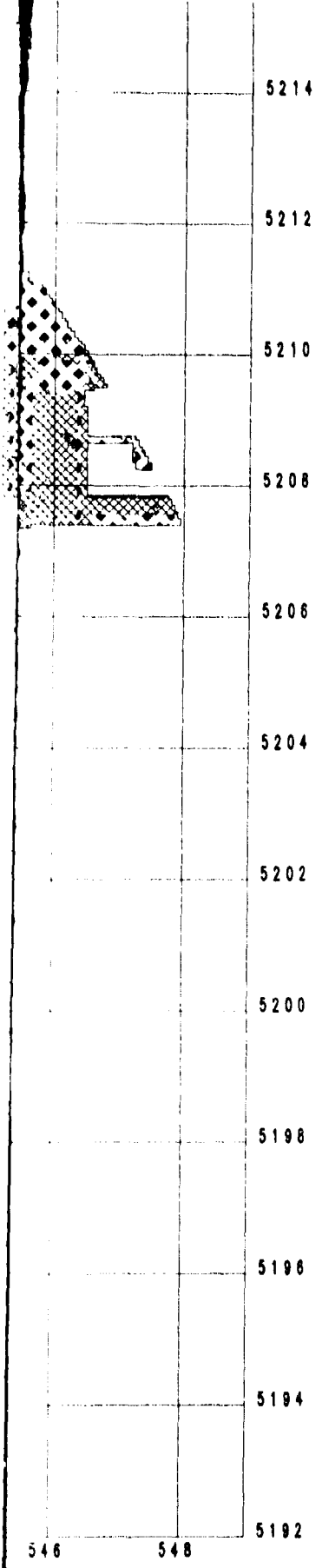
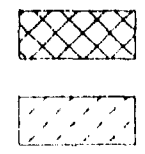


Plate 19. Fifty pass soil disturbance level map for 3-3-5 and 4-3-3 (HMMWV) force struc



SLIGHT
(.5-2 in)

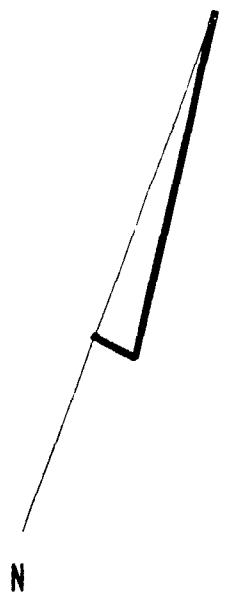
MODERATE
(2-5 in)



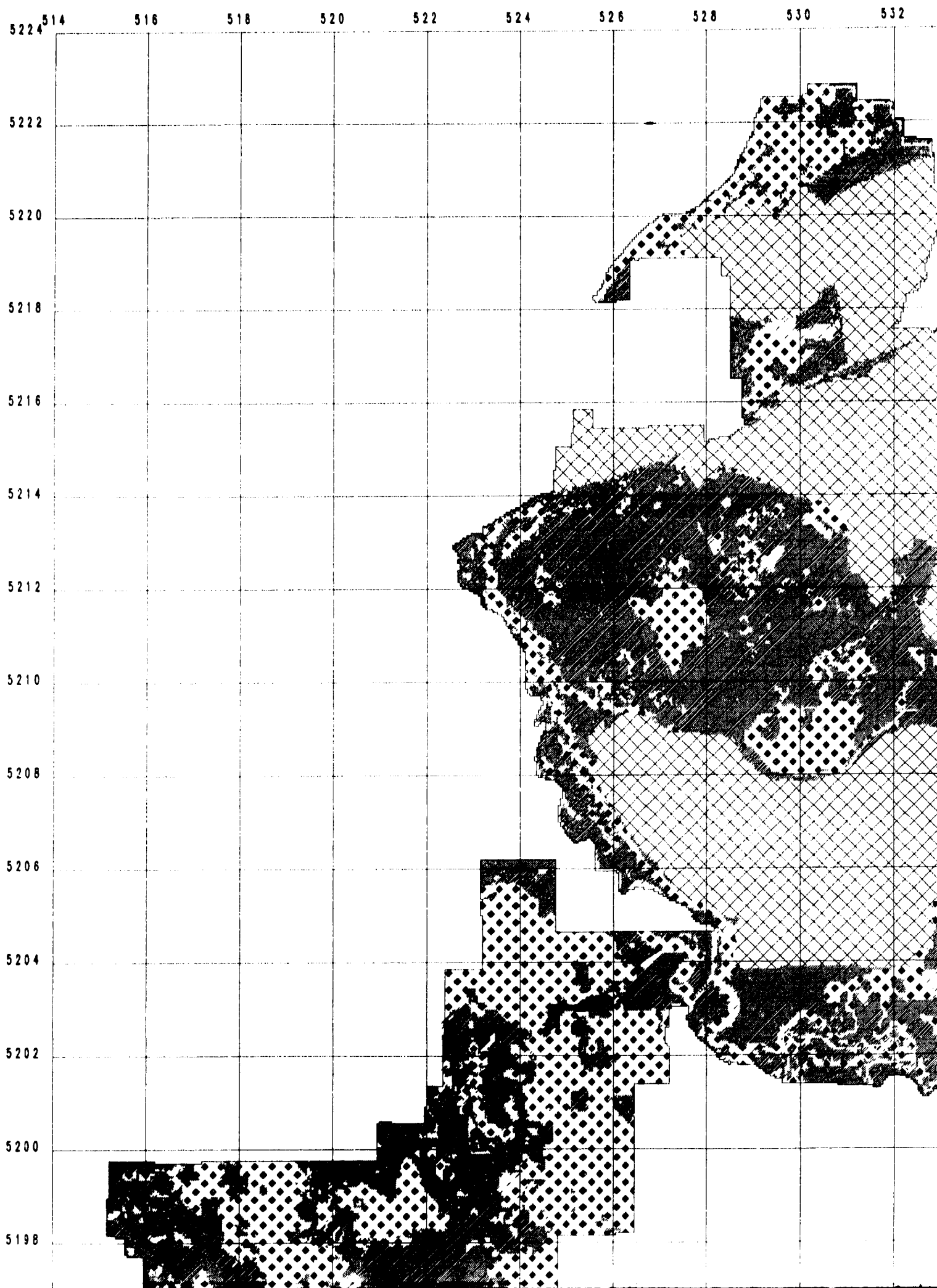
URBAN/
OFF LIMITS

WATER

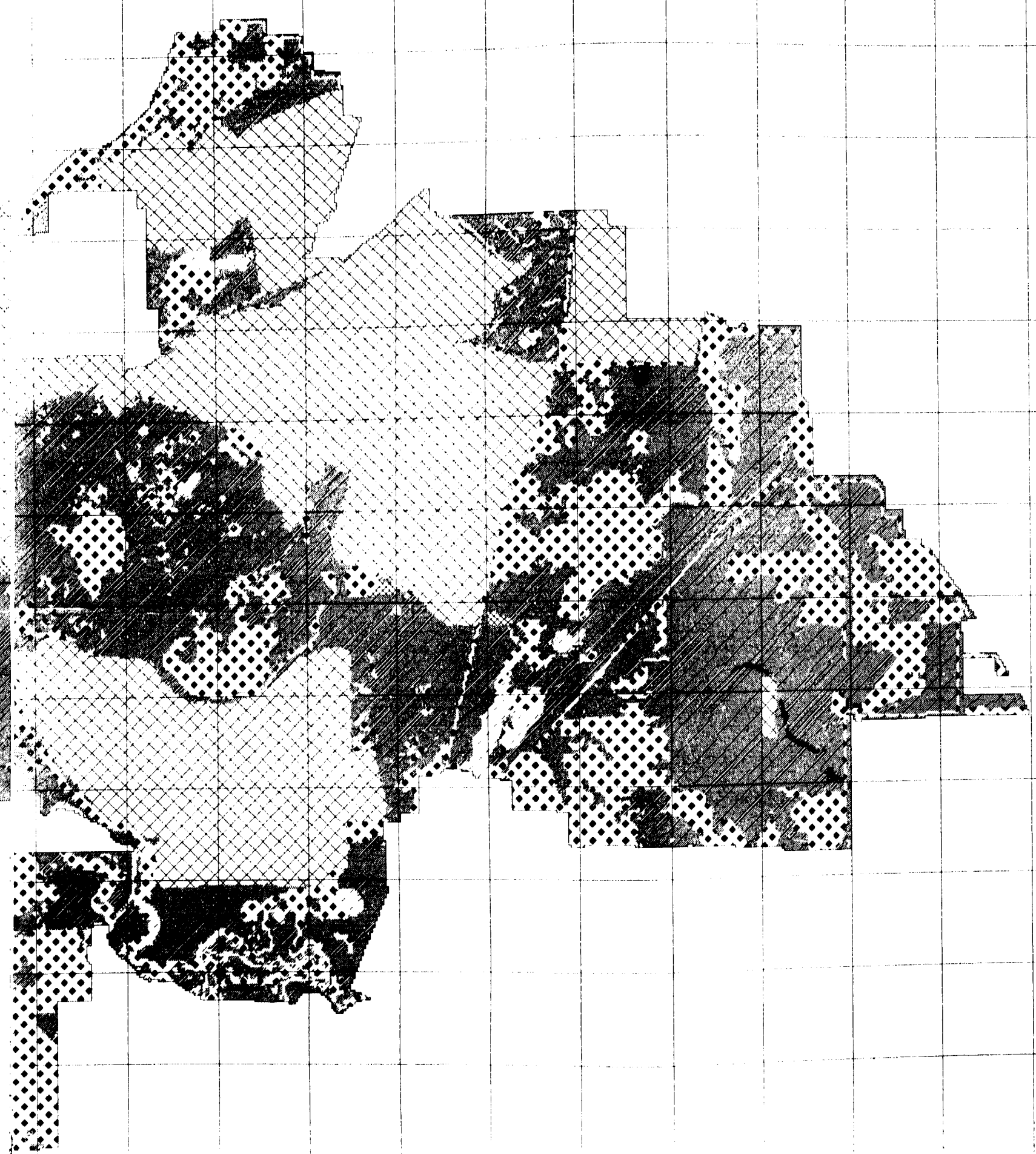
FT LEWIS, WASHINGTON
3-3-5 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
50 PASSES

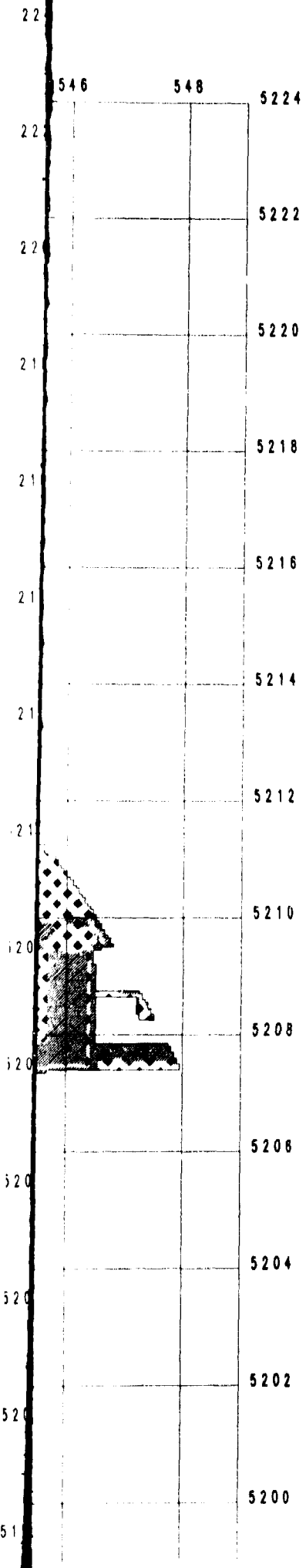


ictures in the wet slippery surface condition



526 528 530 532 534 536 538 540 542 544 546 548





U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



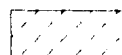
SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

1000 PASSES

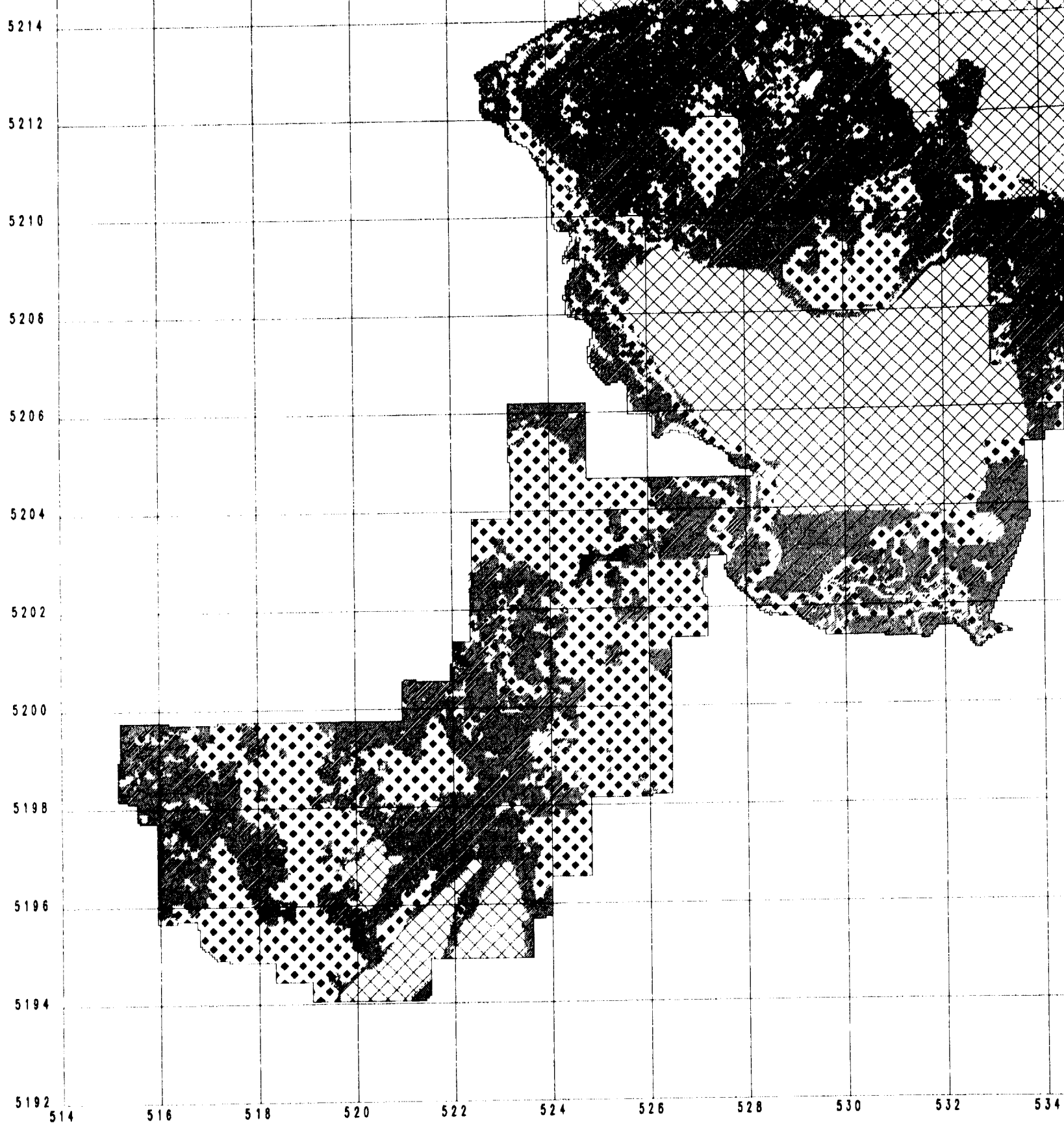
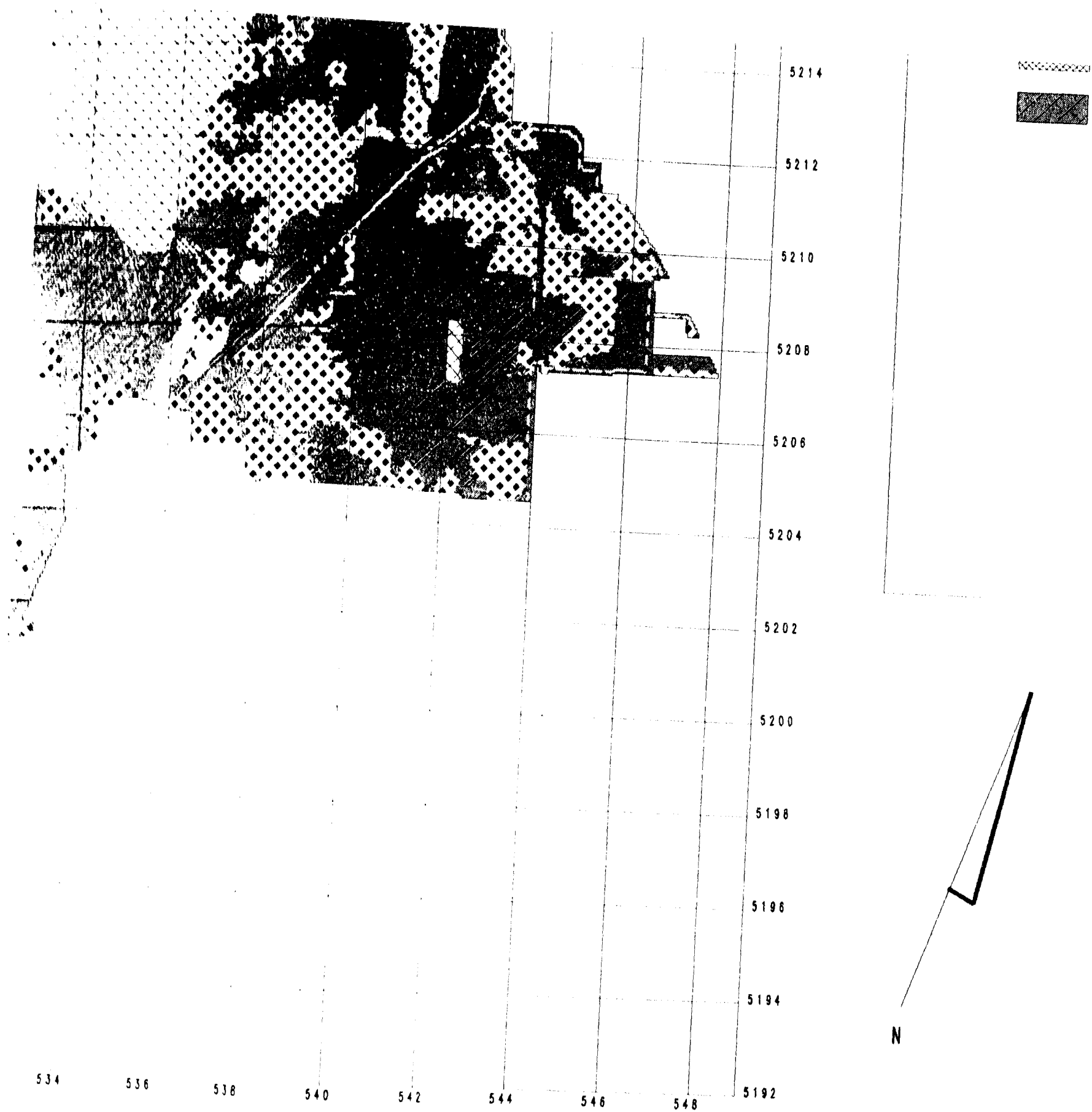
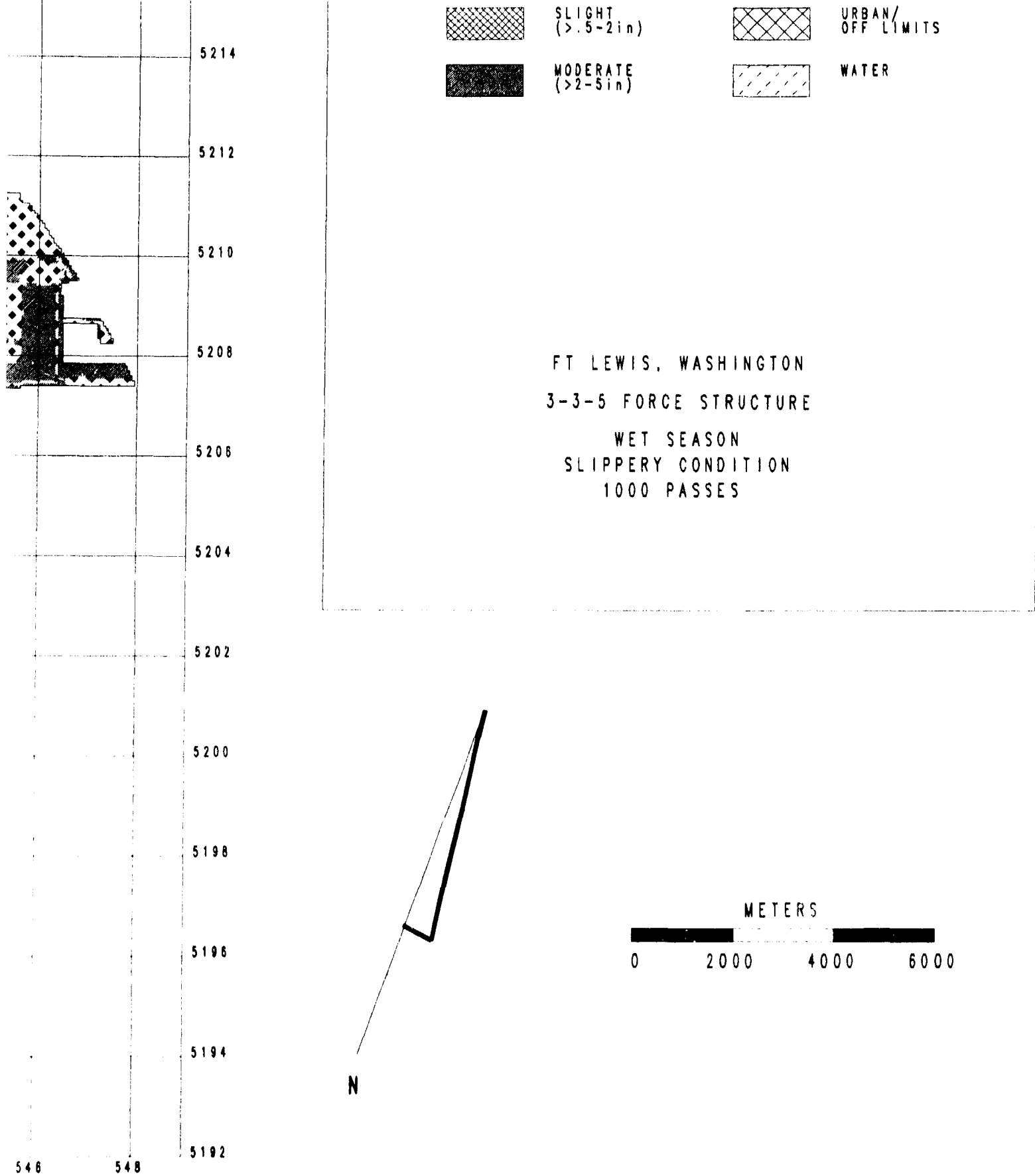


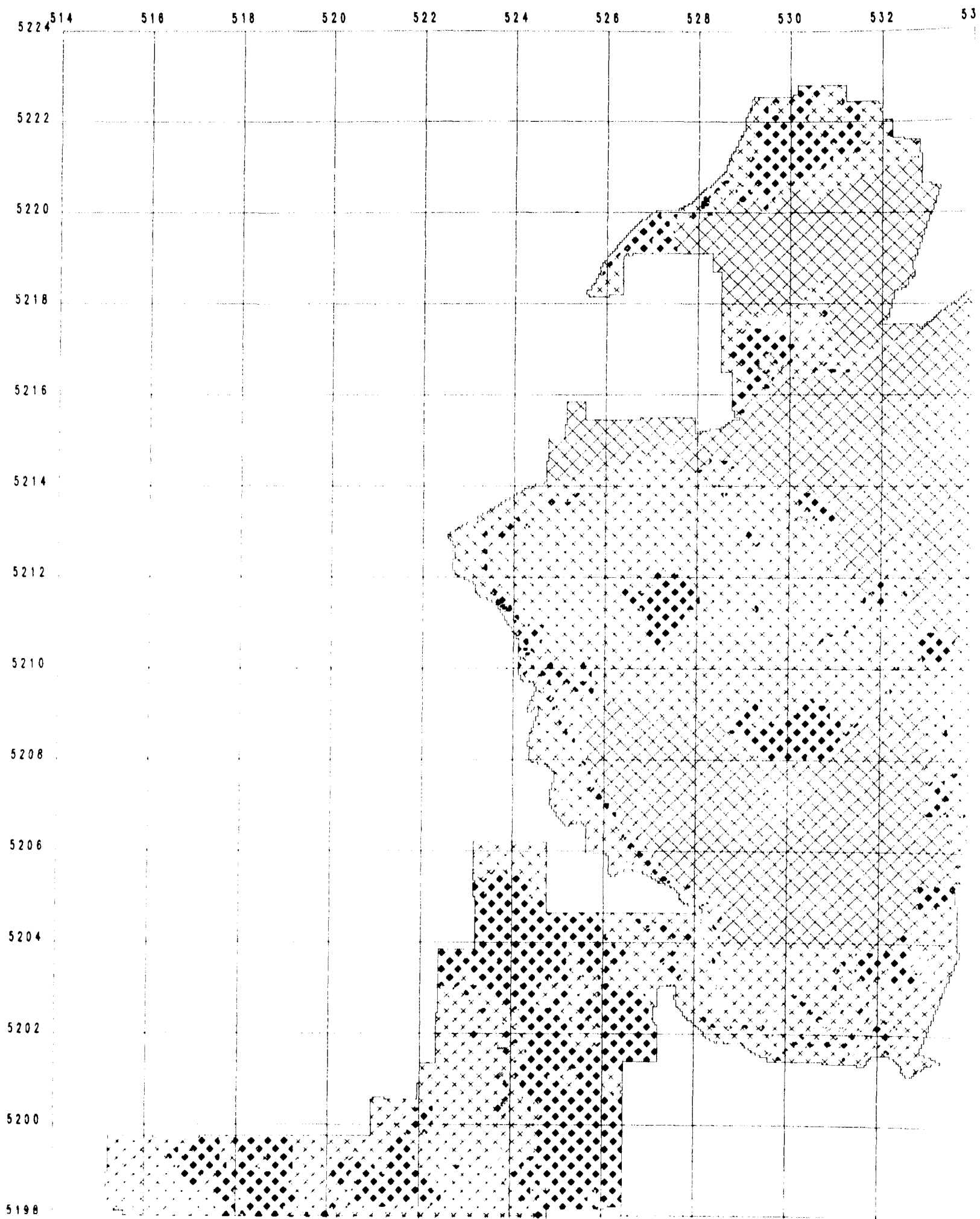
Plate 20. One thousand pass soil disturbance 1

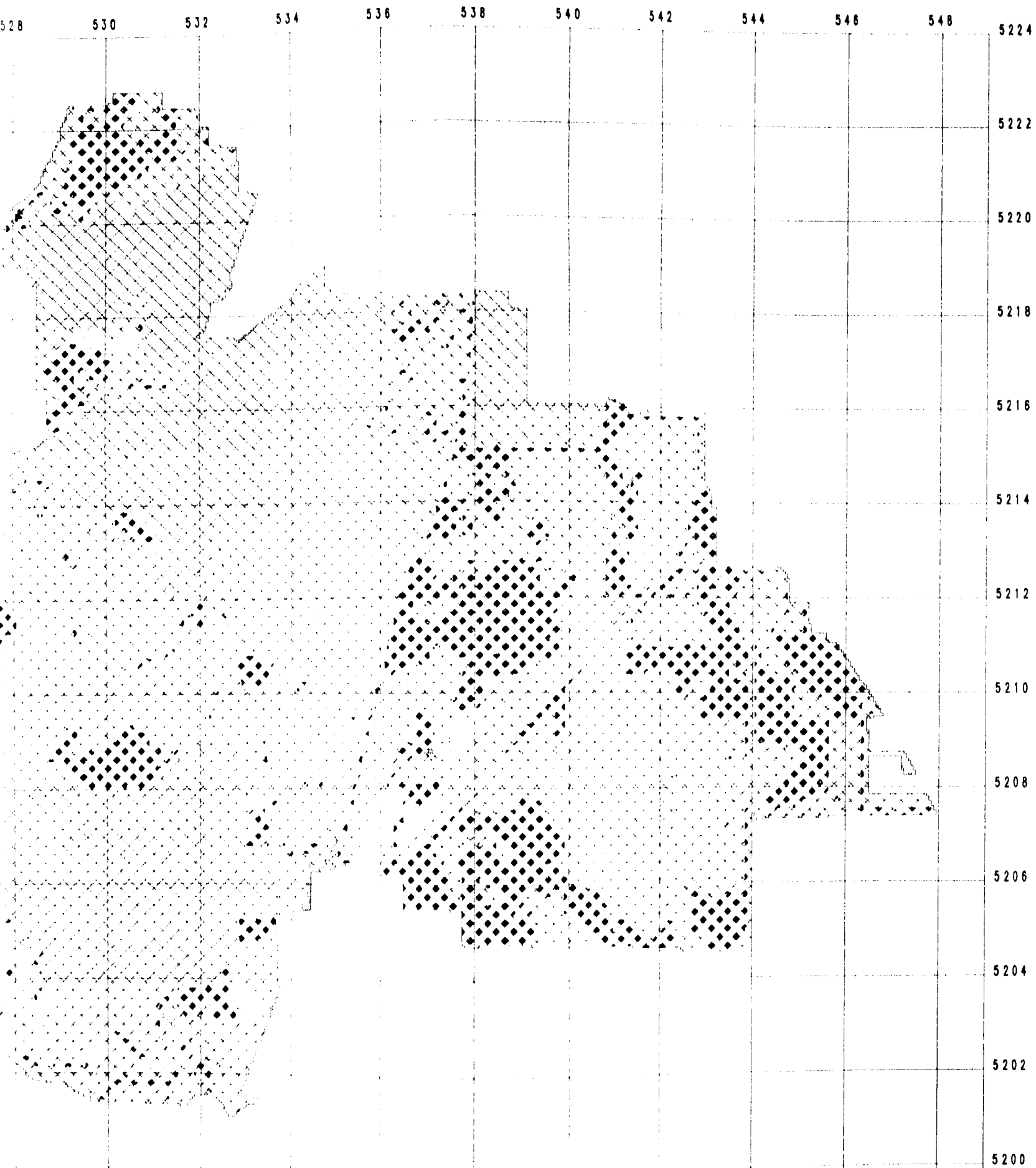


rhance level map for 3-3-5 and 4-3-3 (HMMWV) force structures in the wet slippery surface co



structures in the wet slippery surface condition





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U. S. Army Corps of Engineers
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SOIL DISTURBANCE LEVELS

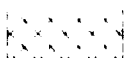
SCALE 1:100000



NOGO



HIGH
(>5-12 in)



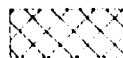
MINIMUM
(0-.5 in)



SEVERE
(>12 in)



SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

10 PASSES

5214

5212

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5208

5206

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5202

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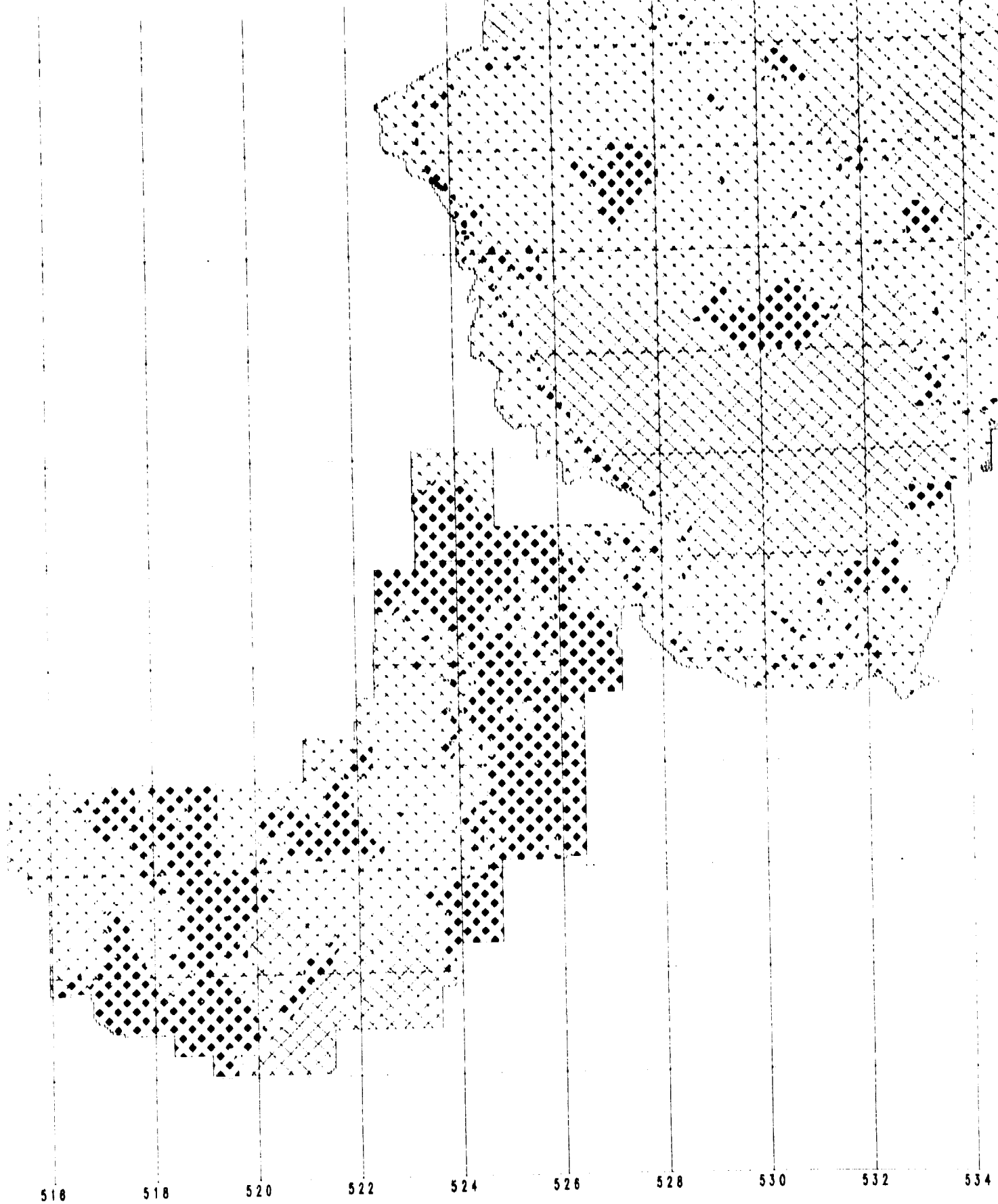
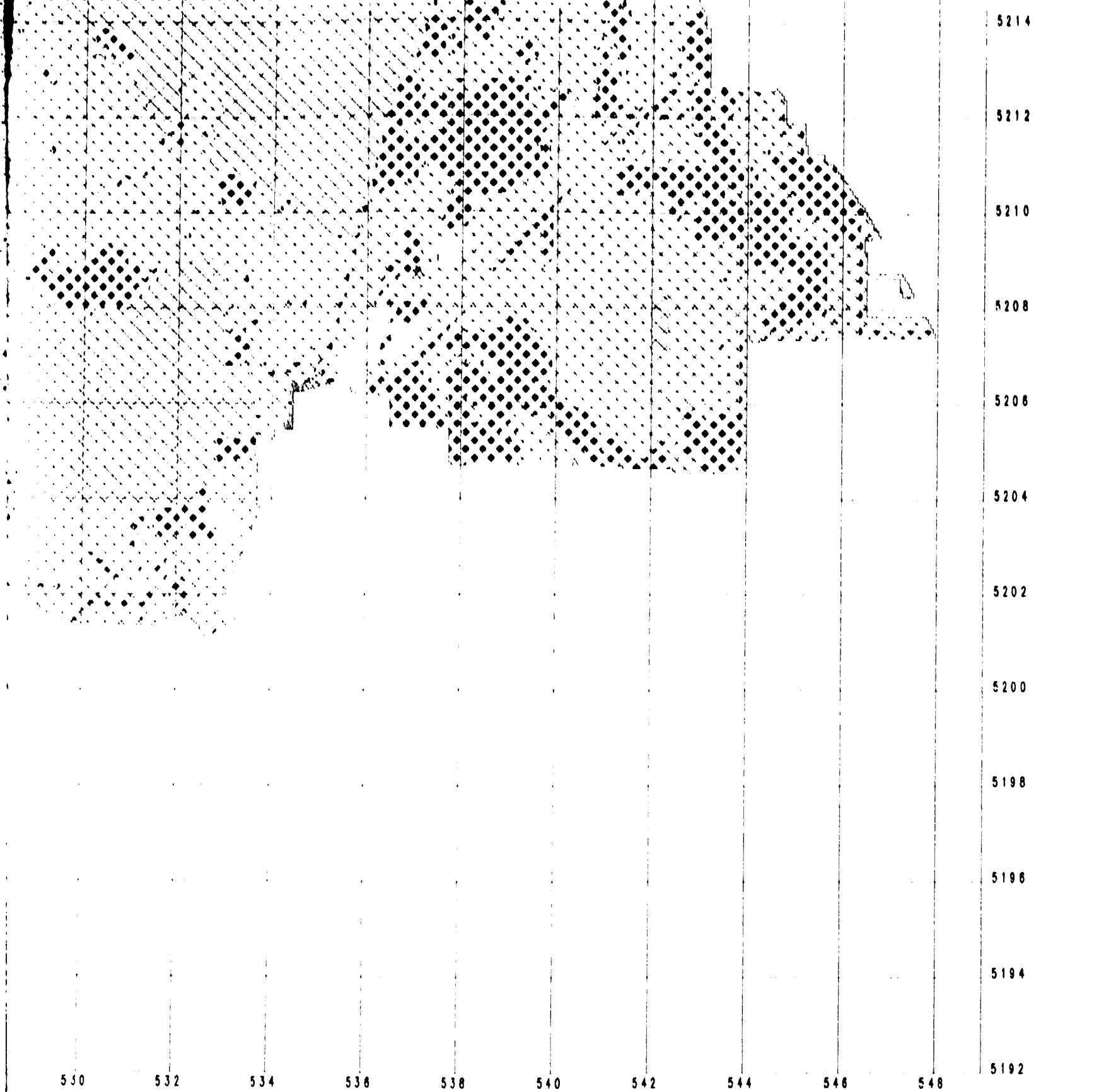


Plate 21. Ten pass soil disturbance level map



il disturbance level map for the 4-3-3 (8X8) force structure in the dry normal surface con

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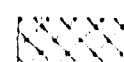
5196

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SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



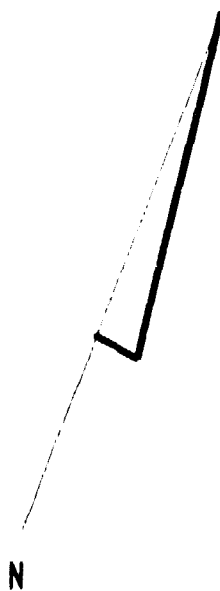
MODERATE
(2-5 in)



WATER

FT LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE

DRY SEASON
NORMAL CONDITION
10 PASSES



METERS



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dry normal surface condition

5224⁵¹⁴

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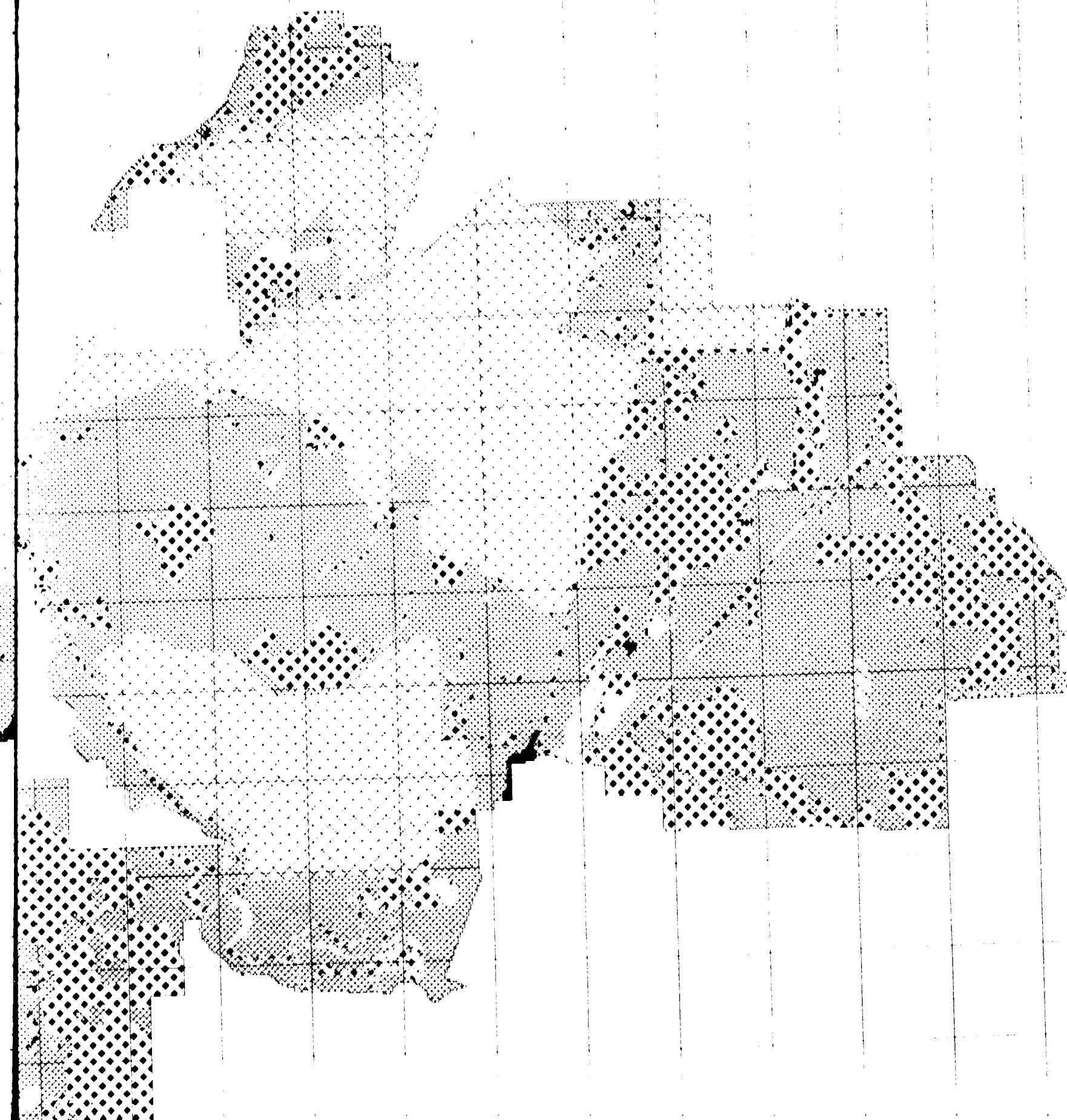
538

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U. S. Army Corps of Engineers
Waterways
Experiment
Station

5220

SOIL DISTURBANCE LEVELS

5218

SCALE 1:100000



NO SOIL



HEAVY
(15-12 in)

5216



MODERATE
(10-15 in)

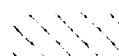


SEVERE
(12-15 in)

5214



SLIGHT
(5-10 in)



URBAN
OFF LIMITS

5212



WATER

WATER

5210

5208

AT LEWIS, WASHINGTON

4 3 3 FORCE STRUCTURE

5206

DRY SEASON
NORMAL CONDITION
50 PASSES

5204

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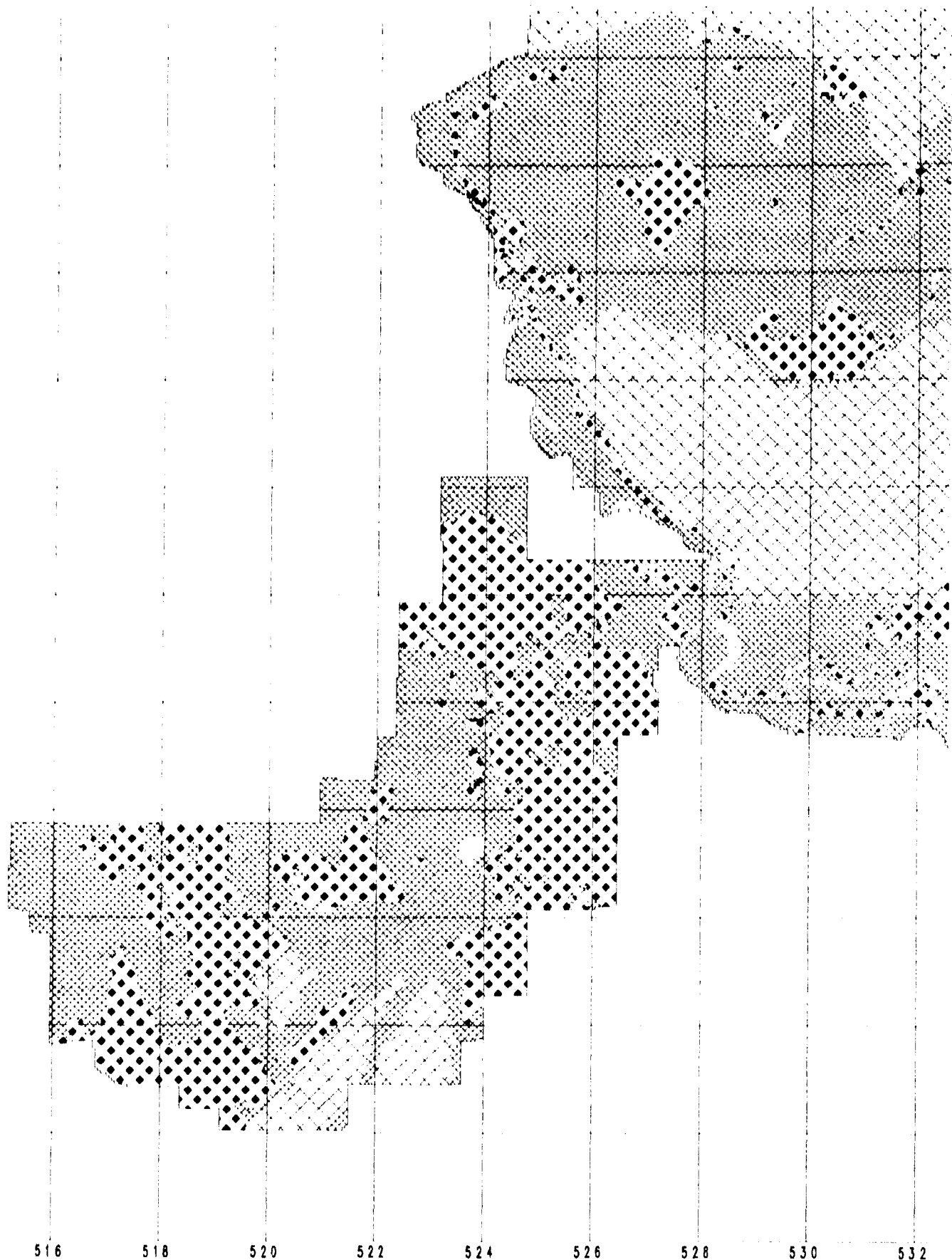
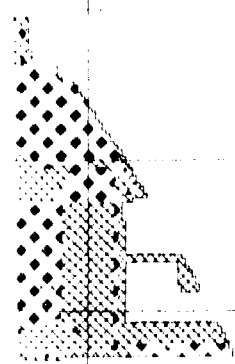
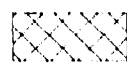


Plate 22. Fifty pass soil disturbar



SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)

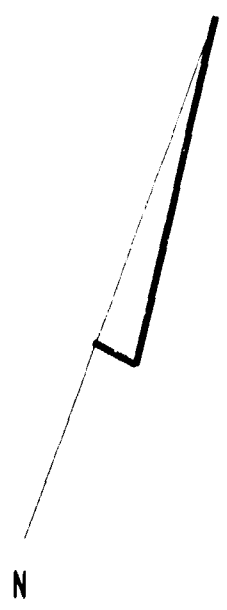


WATER

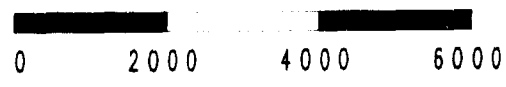
FT LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
50 PASSES

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5212
5210
5208
5206
5204
5202
5200
5198
5196
5194
5192

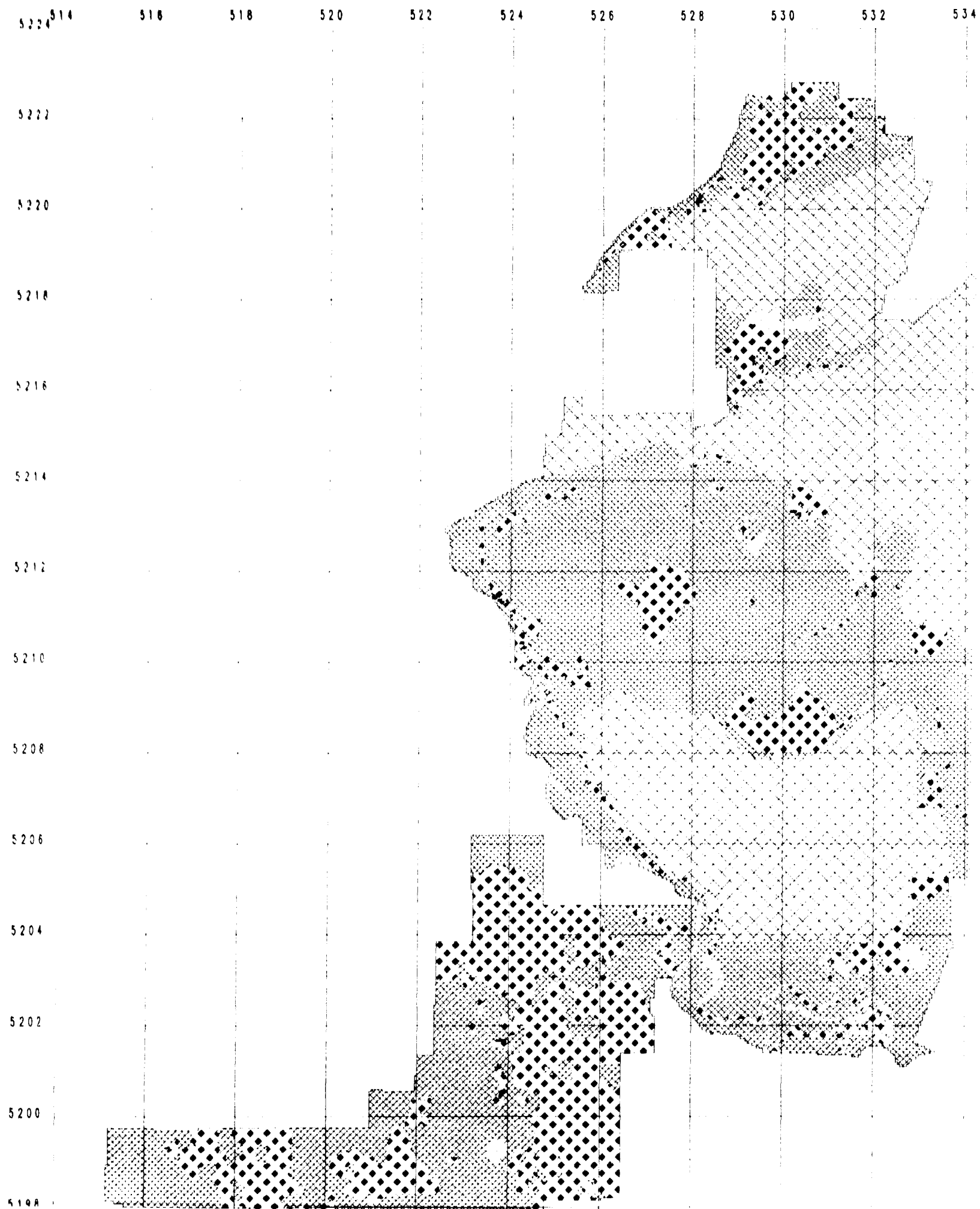
546 548



METERS



rfæ
in the dry normal surface condition



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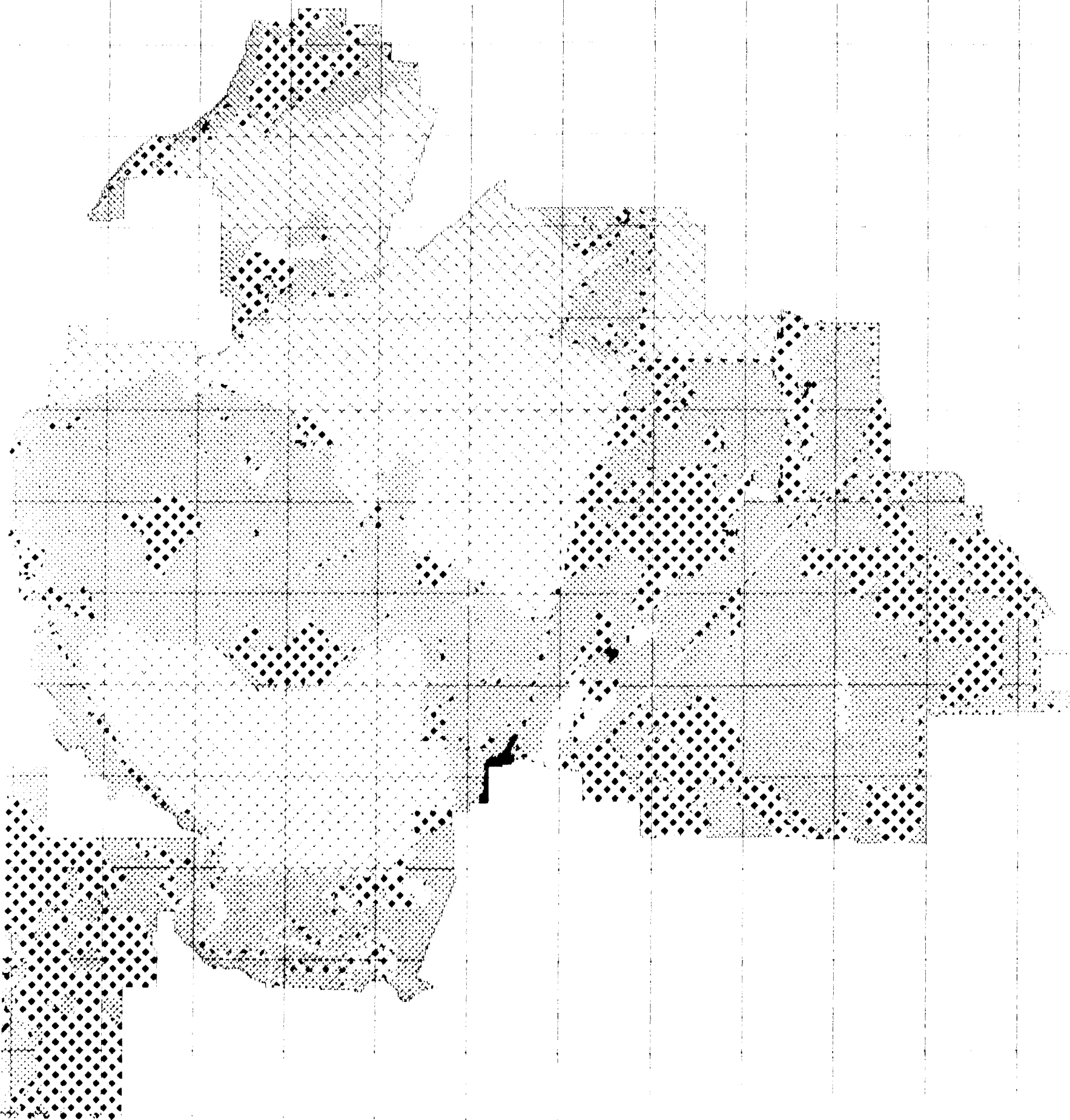
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U. S. Army Corps of Engineers
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Station

SOIL DISTURBANCE LEVELS

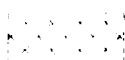
SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



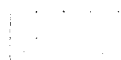
SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

1000 PASSES

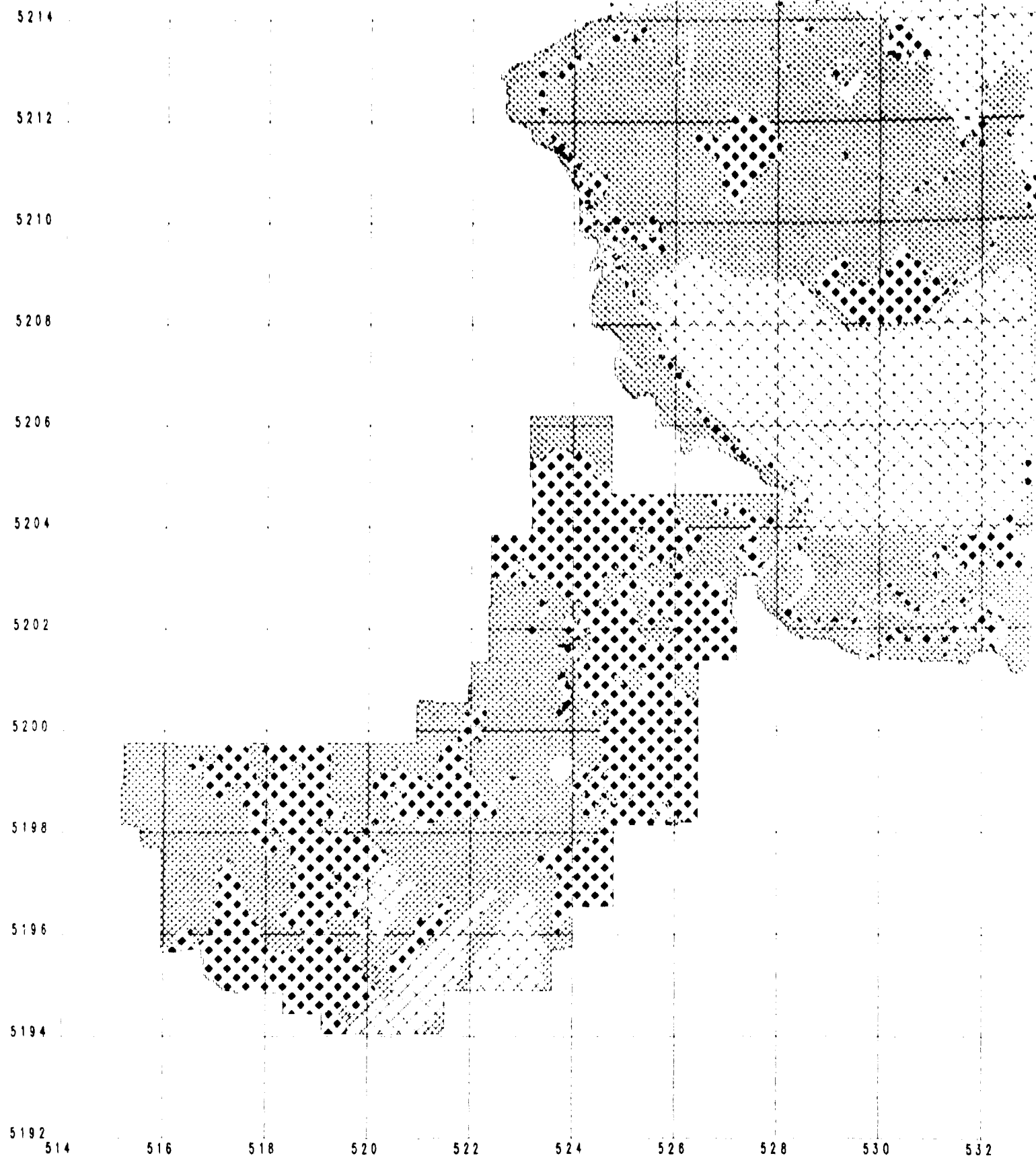
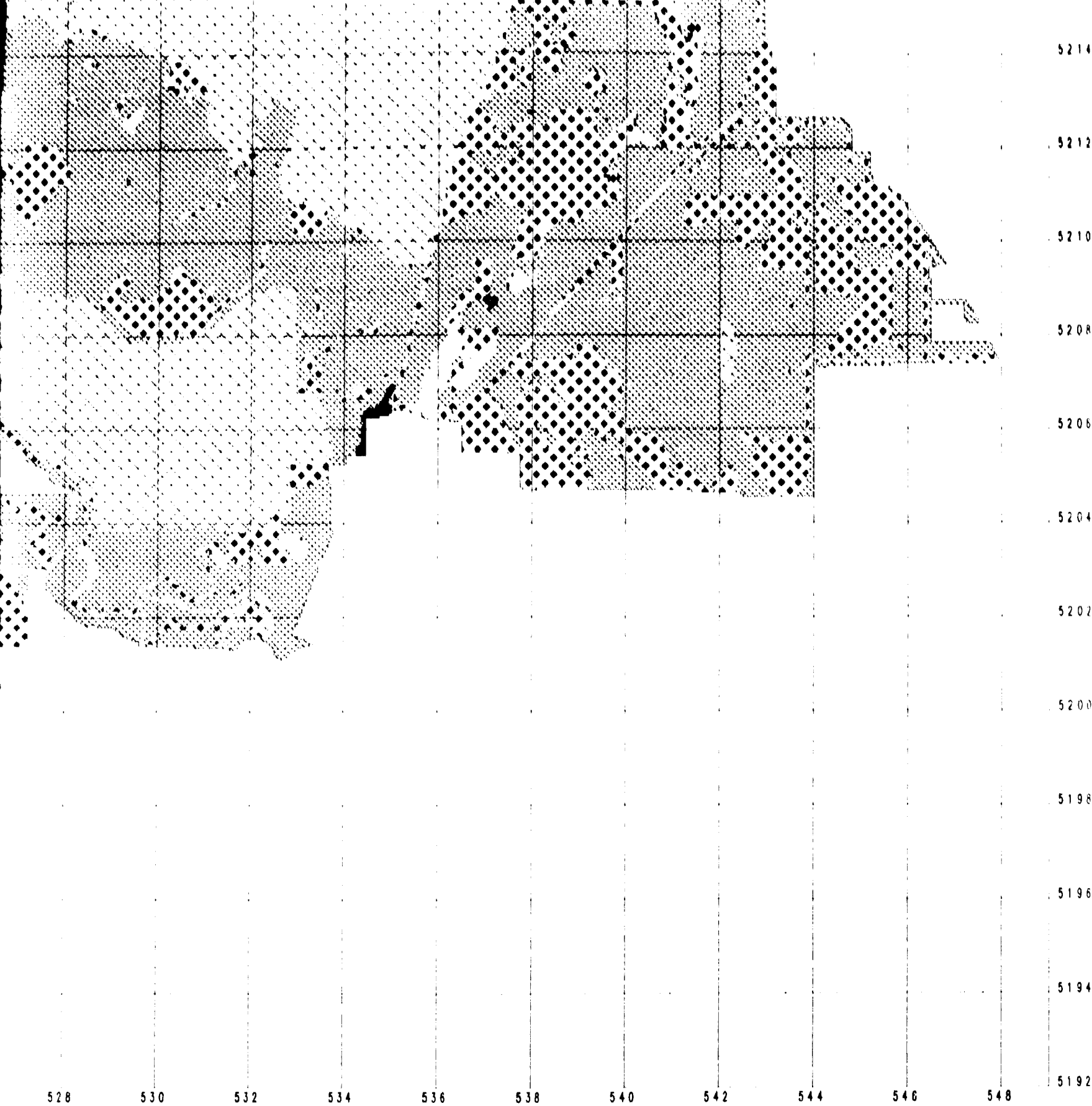


Plate 23. One thousand pass soil disturbance 1



pass soil disturbance level map for the 4-3-3 (8X8) force structure in the dry normal surface

5214

SLIGHT
(> 5-2 in)

URBAN
OFF LIMITS

MODERATE
(> 2-5 in)

MODERATE
(> 2-5 in)

WATER

5212

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5208

FT LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

DRY SEASON
NORMAL CONDITION
1000 PASSES

5206

5204

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5192

N

METERS



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548

the dry normal surface condition

5234⁵¹⁴

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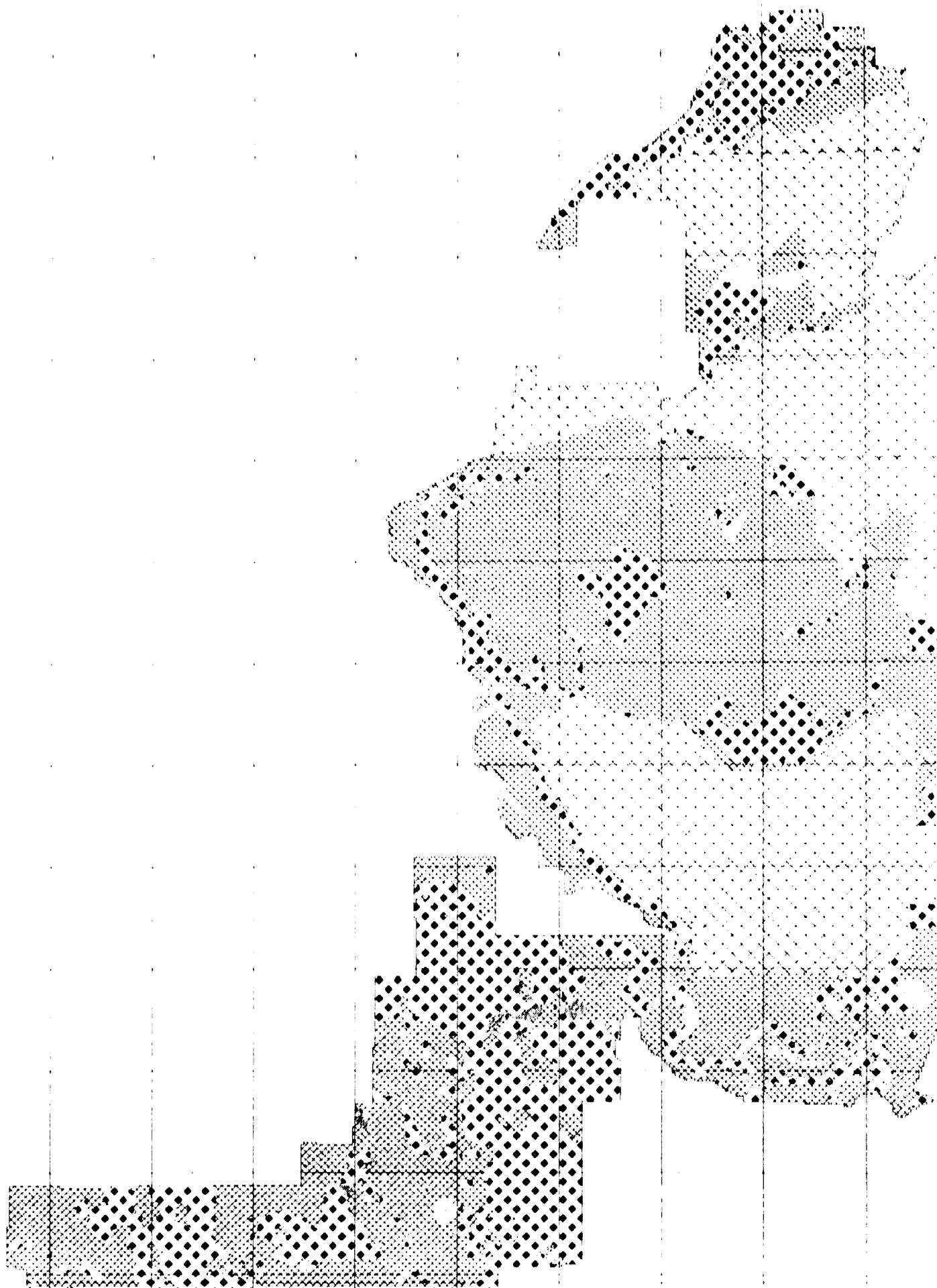
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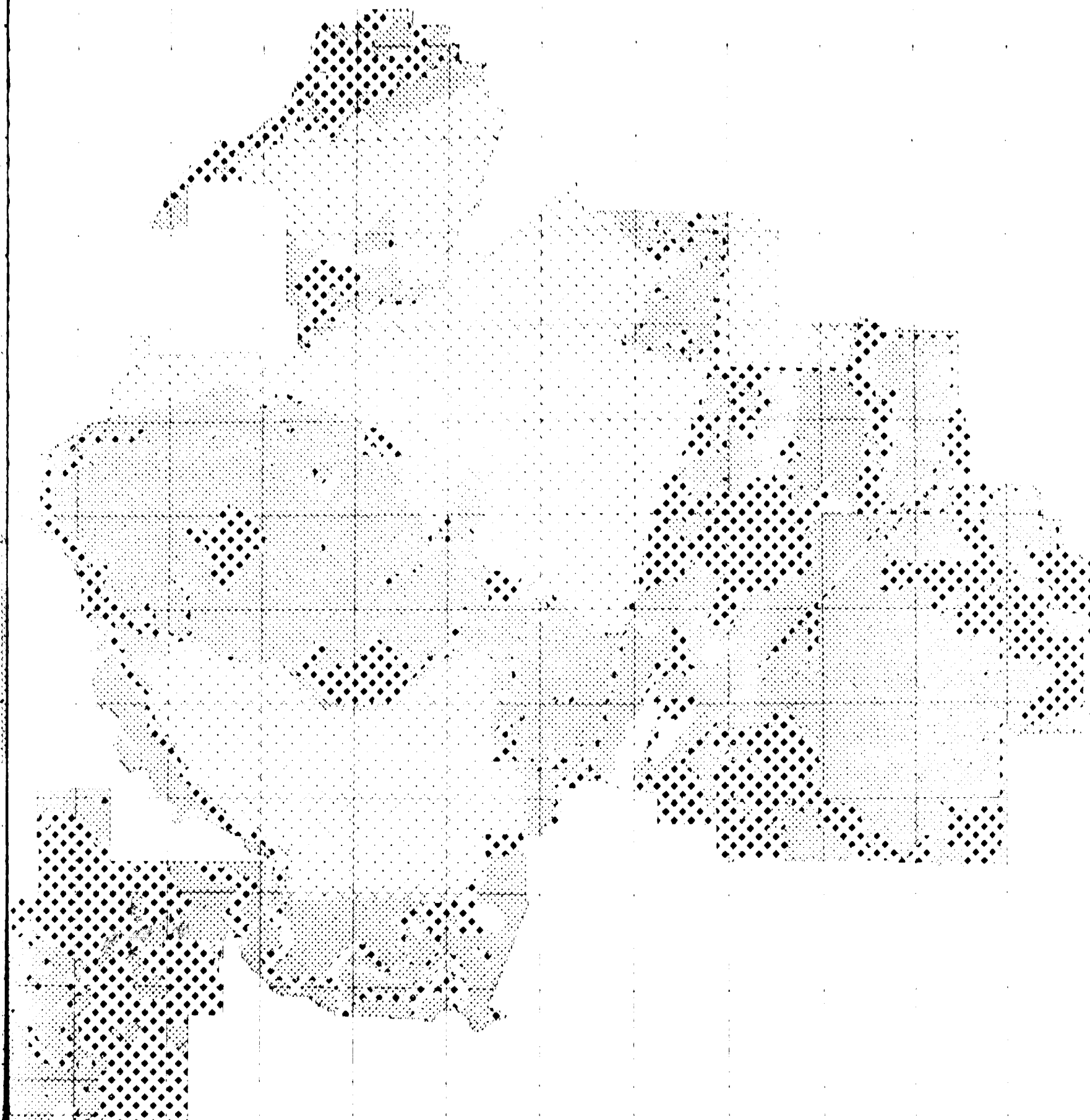
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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

5214

5212

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5208

FT LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE

5206

WET SEASON
SLIPPERY CONDITION
10 PASSES

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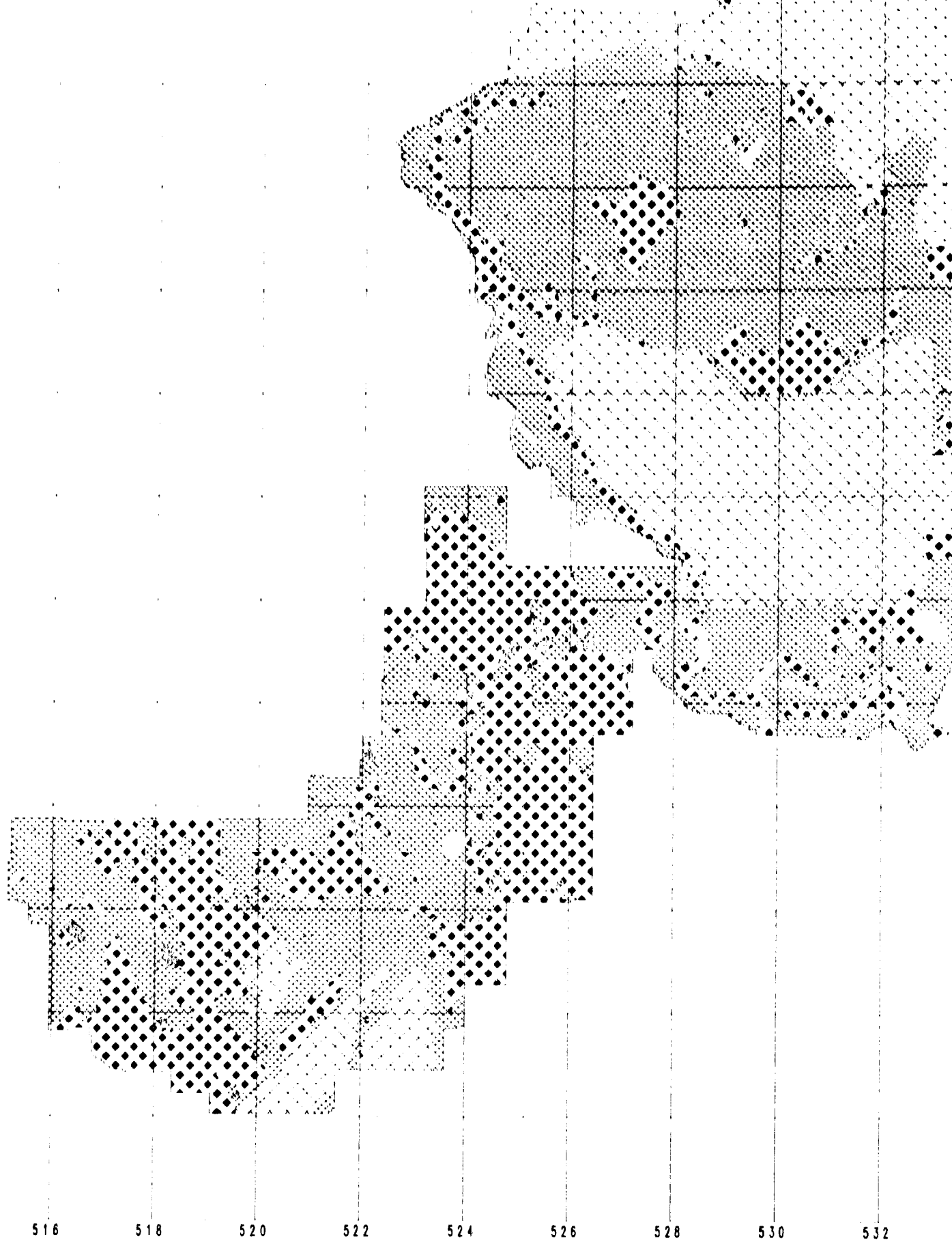
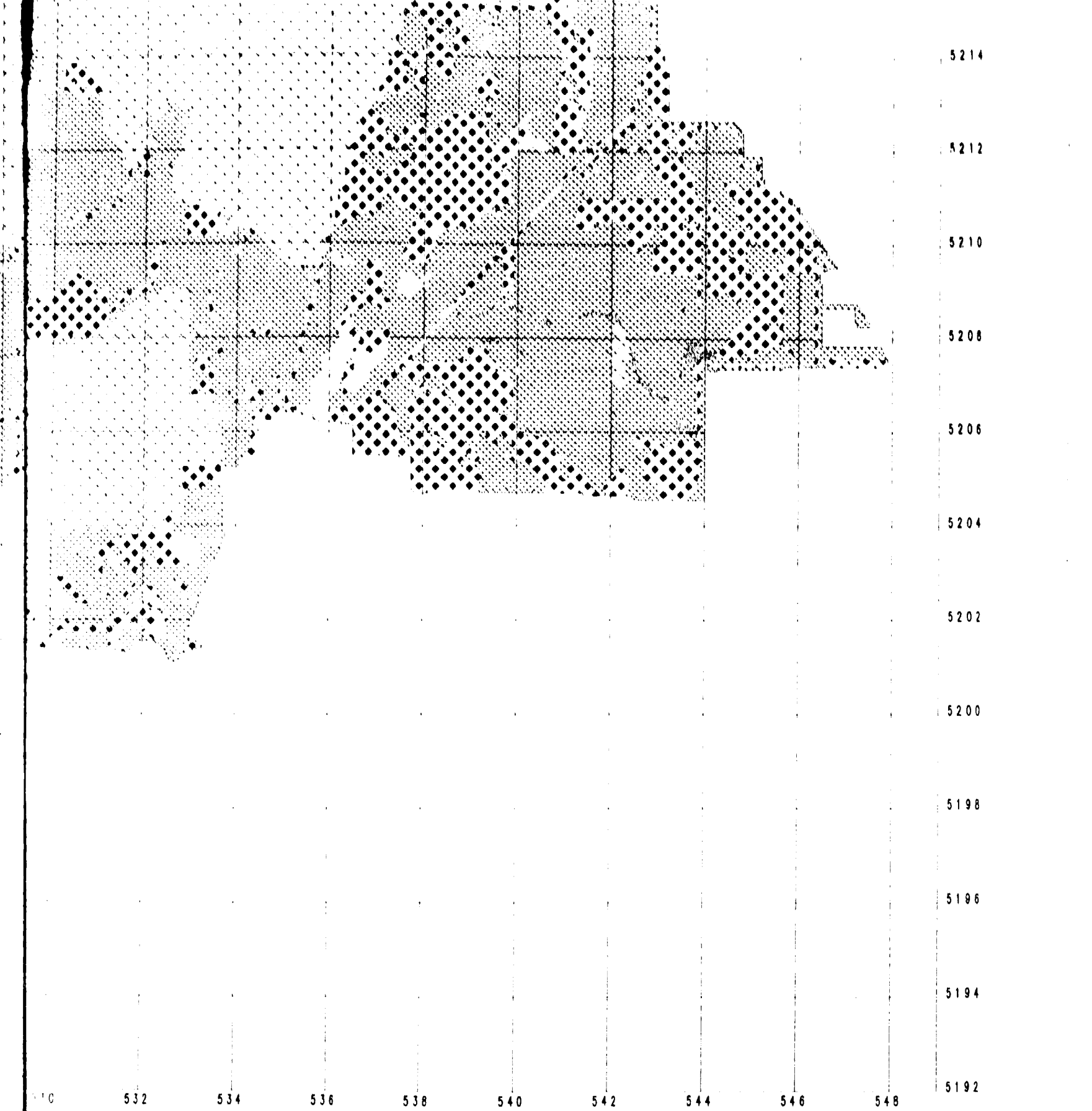


Plate 24. Ten pass soil disturbance level



disturbance level map for the 4-3-3 (8X8) force structure in the wet slippery surface con

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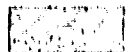
548



SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



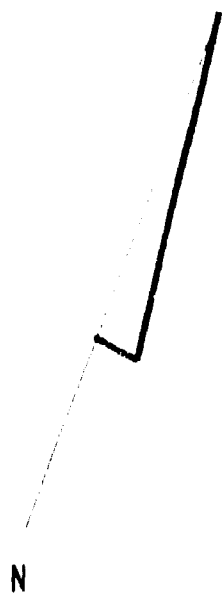
MODERATE
(2-5 in)

WATER

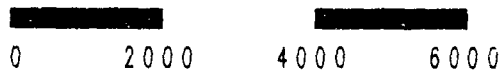
FT LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

WET SEASON
SLIPPERY CONDITION
10 PASSES



METERS



to wet slippery surface condition

5224⁵¹⁴

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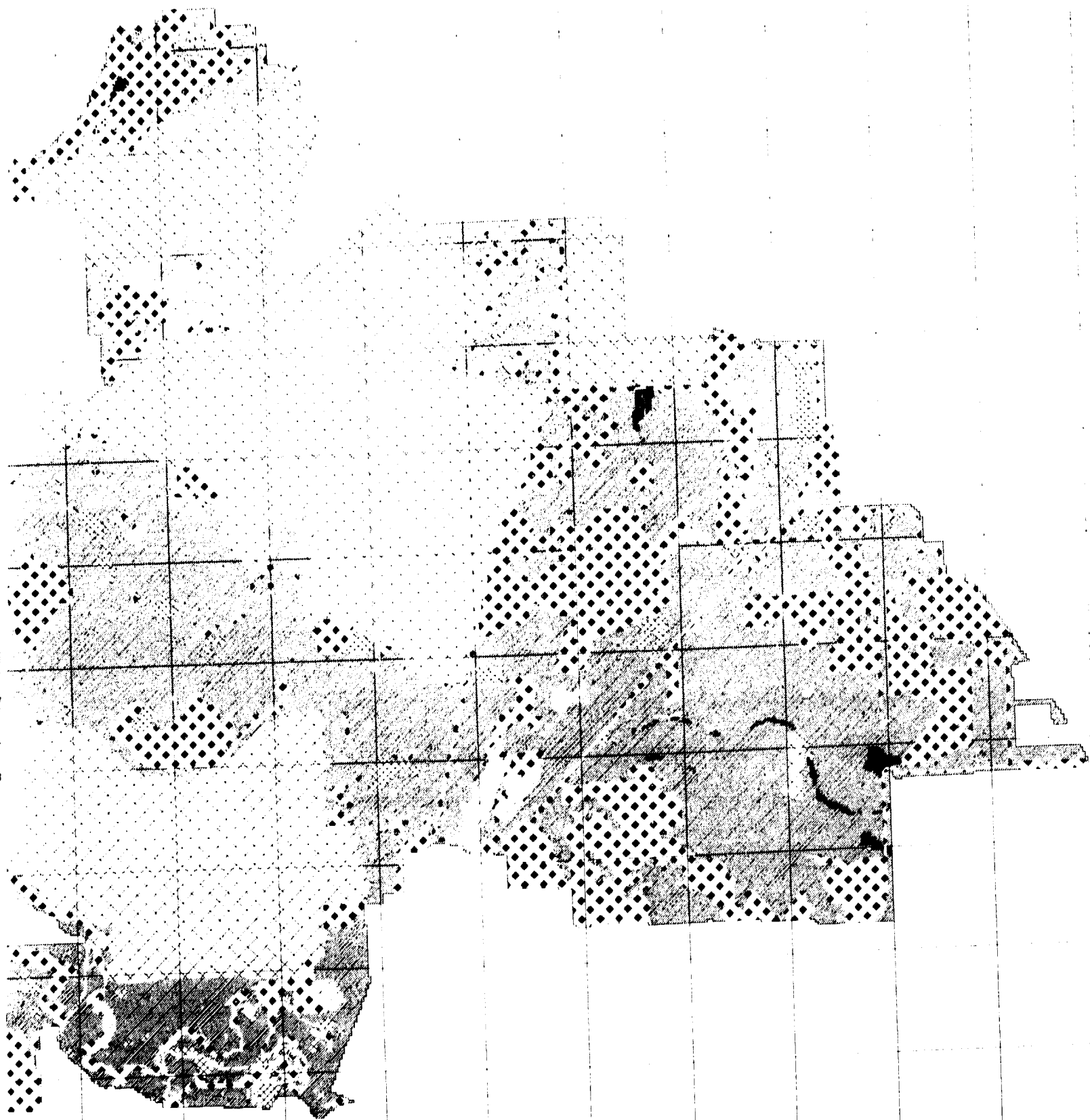
52

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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



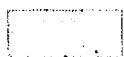
SEVERE
(>12 in)



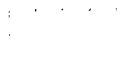
SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(2-5 in)



WATER

FT LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

50 PASSES

5214
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5194
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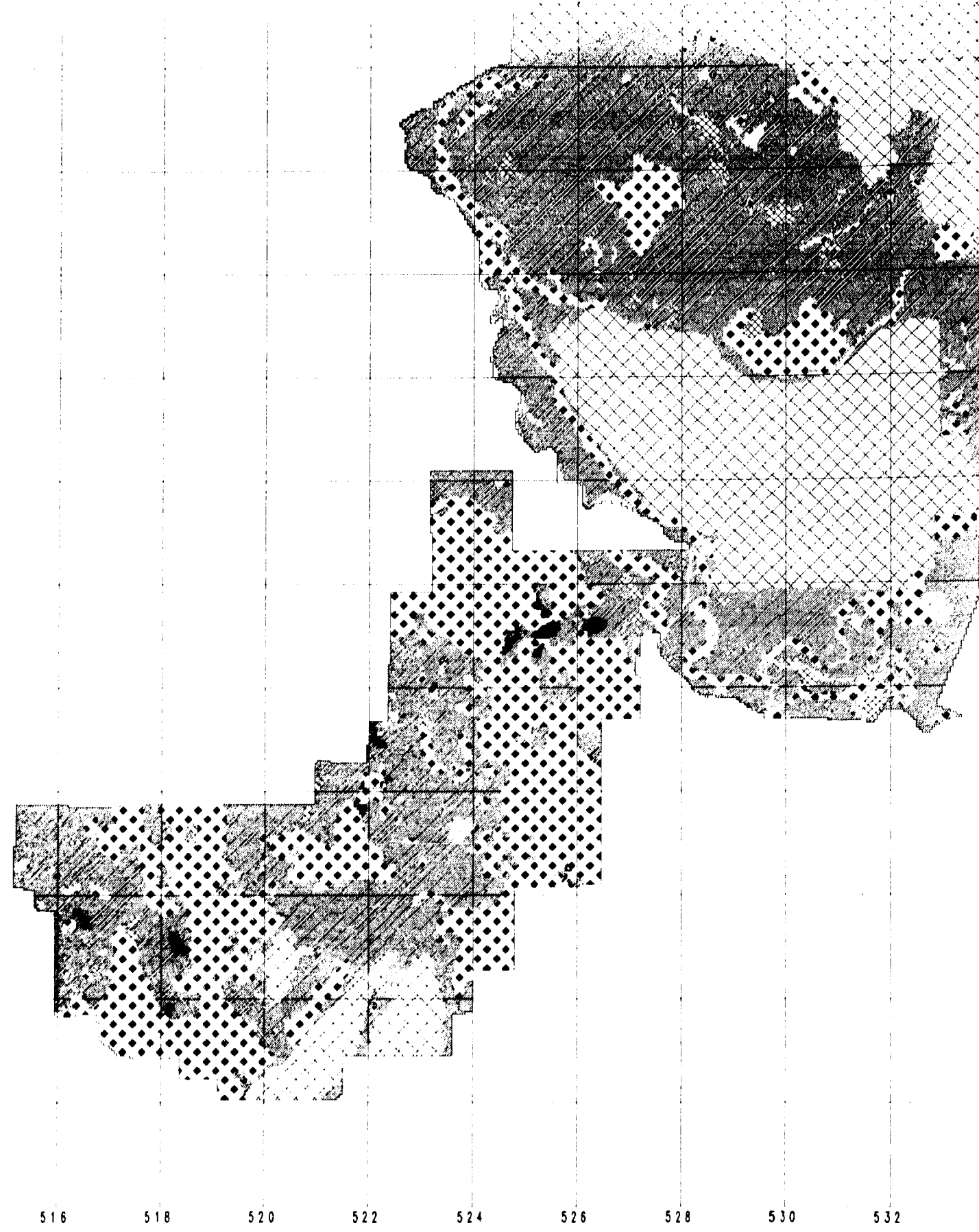
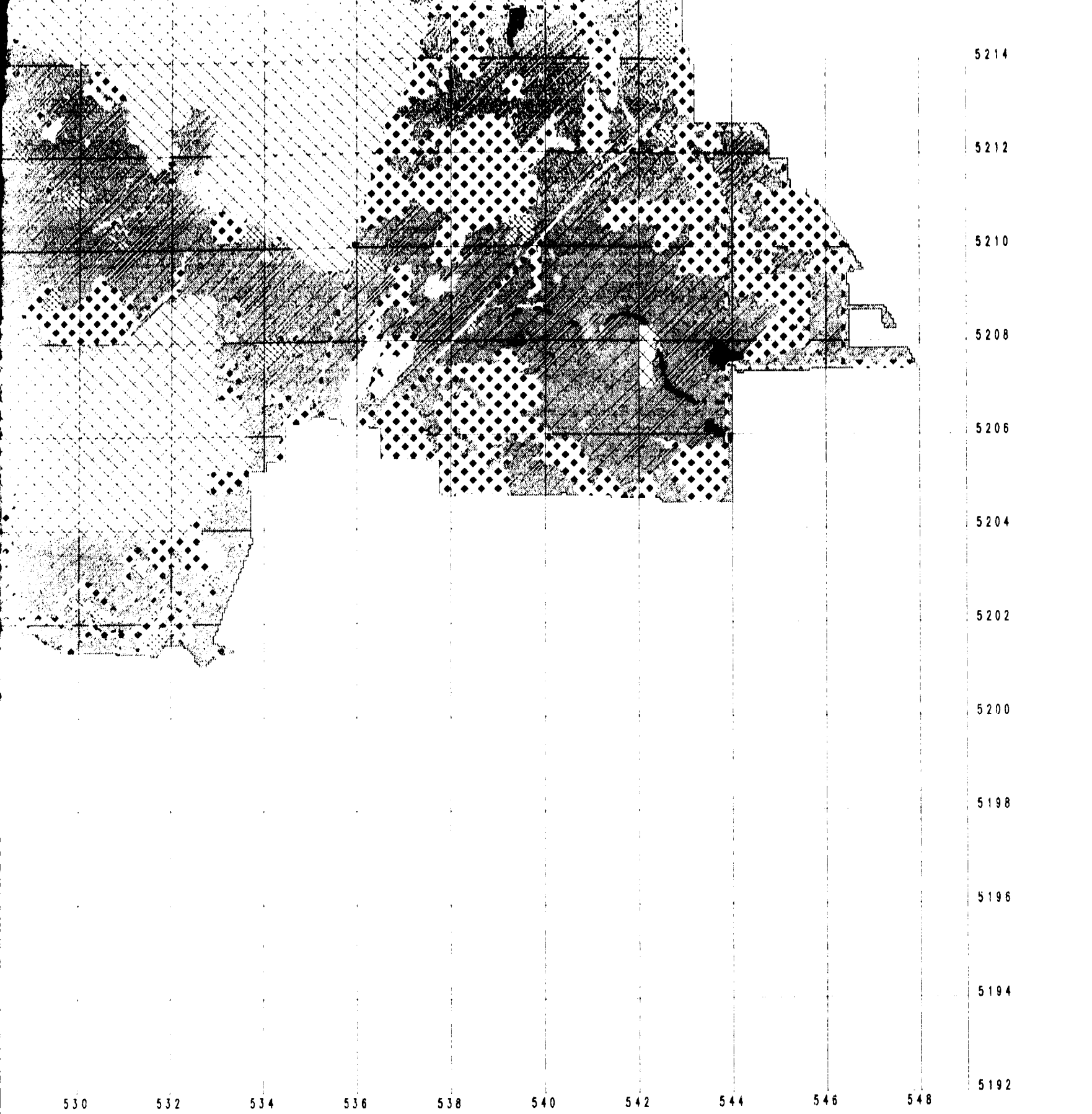
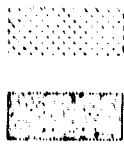


Plate 25. Fifty pass soil disturbance level



soil disturbance level map for the 4-3-3 (8X8) force structure in the wet slippery surface con

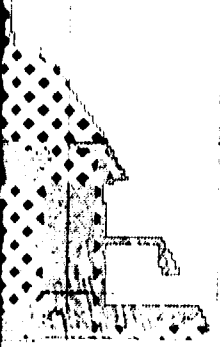
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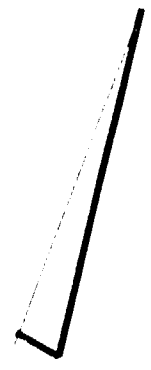
SLIGHT
(>.5-2in)
MODERATE
(>2-5in)



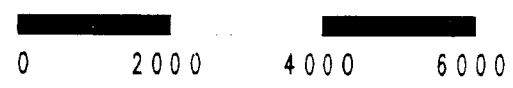
URBAN/
OFF LIMITS
WATER



FT LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
50 PASSES



METERS



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wet slippery surface condition

5224 514 516 518 520 522 524 526 528 530 532 53

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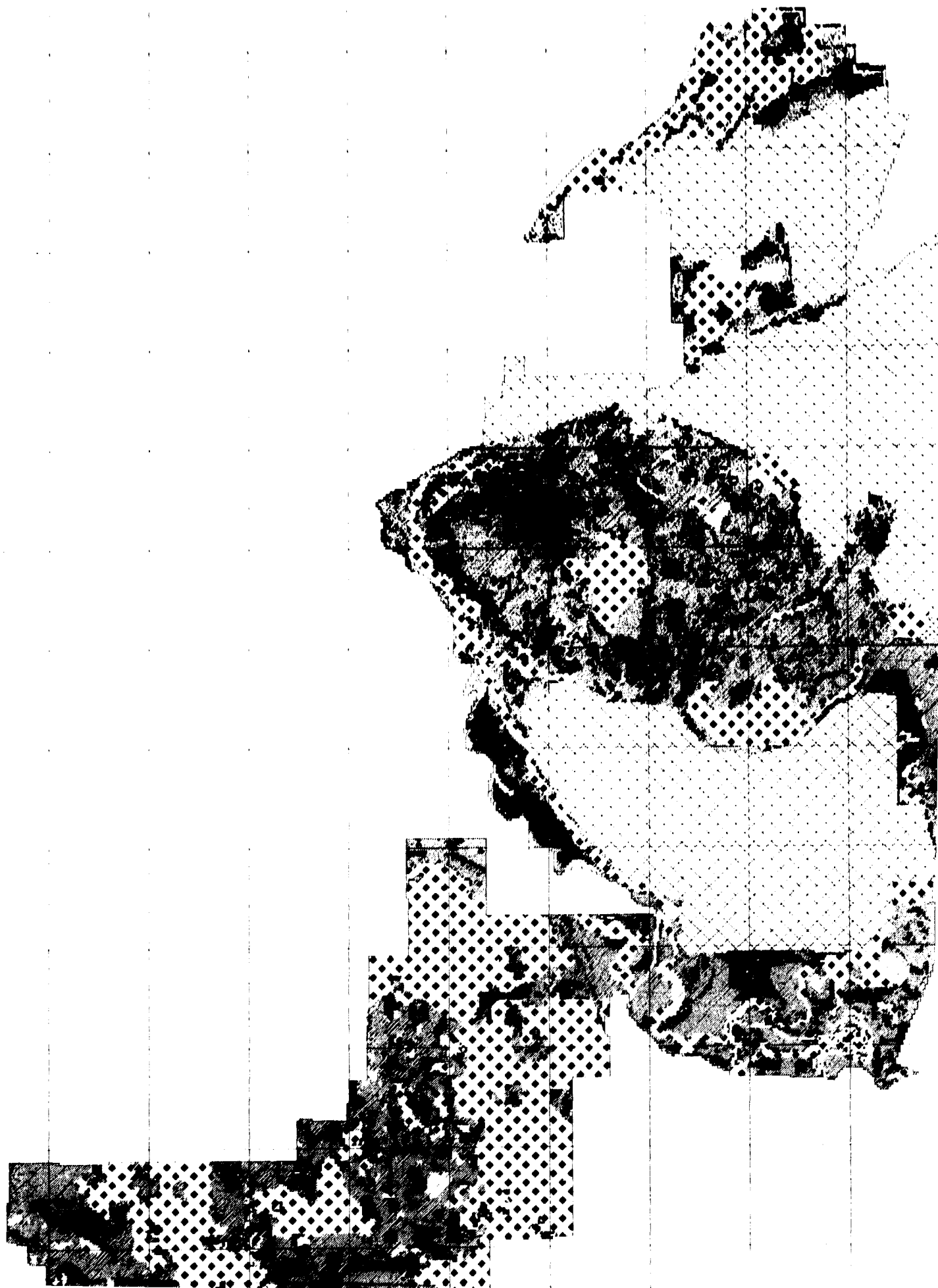
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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



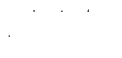
SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(2-5 in)



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FT LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE

WET SEASON
SLIPPERY CONDITION
1000 PASSES

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Plate 26. One thousand pass soil disturbance le



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soil disturbance level map for the 4-3-3 (8X8) force structure in the wet slippery surface

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SLIGHT
(.5-2 in)

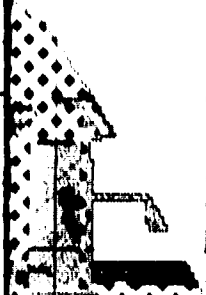


URBAN/
OFF LIMITS

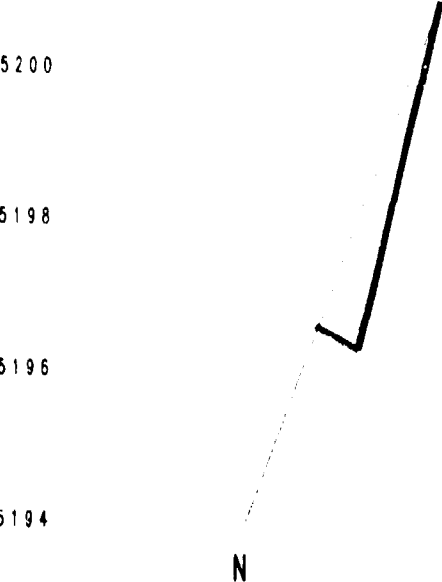


MODERATE
(2-5 in)

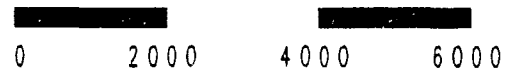
WATER



FT LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
1000 PASSES



METERS



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on the wet slippery surface condition

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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



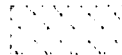
MINIMUM
(0-.5 in)



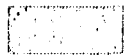
SEVERE
(>12 in)



SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

10 PASSES

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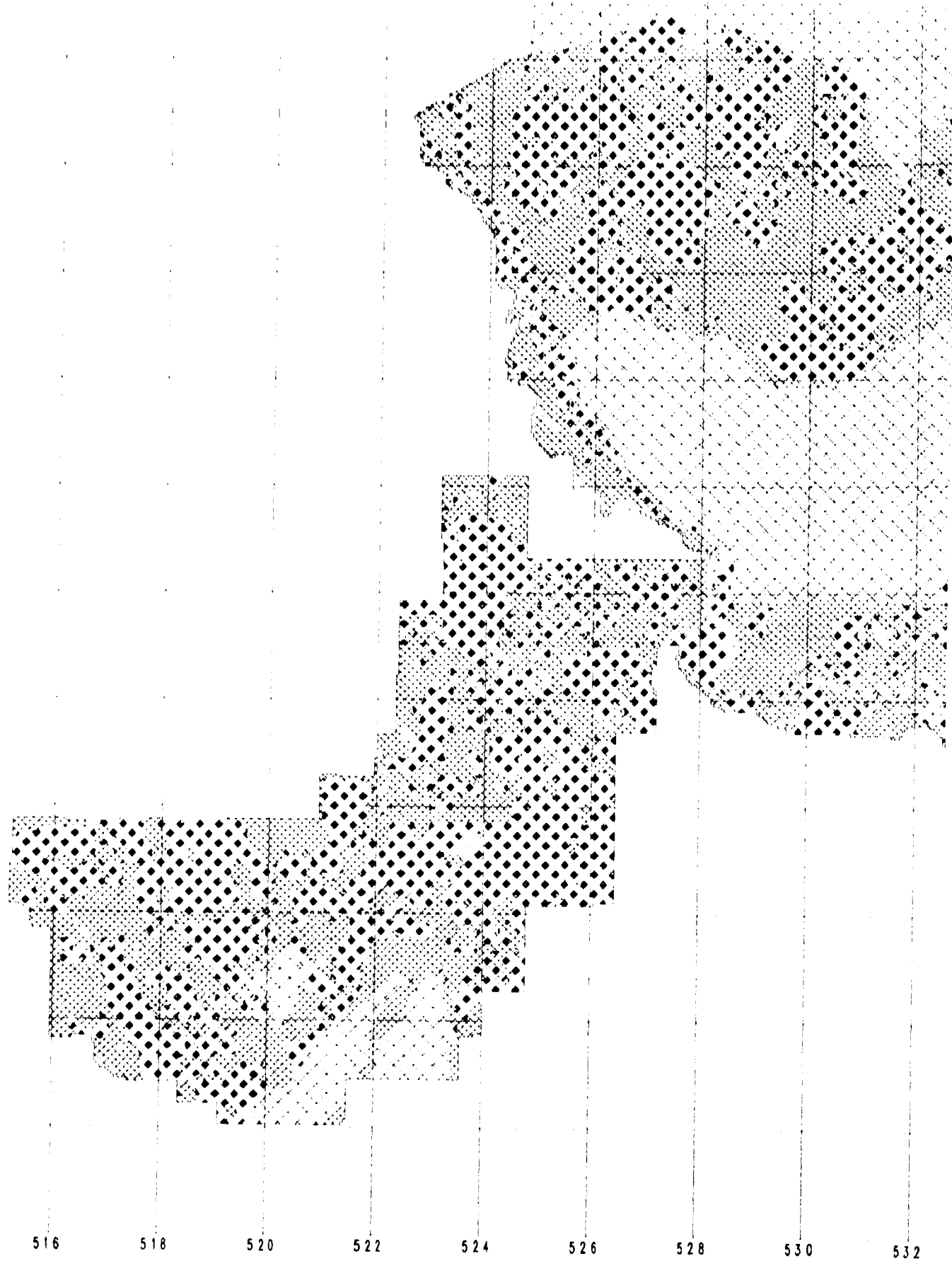
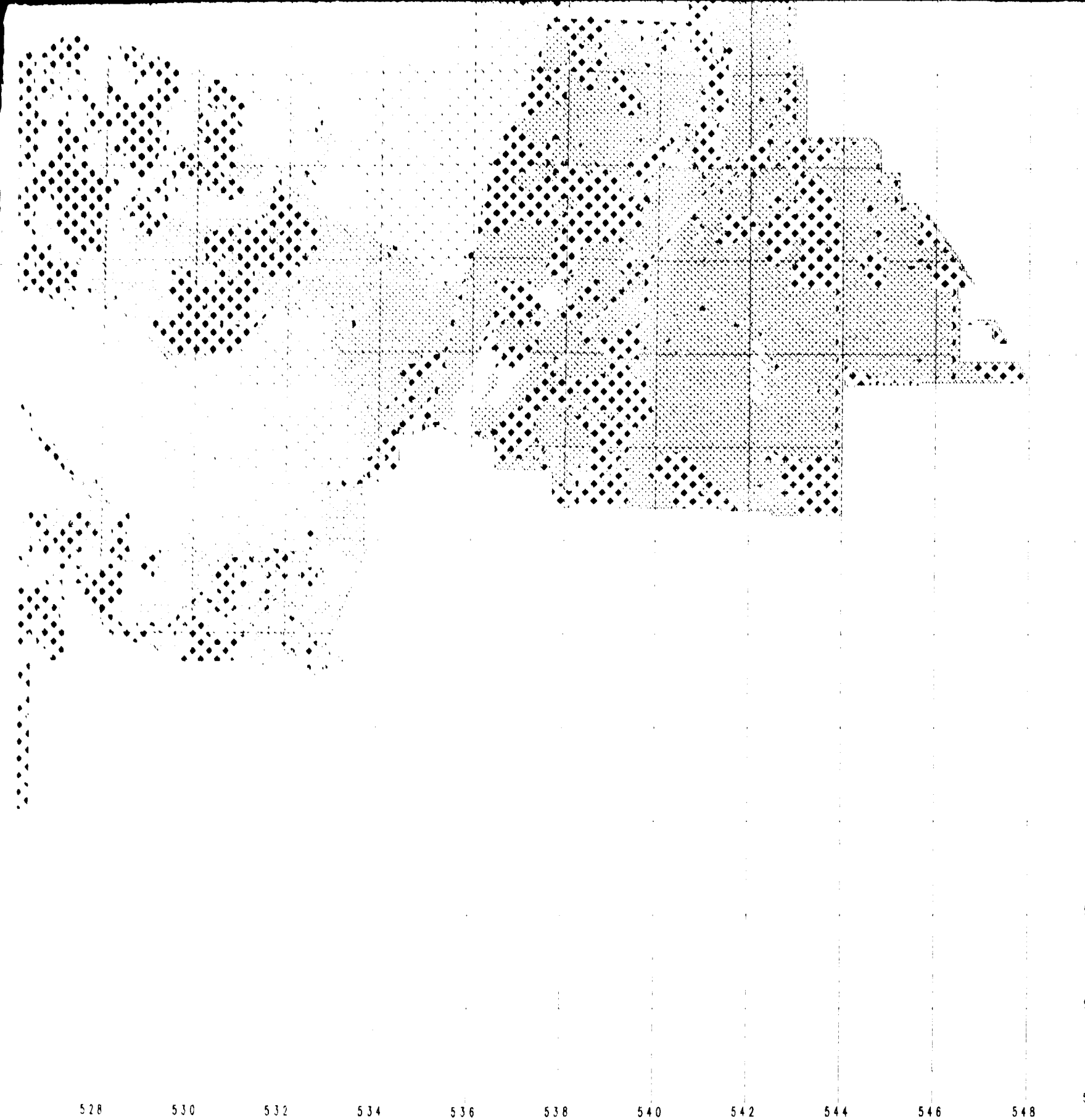
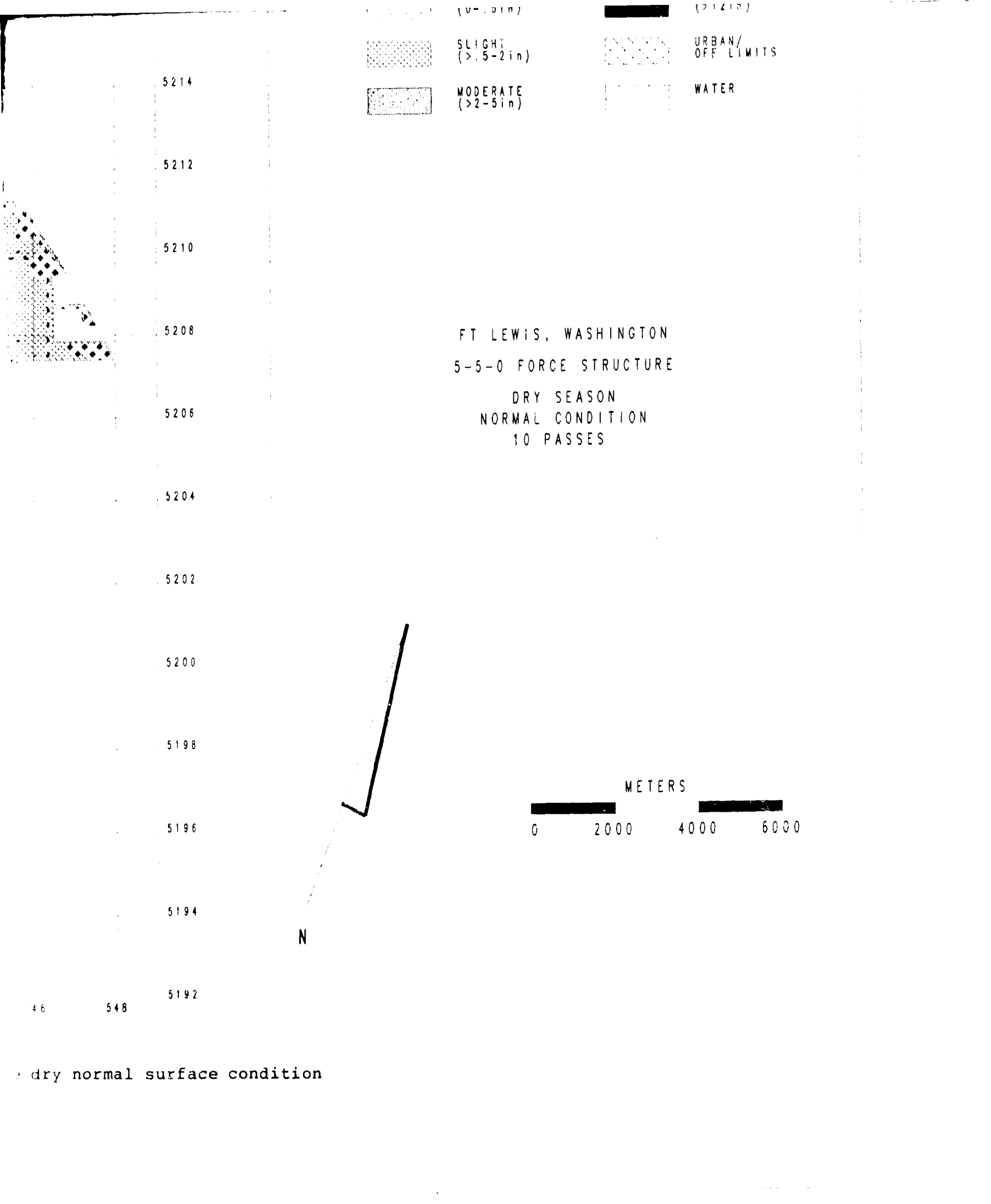
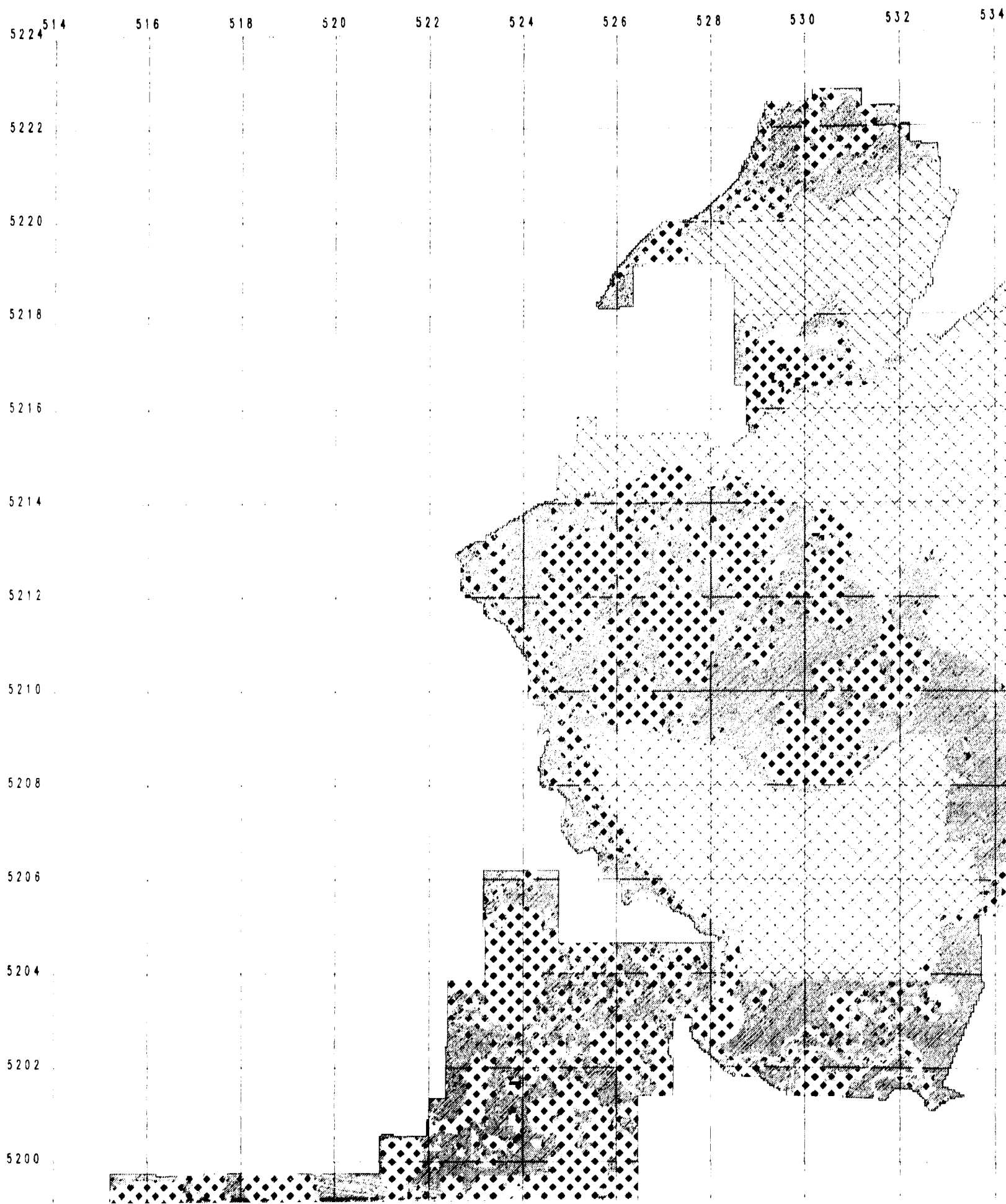


Plate 27. Ten pass soil distur



17. Ten pass soil disturbance level map for the 5-5-0 force structure in the dry normal sur





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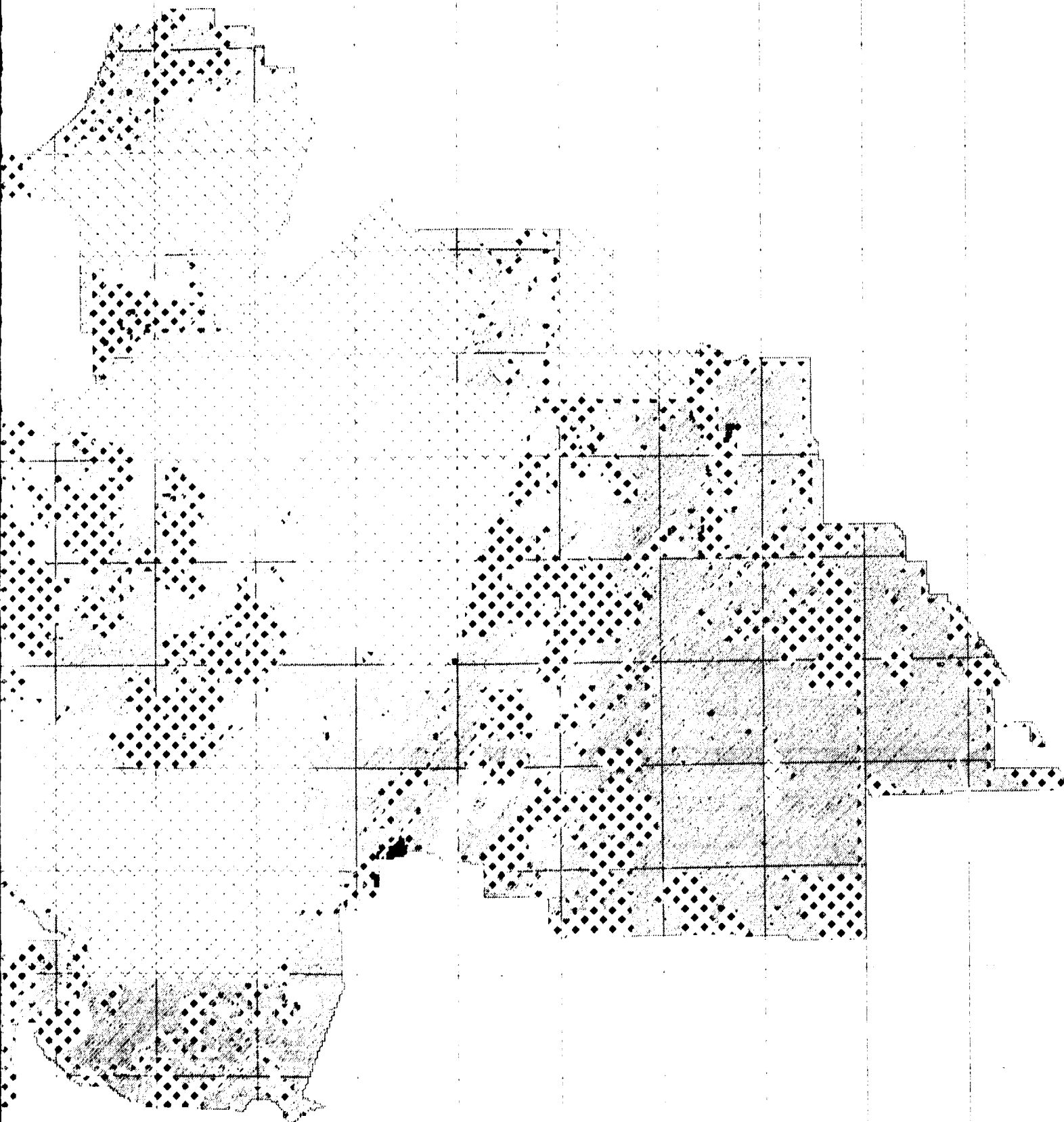
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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

50 PASSES

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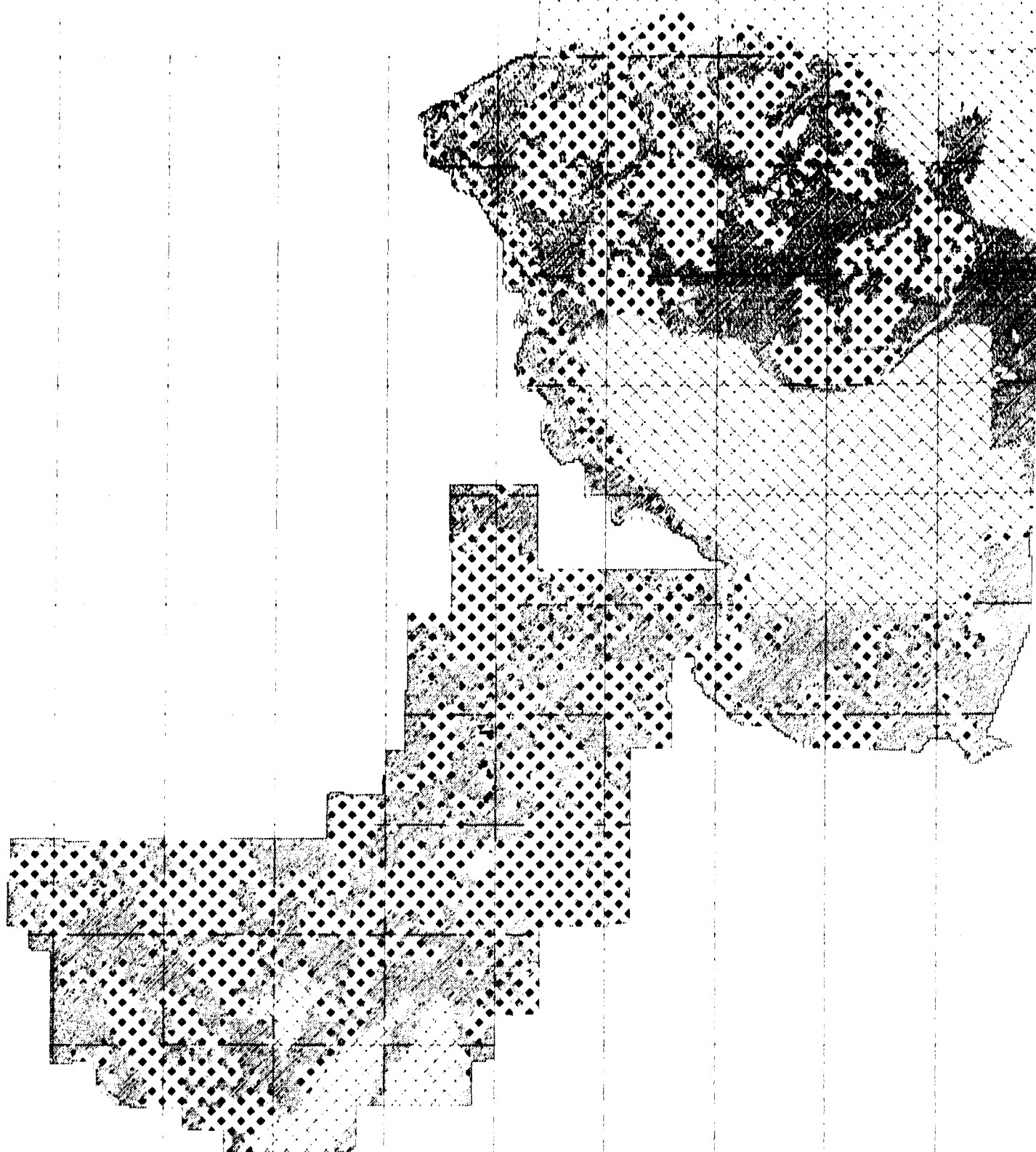
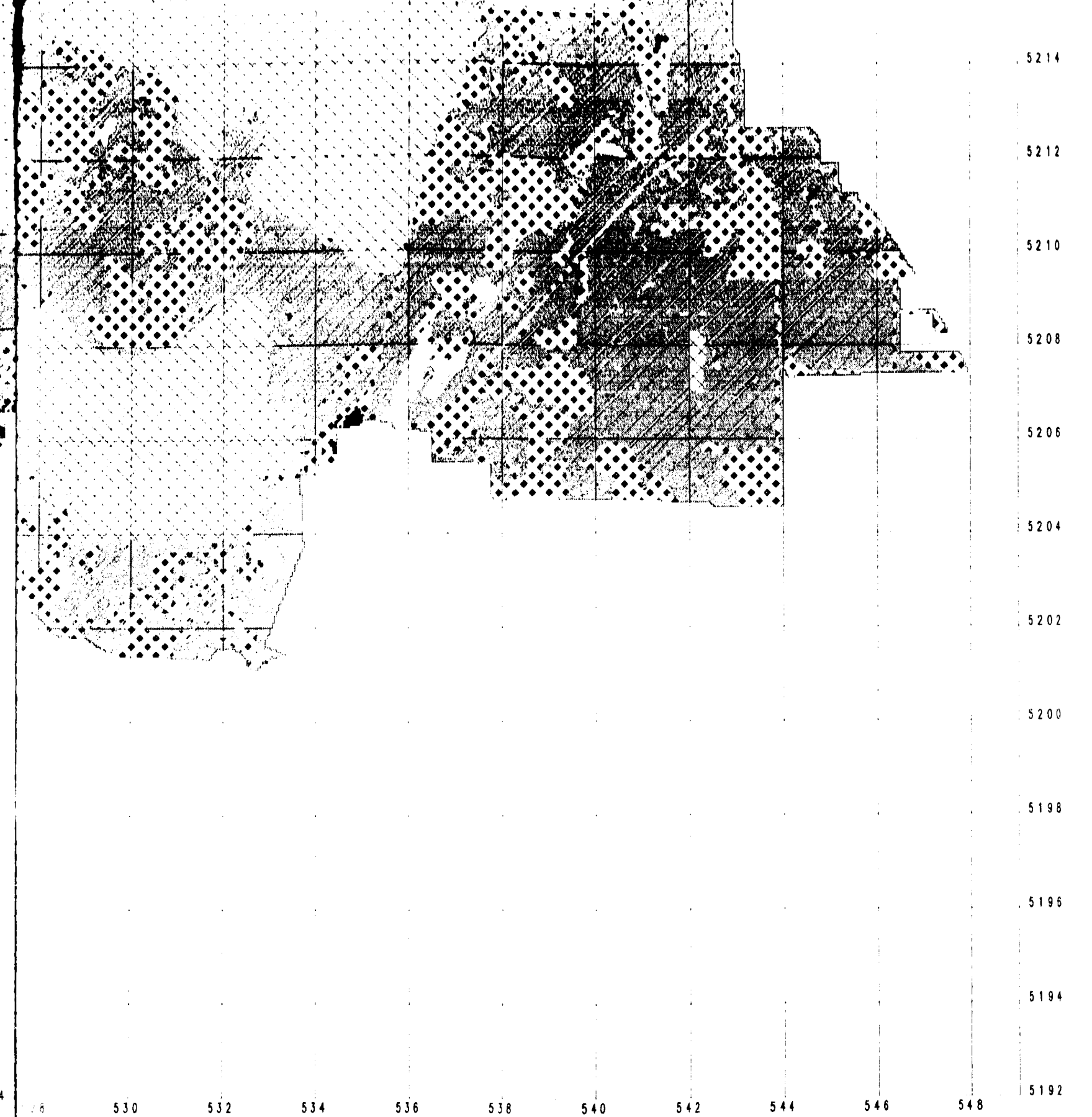
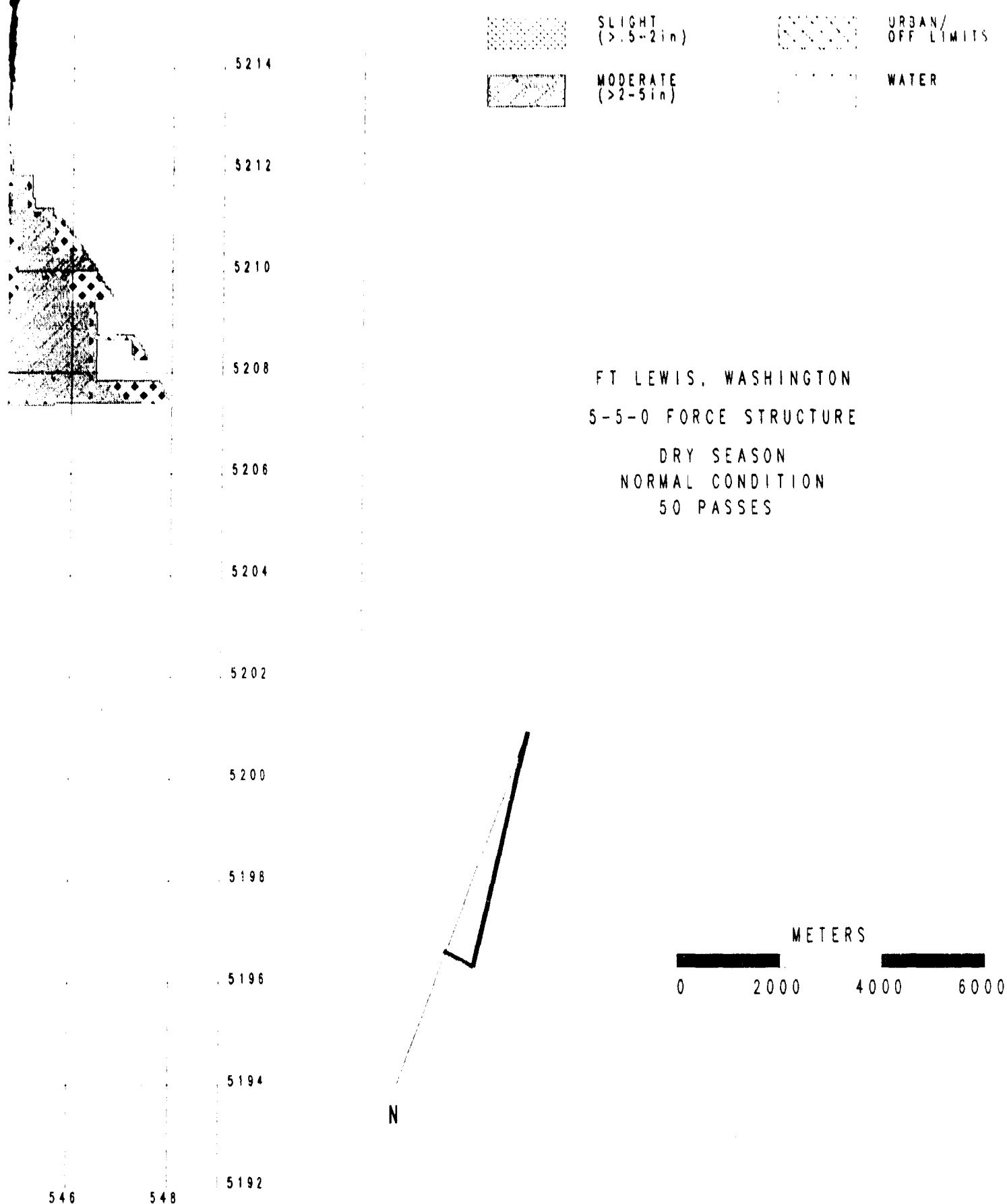


Plate 28. Fifty pass soil disturbance



pass soil disturbance level map for the 5-5-0 force structure in the dry normal surface con



ie dry normal surface condition

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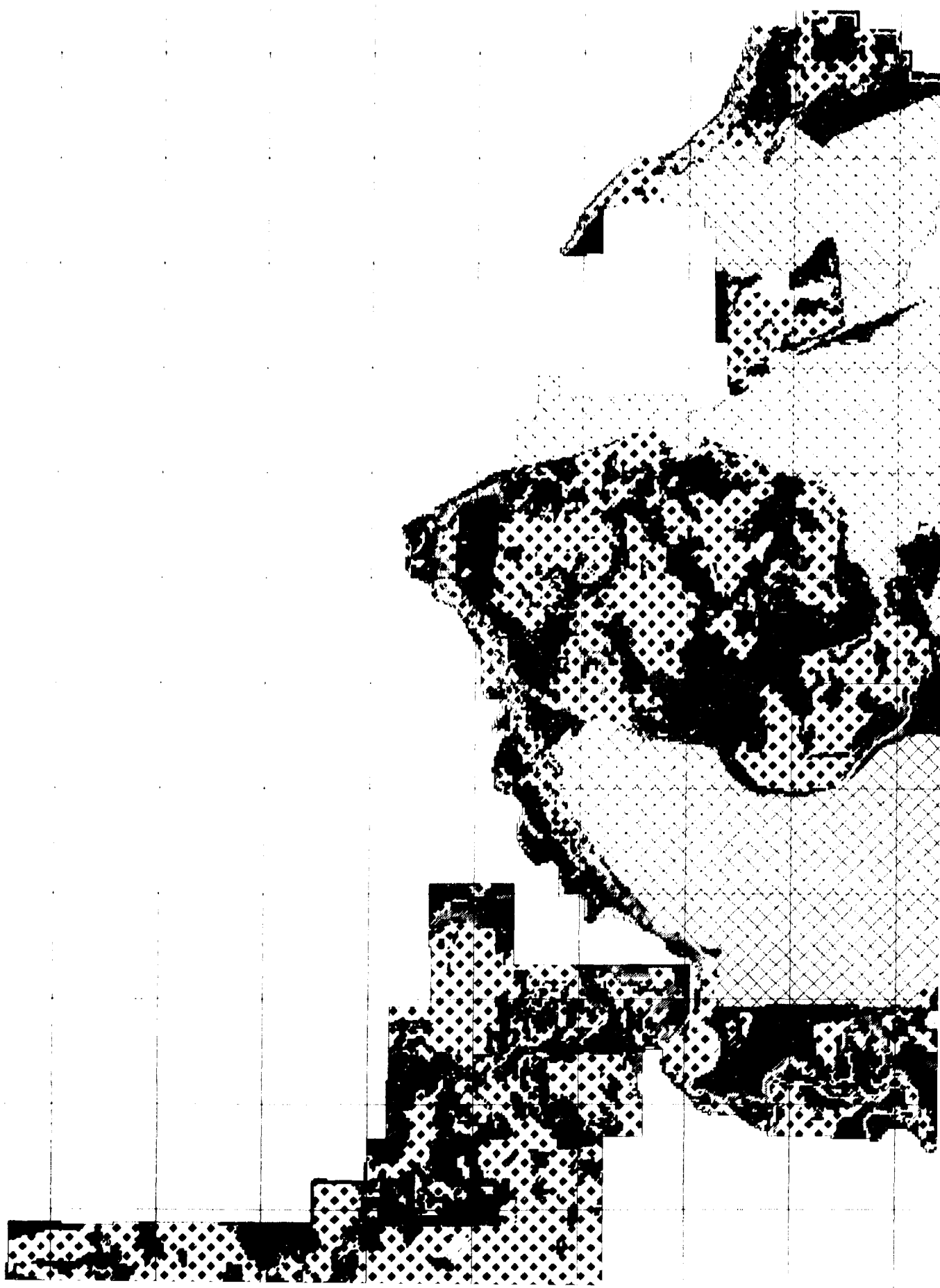
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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



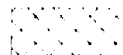
MINIMUM
(0-.5 in)



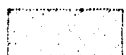
SEVERE
(>12 in)



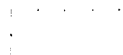
SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

1000 PASSES

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Plate 29. One thousand pass soil dist



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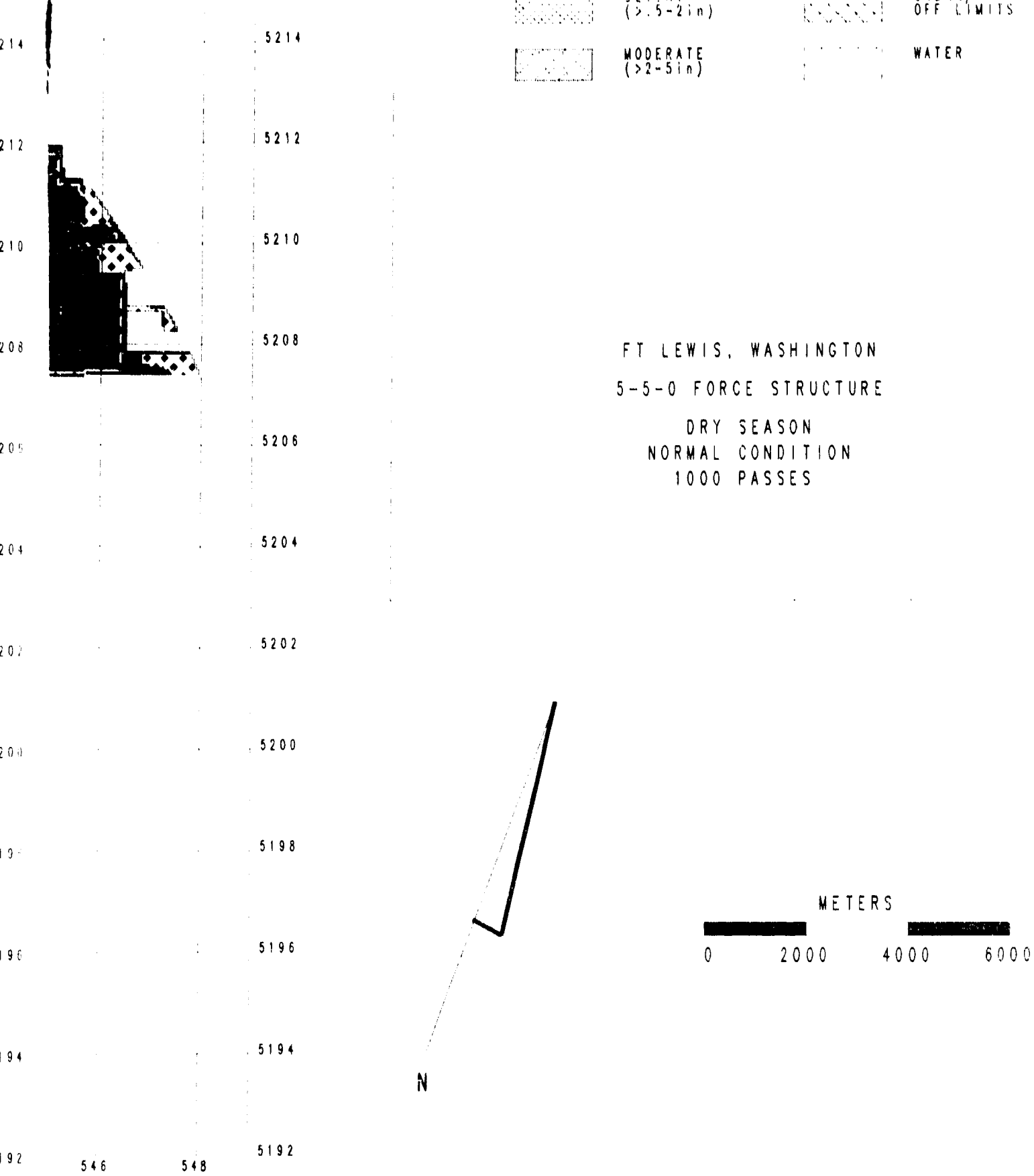
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ban thousand pass soil disturbance level map for the 5-5-0 force structure in the dry normal



rfac the dry normal surface condition

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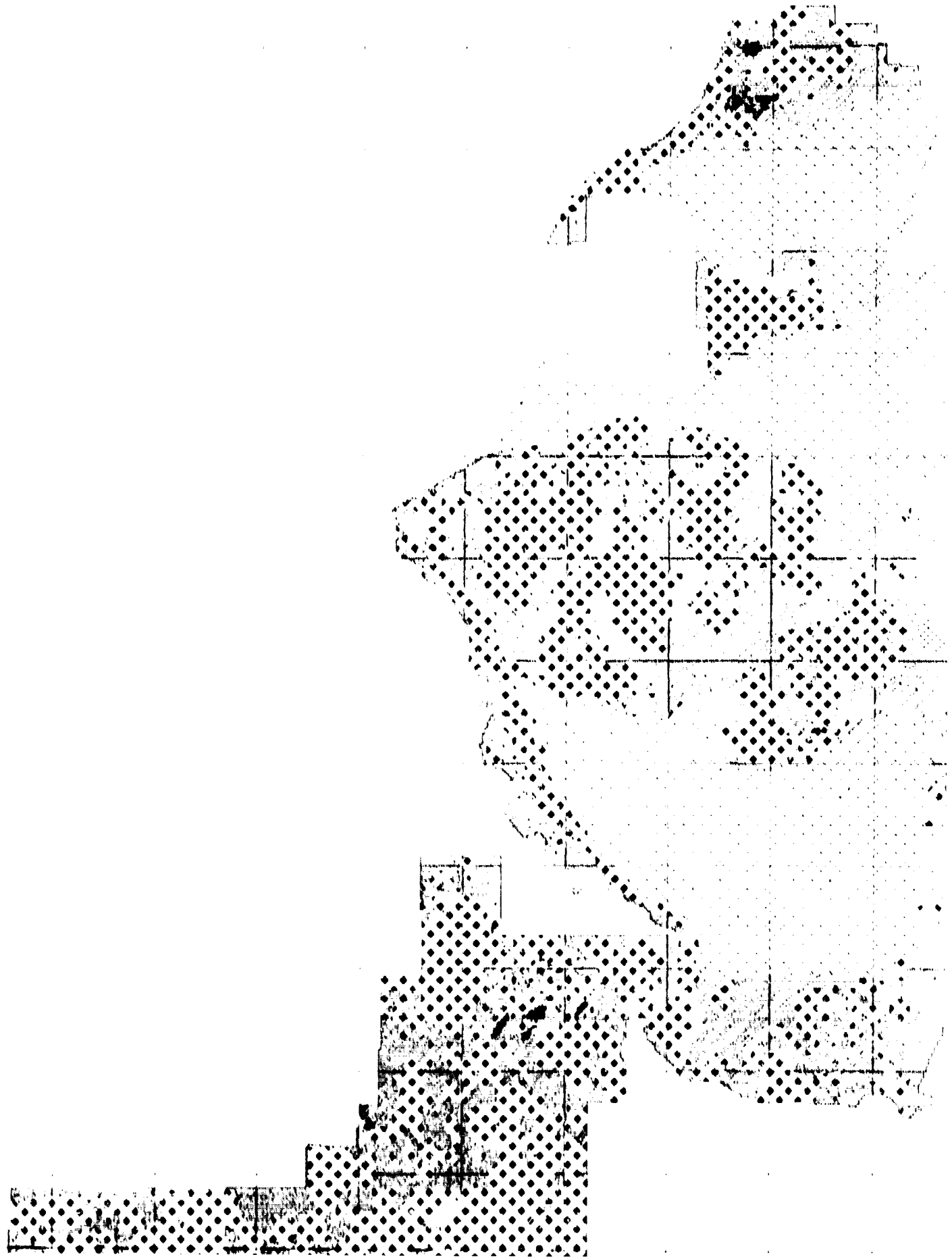
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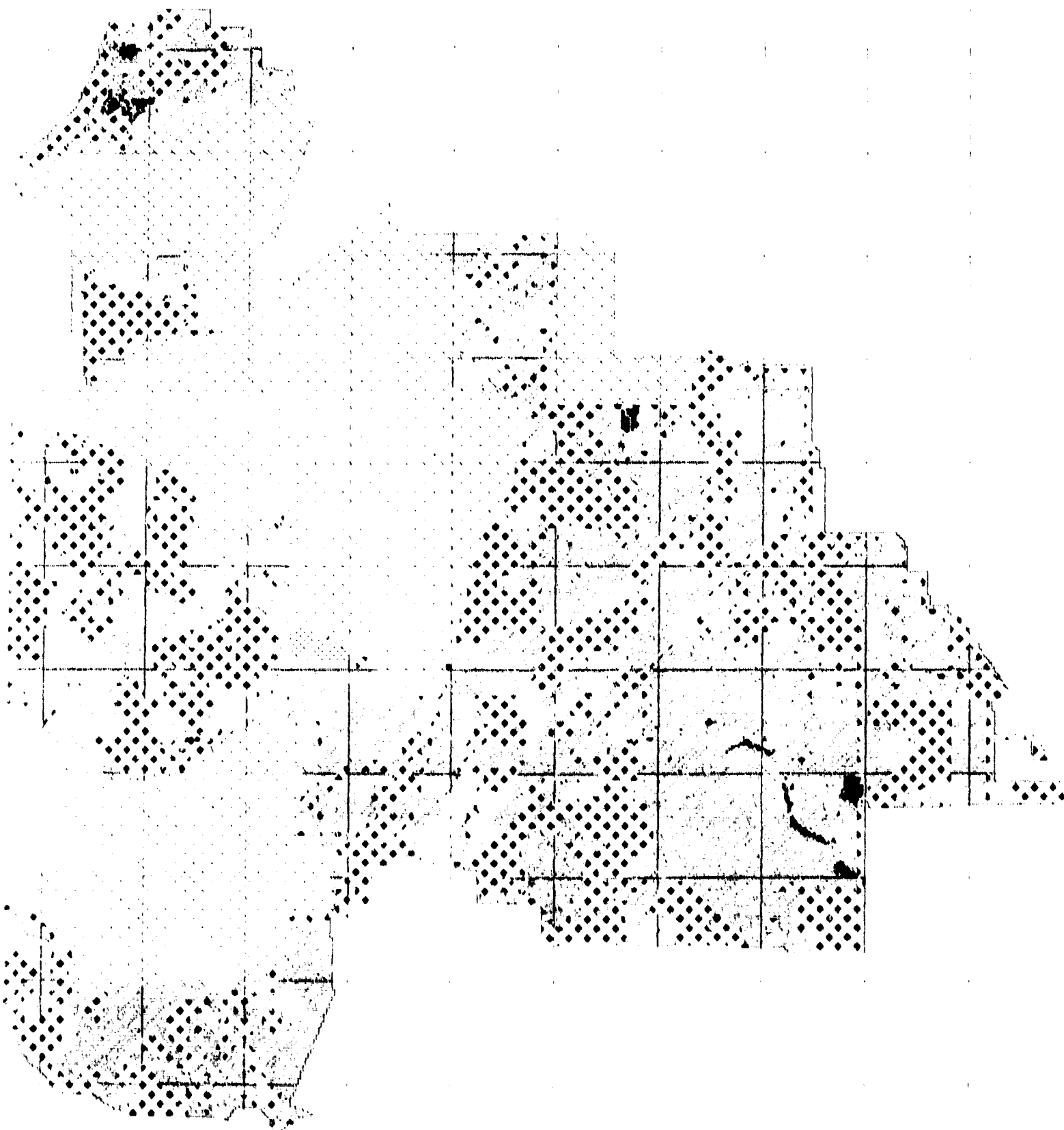
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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

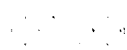
SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



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FT LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

10 PASSES

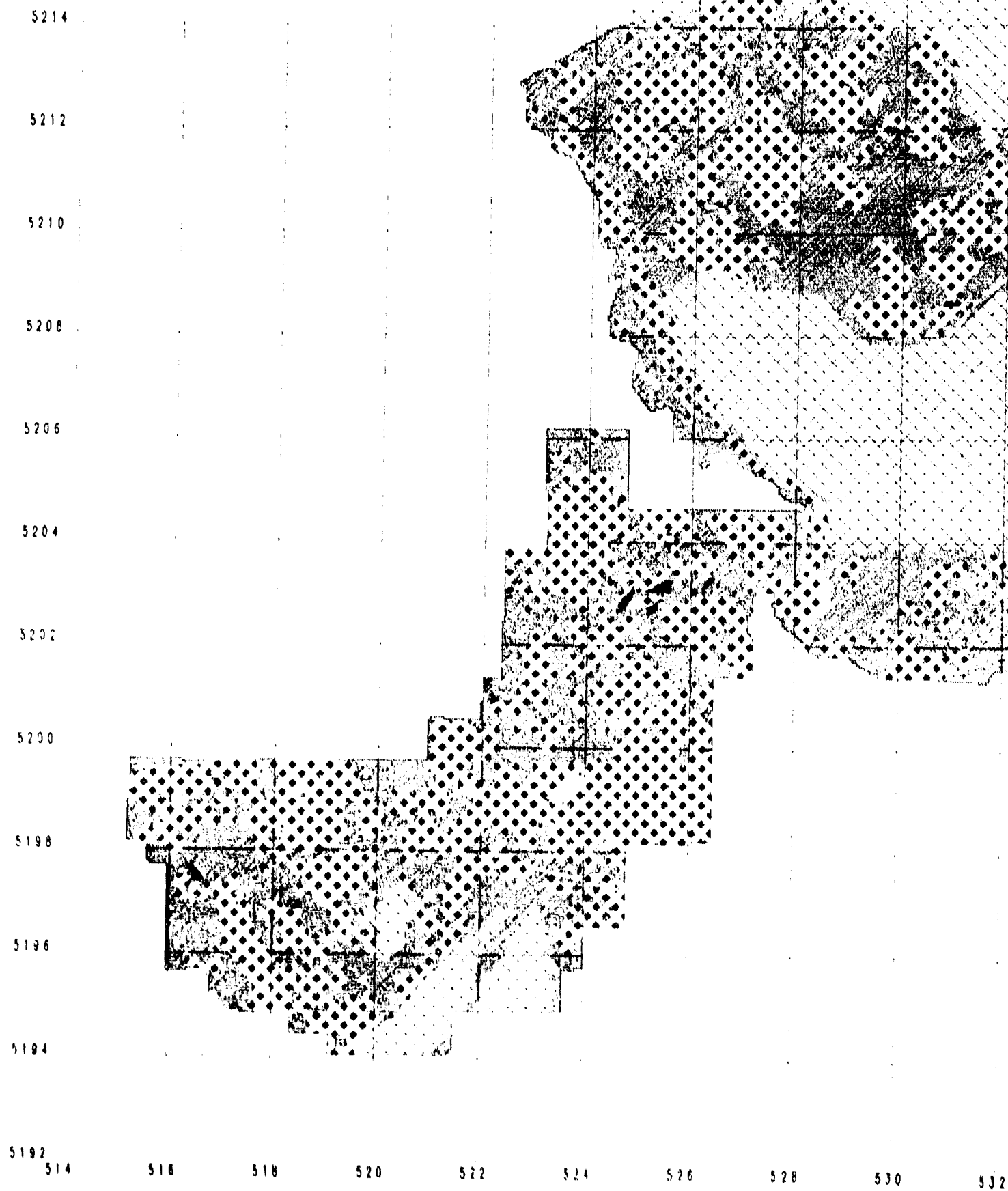
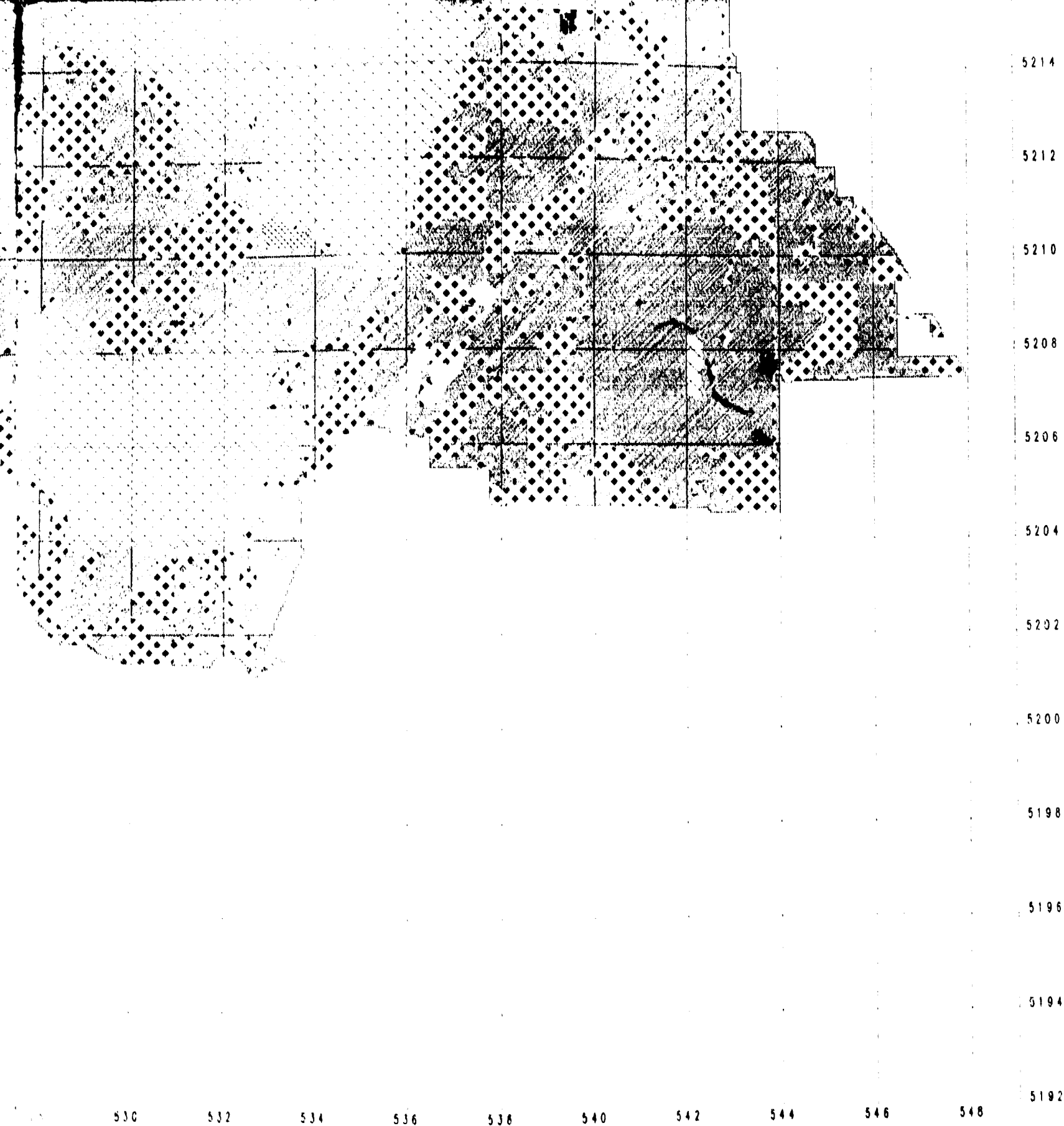


Plate 30. 'Ten pass soil' disturbance 1



PASS soil disturbance level map for the 5-5-0 force structure in the wet slippery surface ce

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(3-1-1)



SLIGHT
(5-5-1)



MODERATE
(5-5-1)

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FT LEWIS, WASHINGTON
5-5-0 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
10 PASSES



METERS



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the wet slippery surface condition

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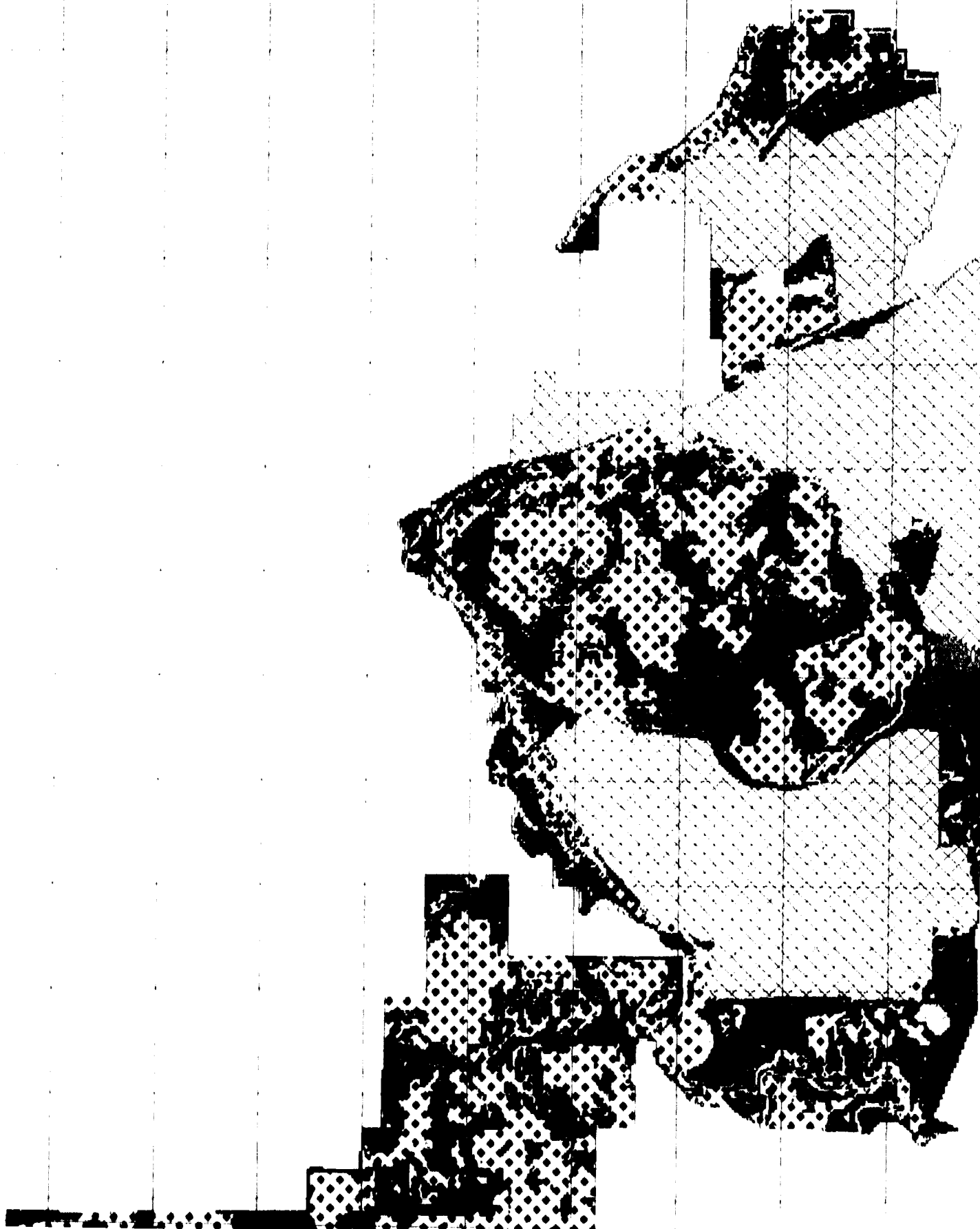
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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



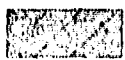
SEVERE
(>12 in)



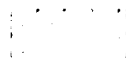
SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

50 PASSES

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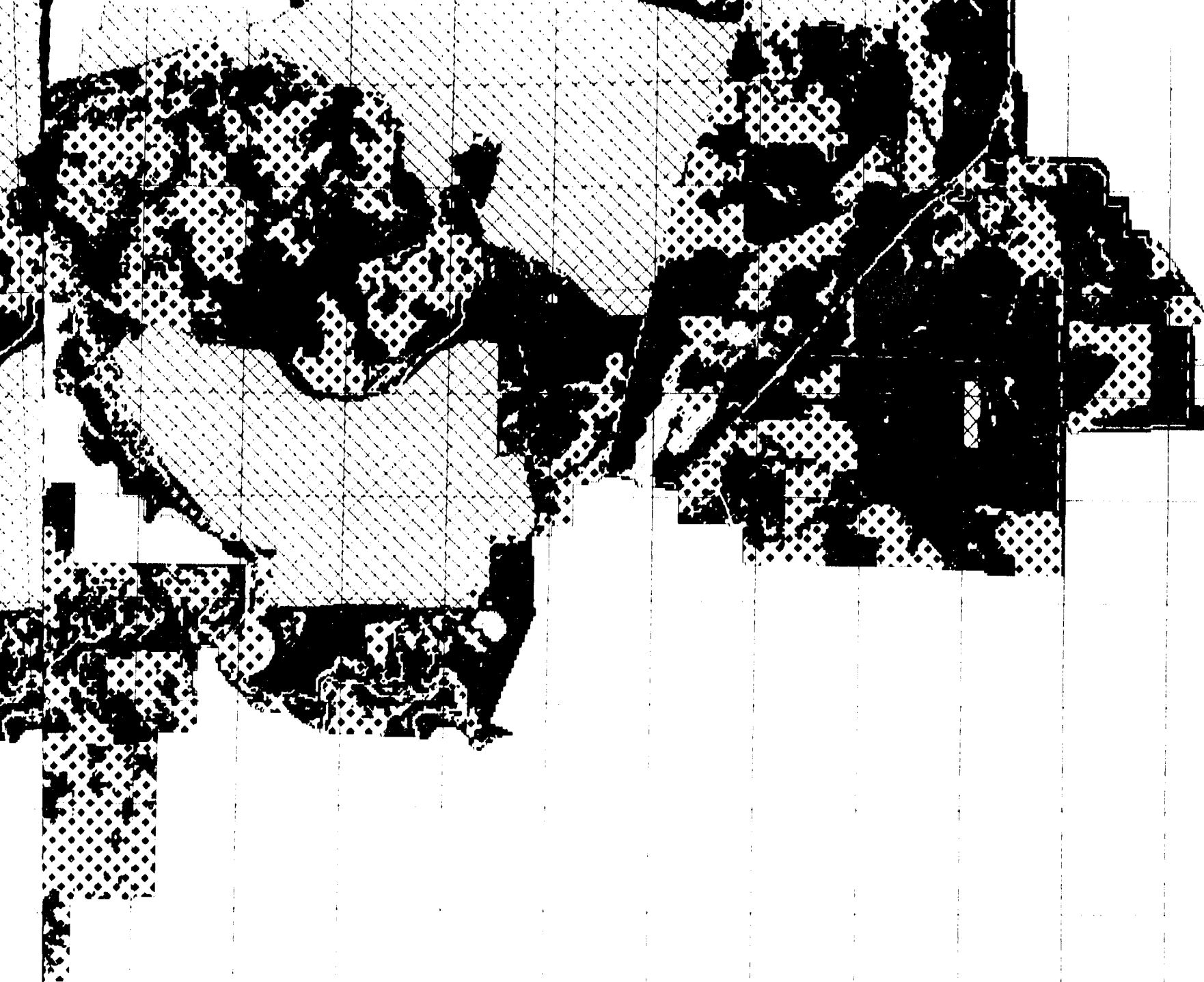
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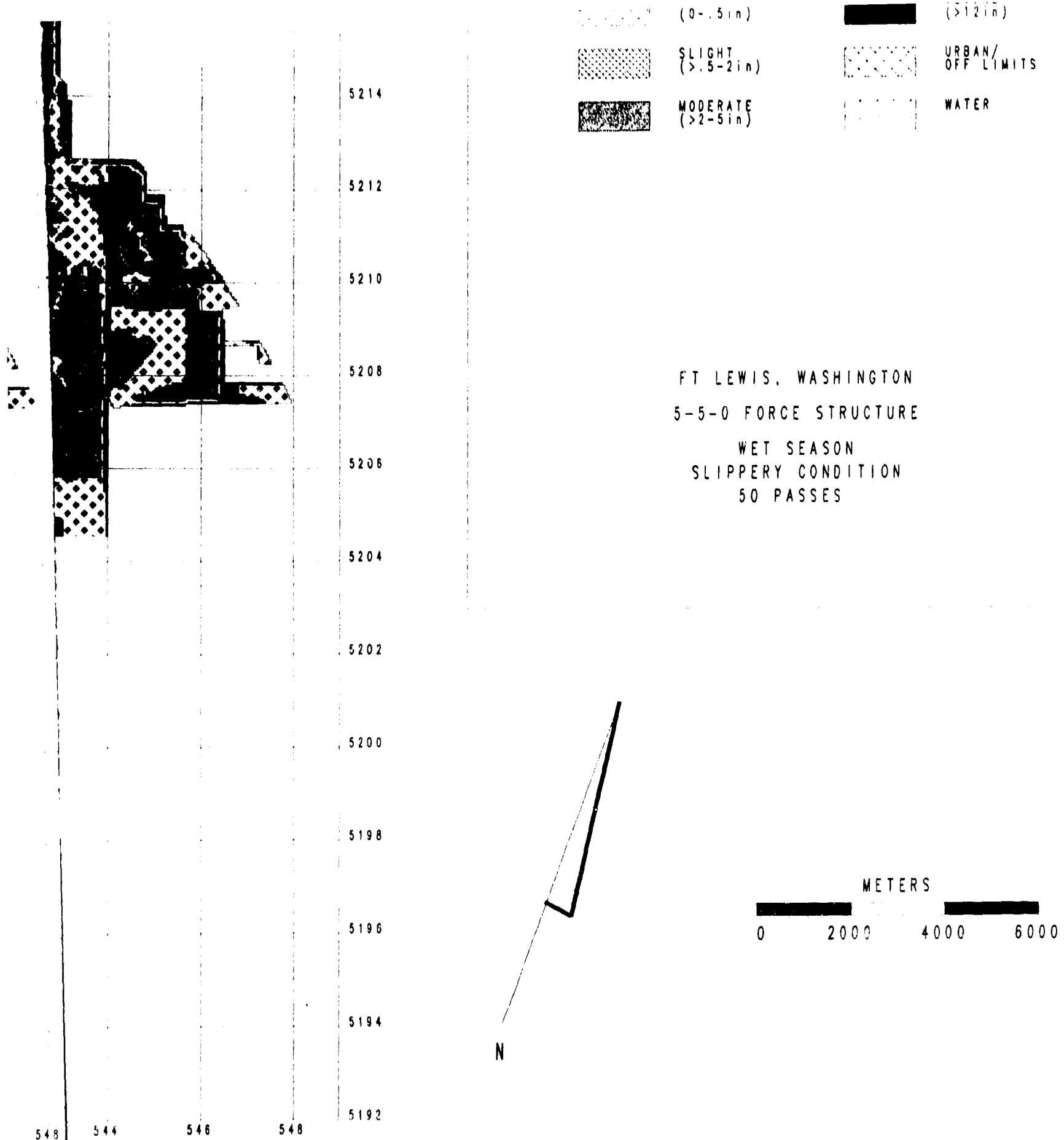
530



plate 31. Fifty pass soil



31. Fifty pass soil disturbance level map for the 5-5-0 force structure in the wet



ipper in the wet slippery surface condition

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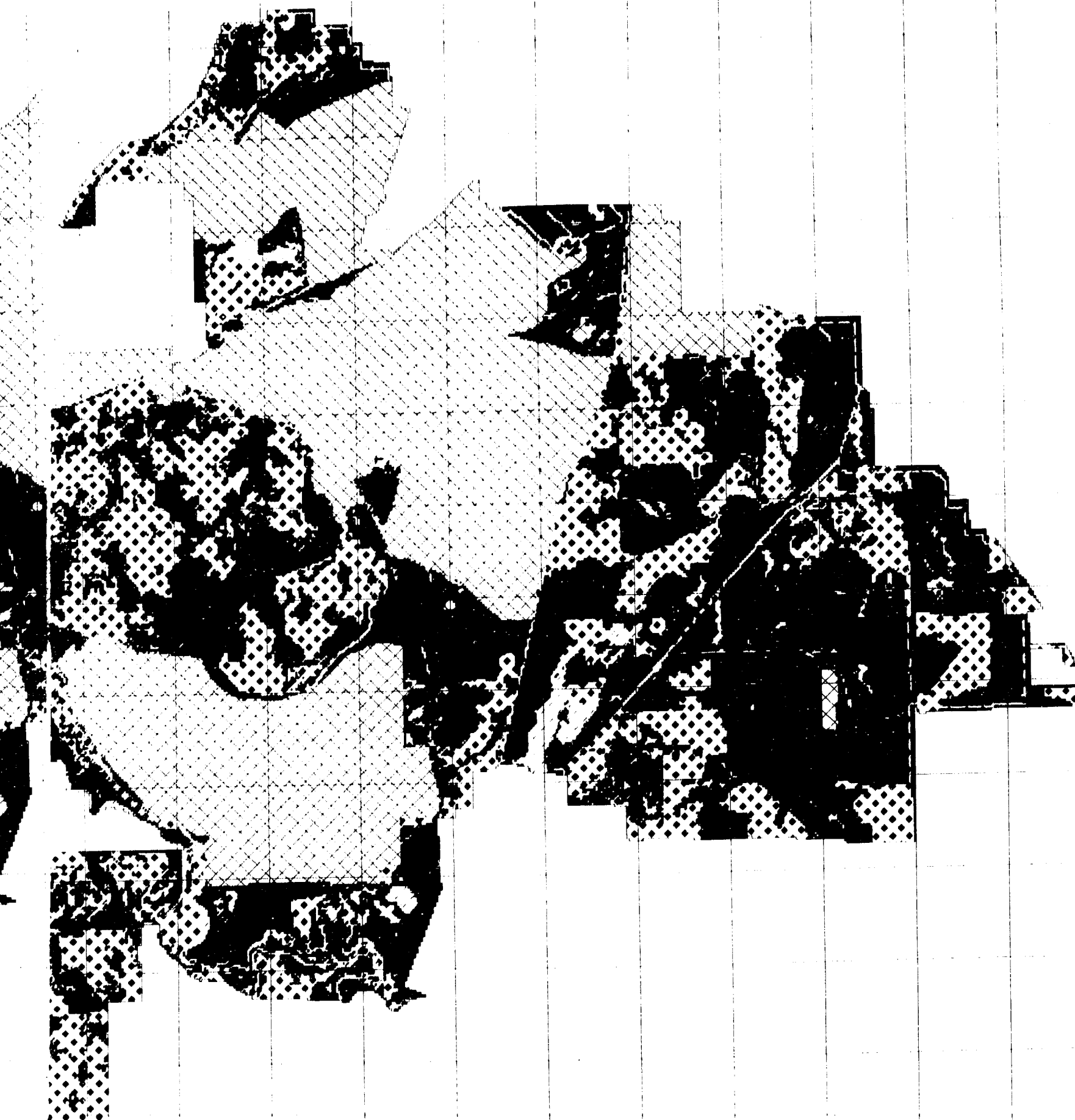
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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

1000 PASSES

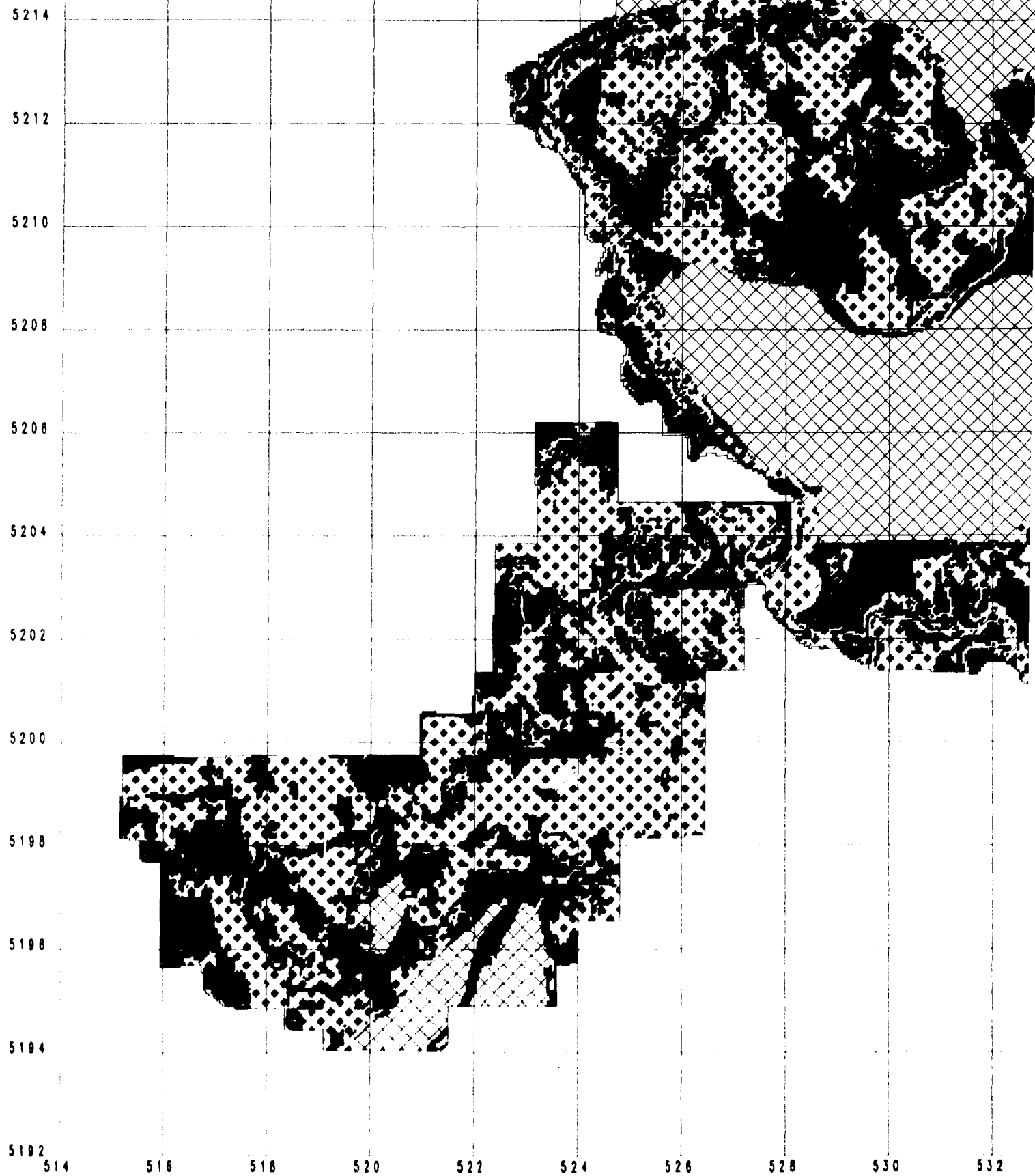
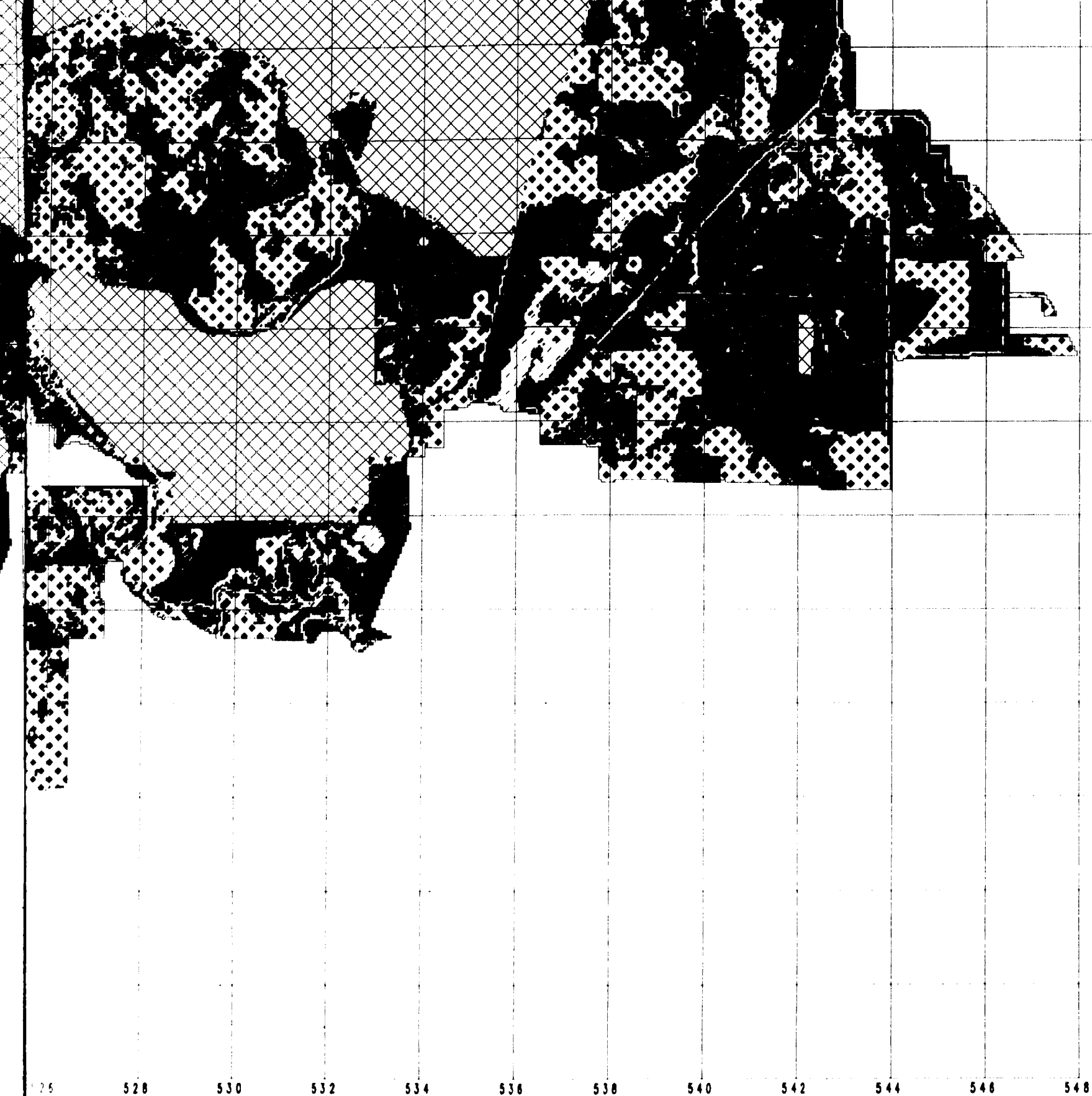
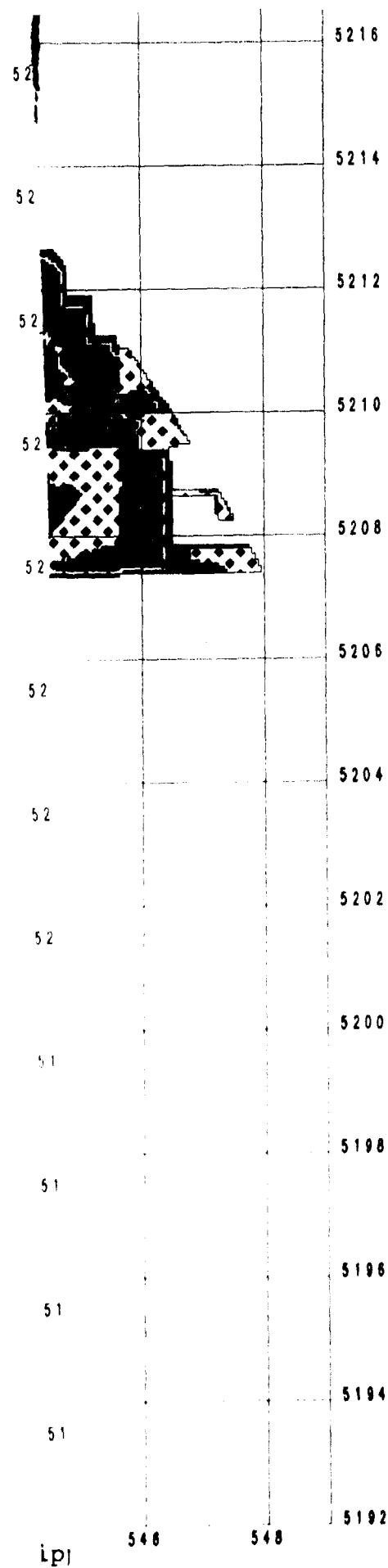


Plate 32. One thousand pass soil dist



One thousand pass soil disturbance level map for the 5-5-0 force structure in the wet
an



MINIMUM
(0-.5 in)



SLIGHT
(>.5-2 in)



MODERATE
(>2-5 in)



SEVERE
(>12 in)



URBAN/
OFF LIMITS

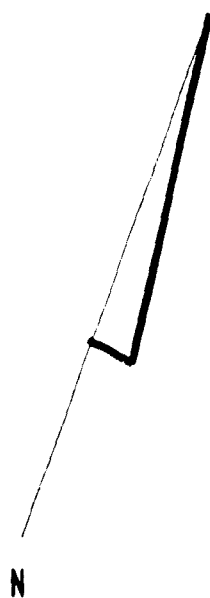


WATER

FT LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

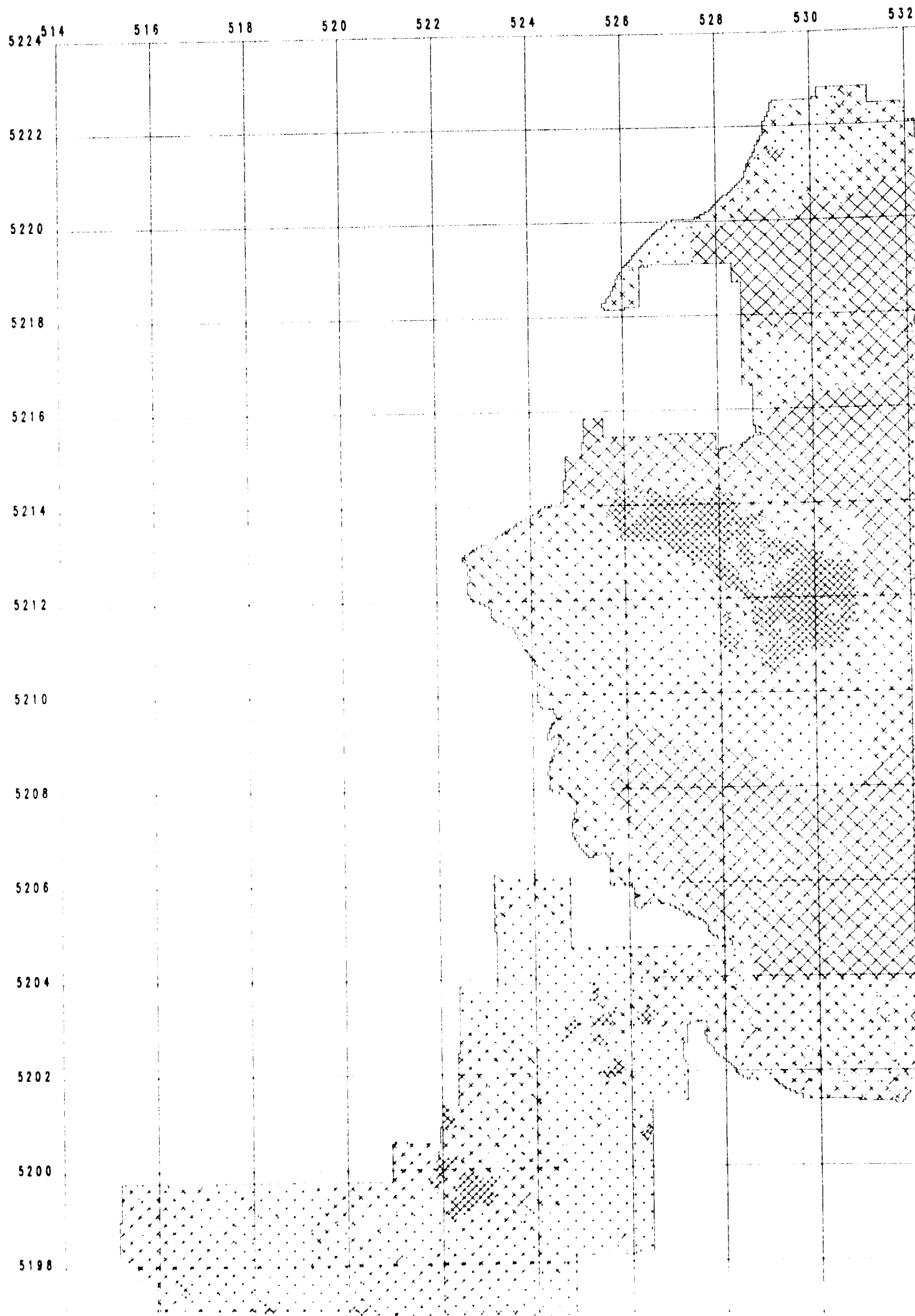
WET SEASON
SLIPPERY CONDITION
1000 PASSES



METERS



e in the wet slippery surface condition



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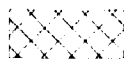
5200

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U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



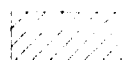
URBAN/
OFF LIMITS



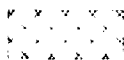
> 5 - 10



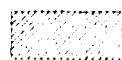
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
10 PASSES

METERS

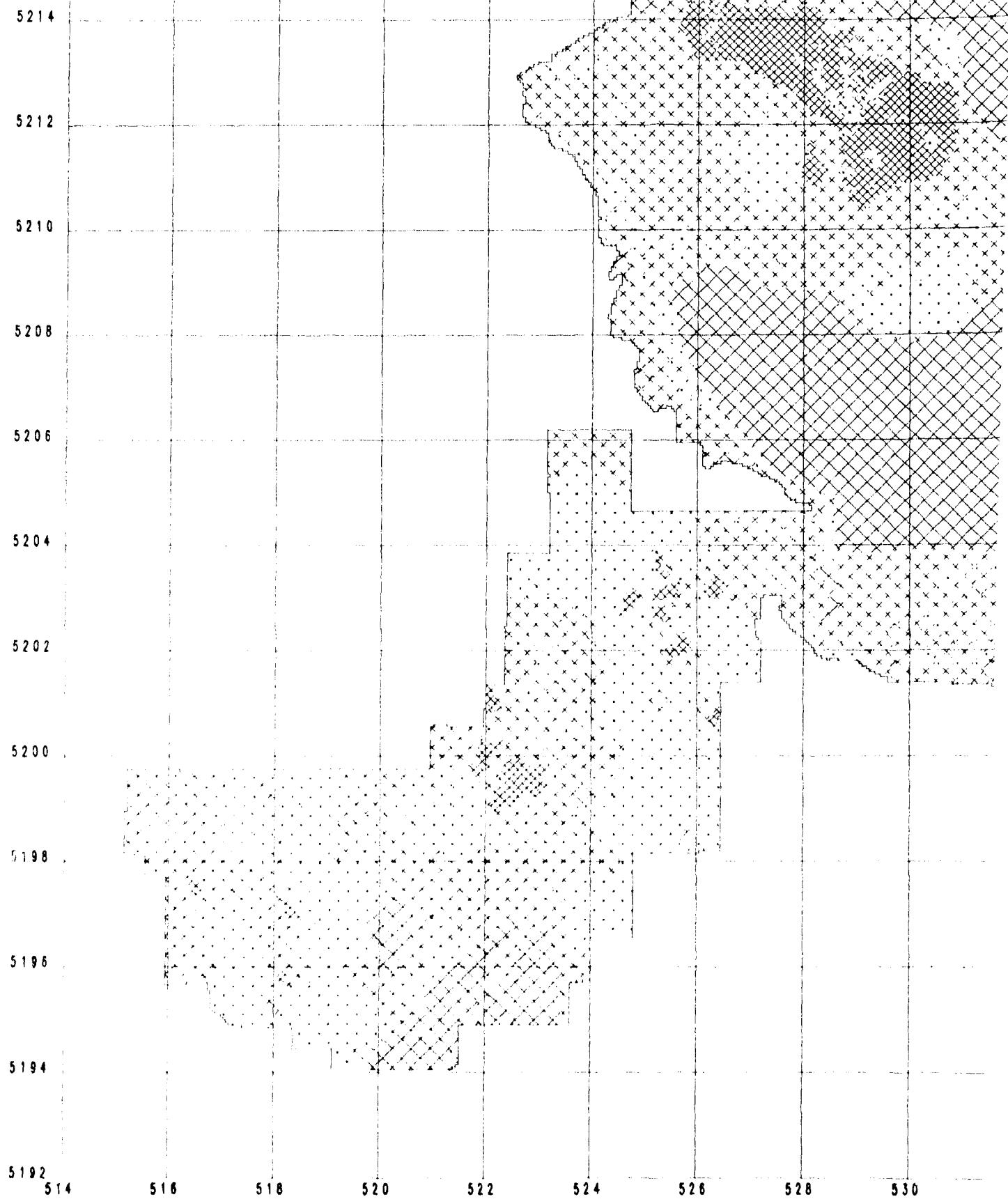
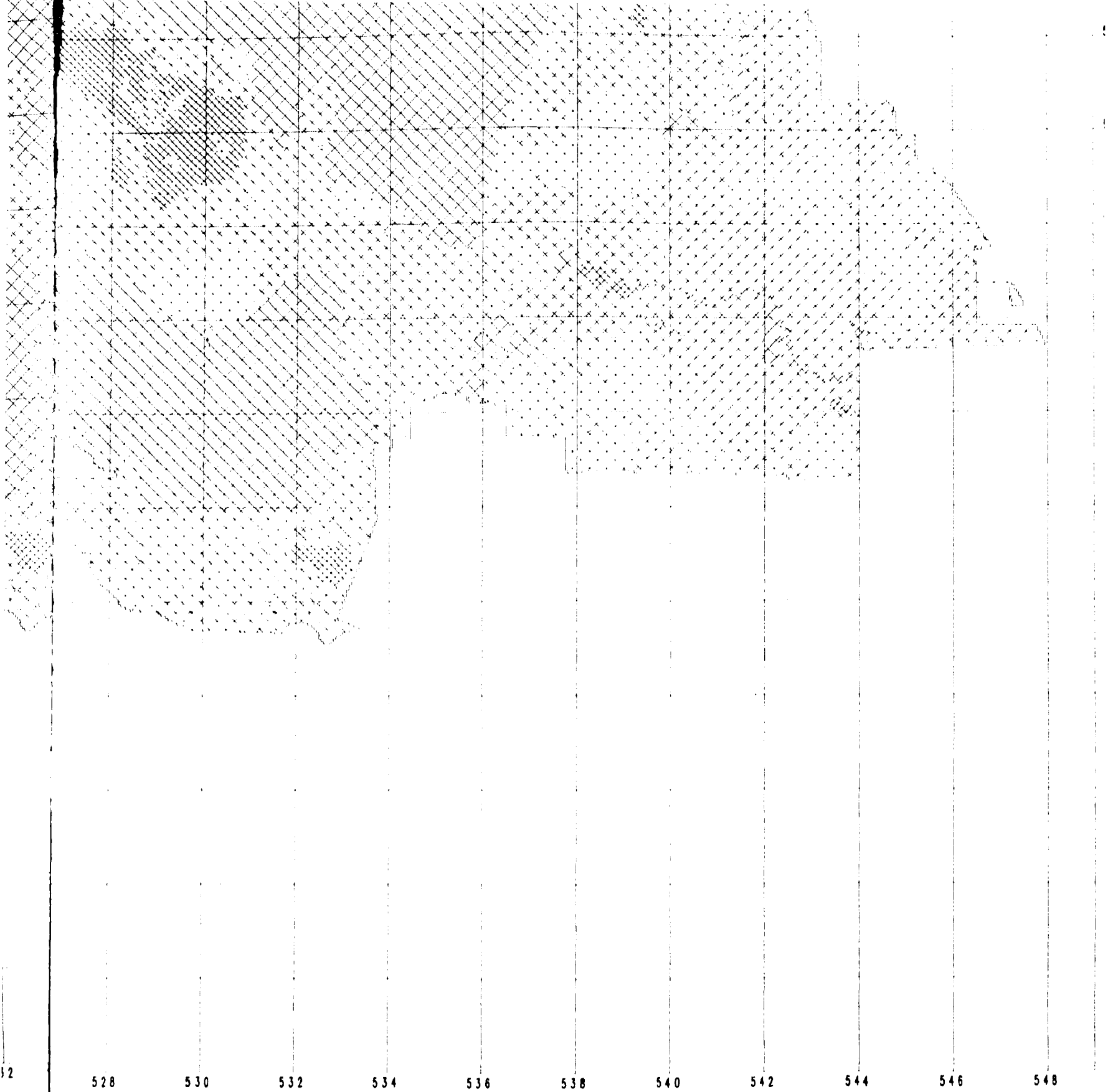
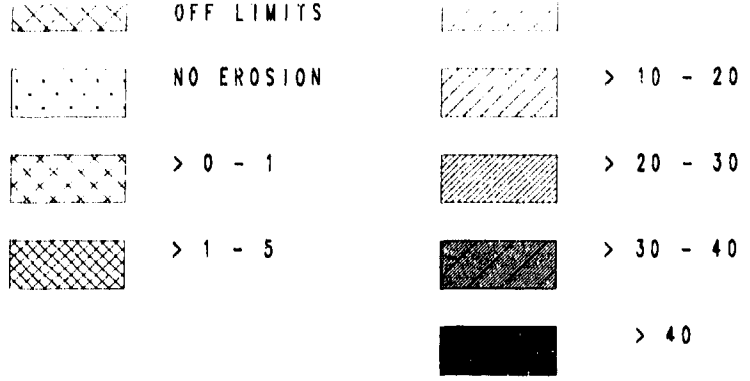
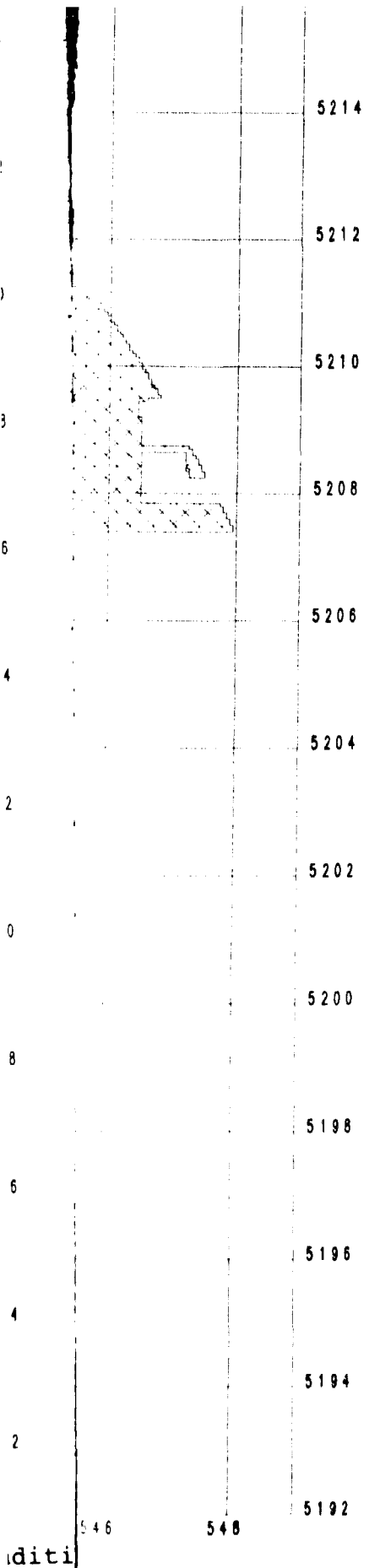


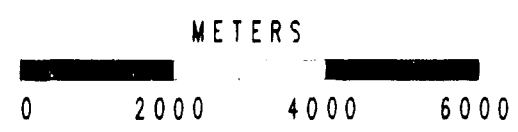
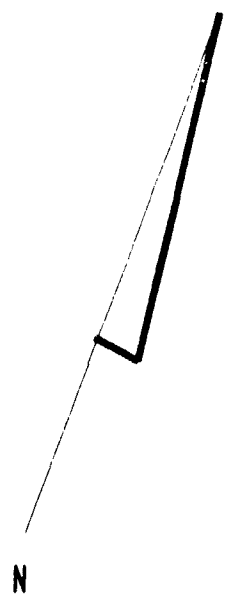
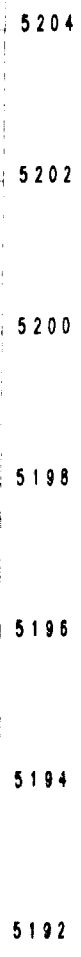
Plate 33. Rate of soil erosion f



3-3 of soil erosion for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal surface

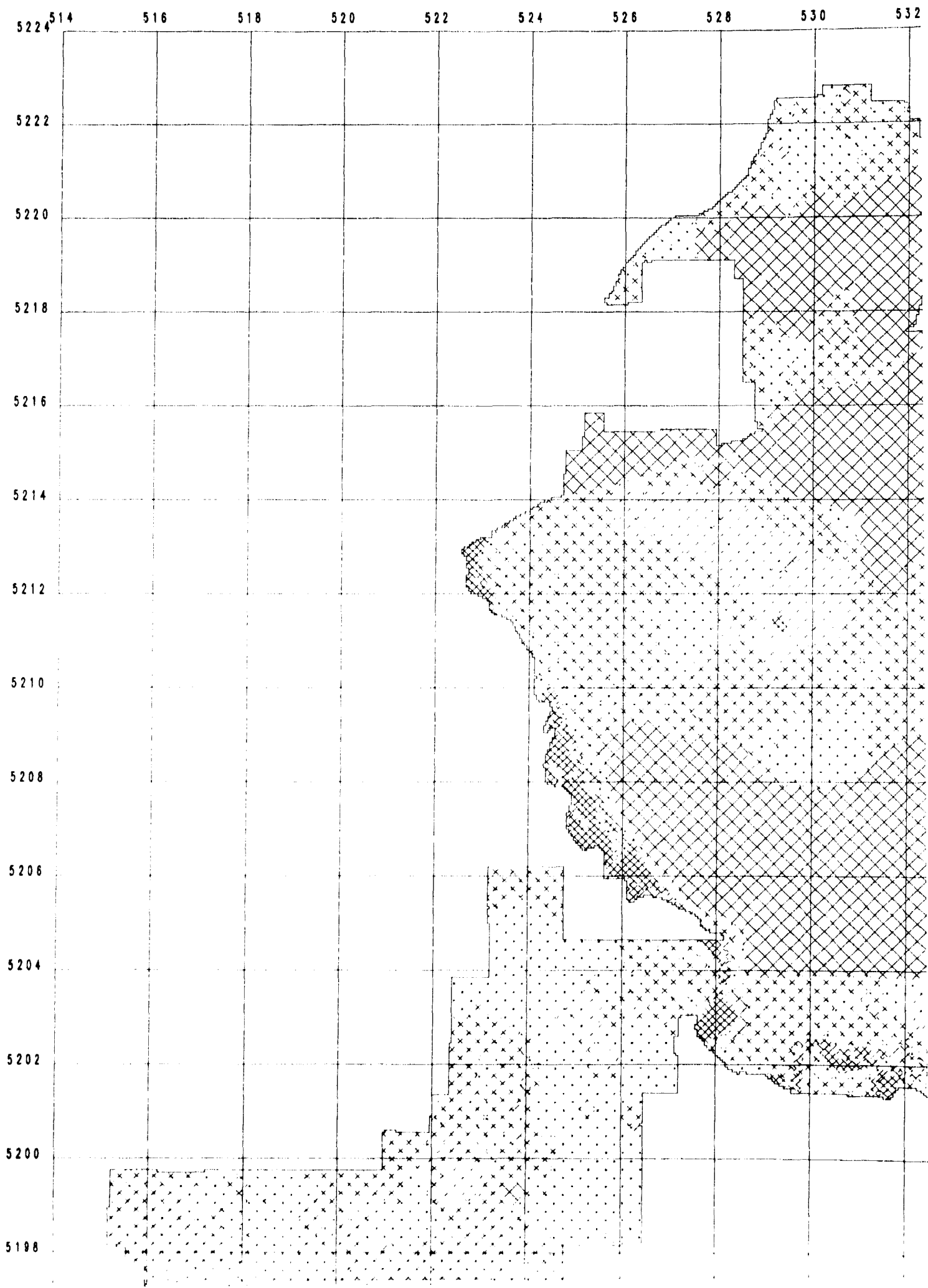


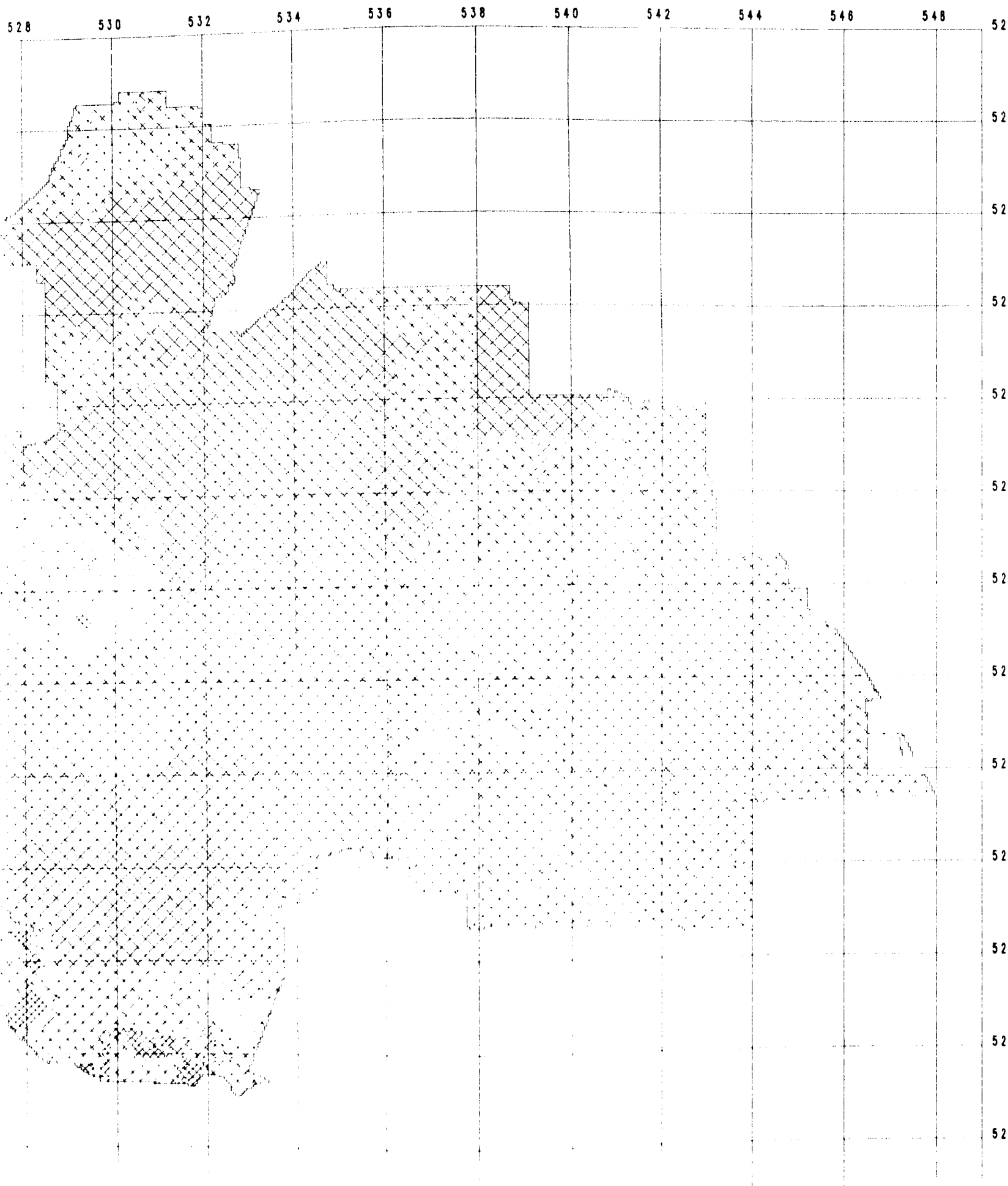
FT. LEWIS, WASHINGTON
 3-3-5 FORCE STRUCTURE
 DRY SEASON
 NORMAL CONDITION
 10 PASSES



aditi

rmal surface condition for ten passes





548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

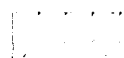


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Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



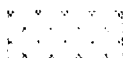
> 5 - 10



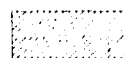
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

50 PASSES

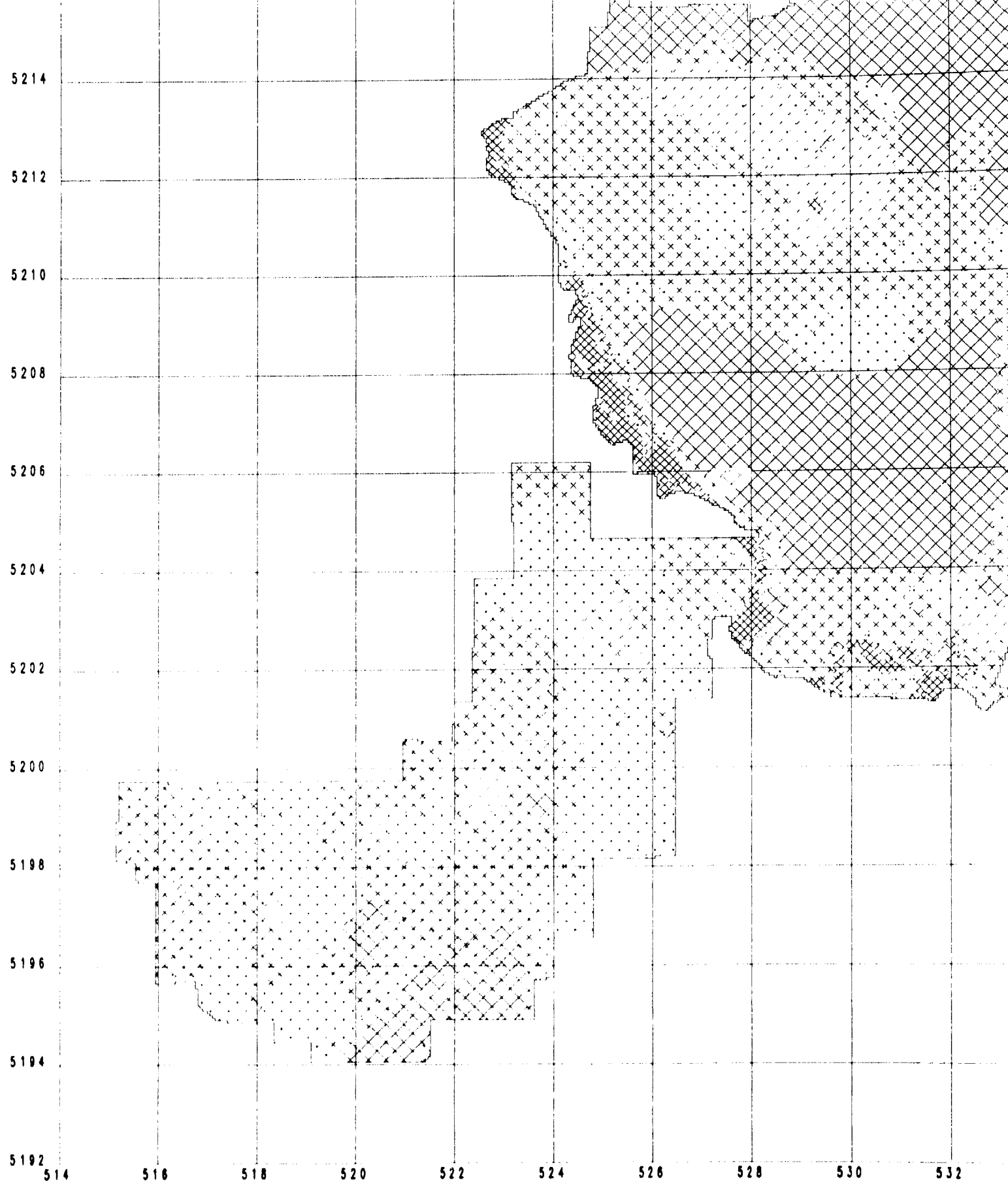
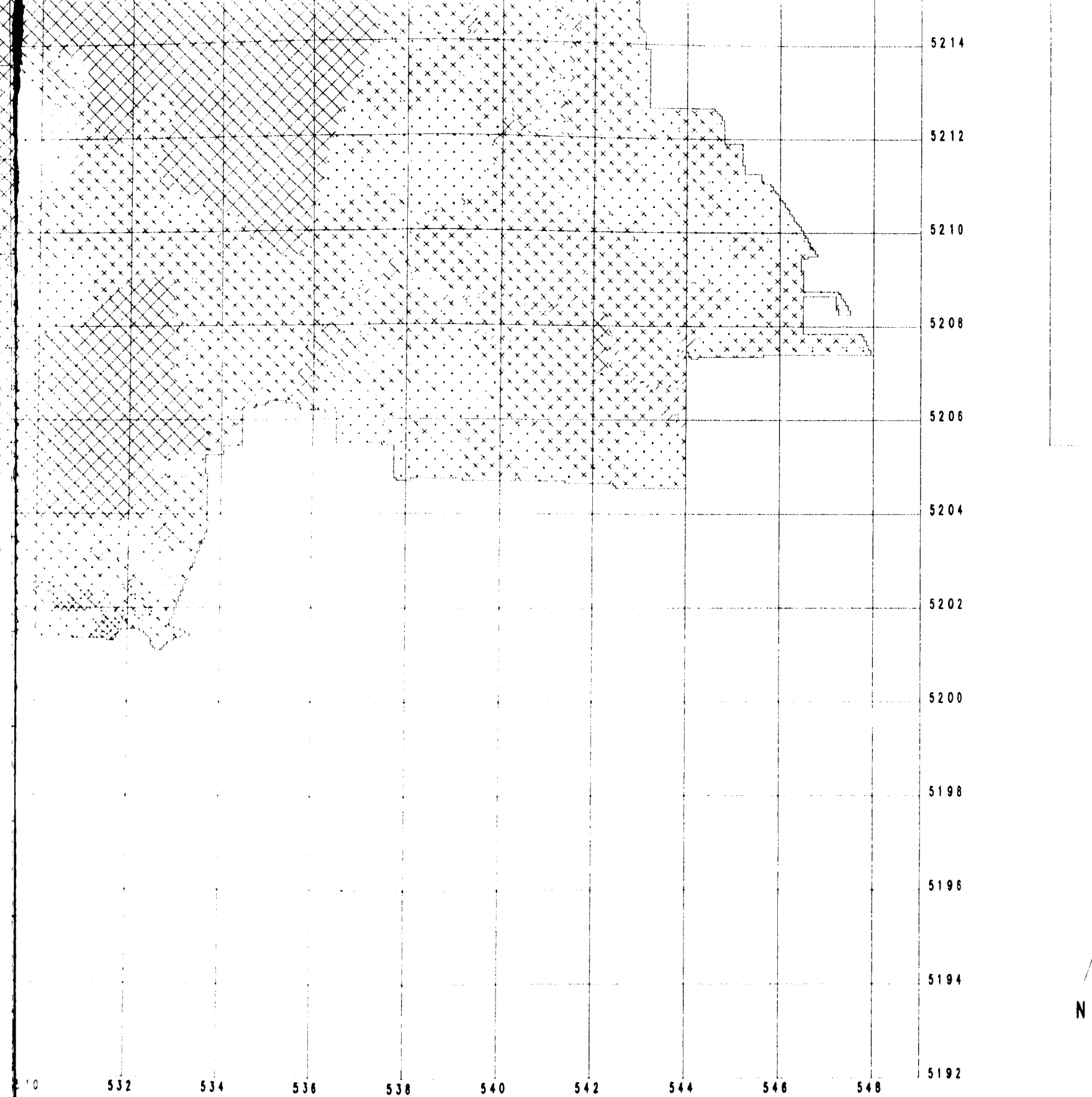
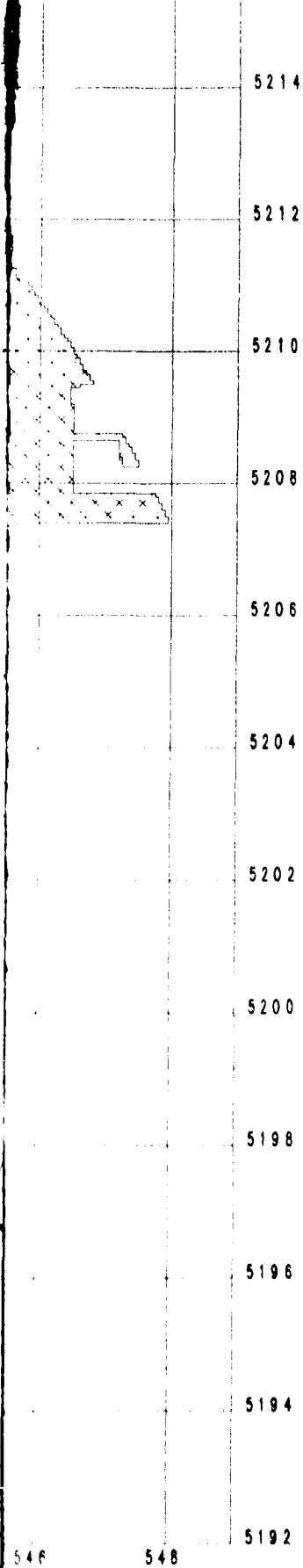


Plate 34. Rate of soil erosion for 3-3-5 and



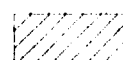
for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal surface condition for fifty



NO EROSION

> 0 - 1

> 1 - 5



> 10 - 20



> 20 - 30



> 30 - 40



> 40

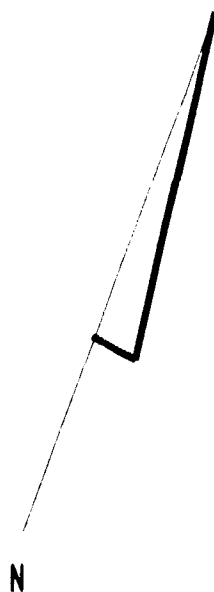
FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

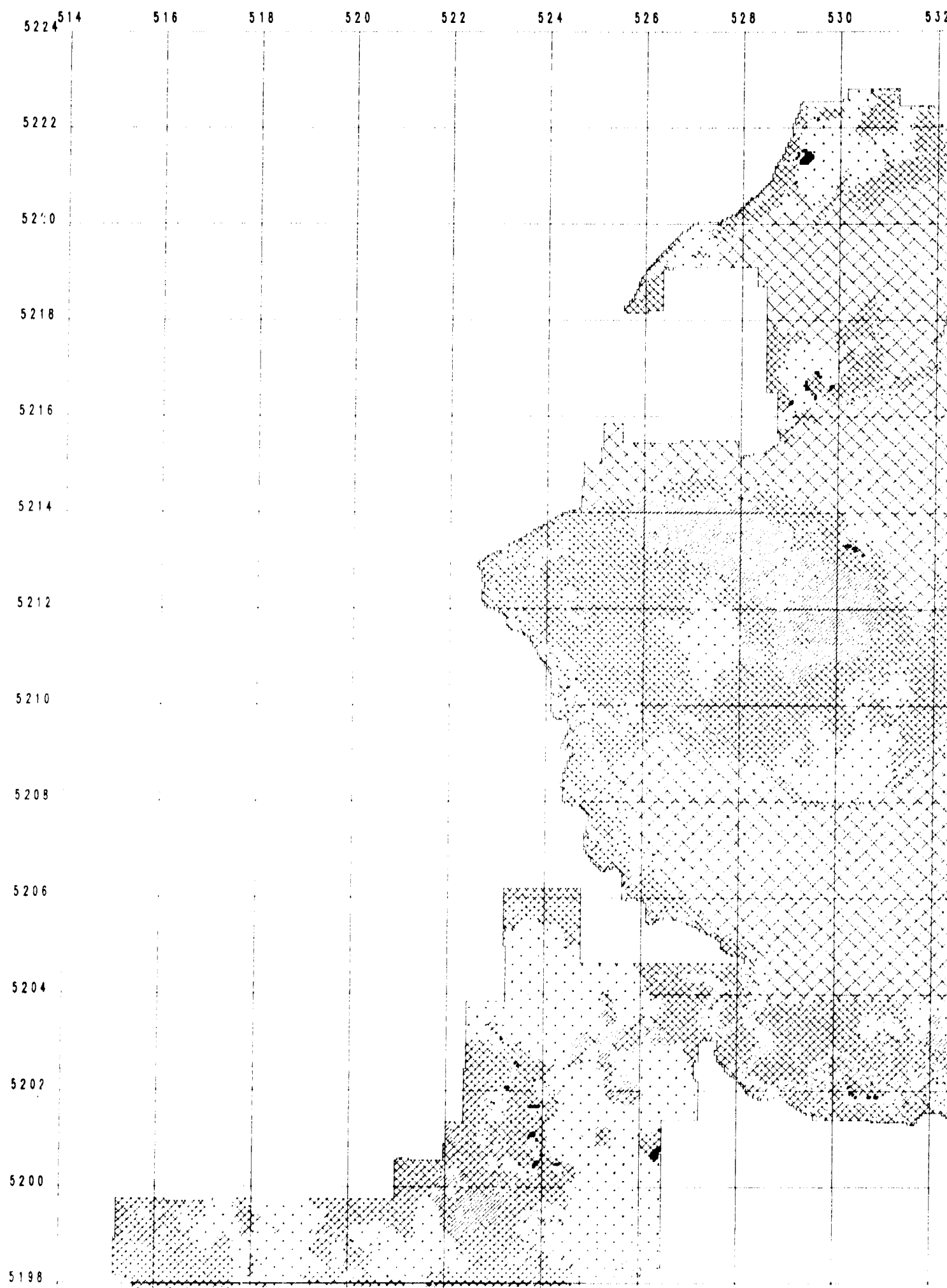
50 PASSES



METERS



surface condition for fifty passes



524

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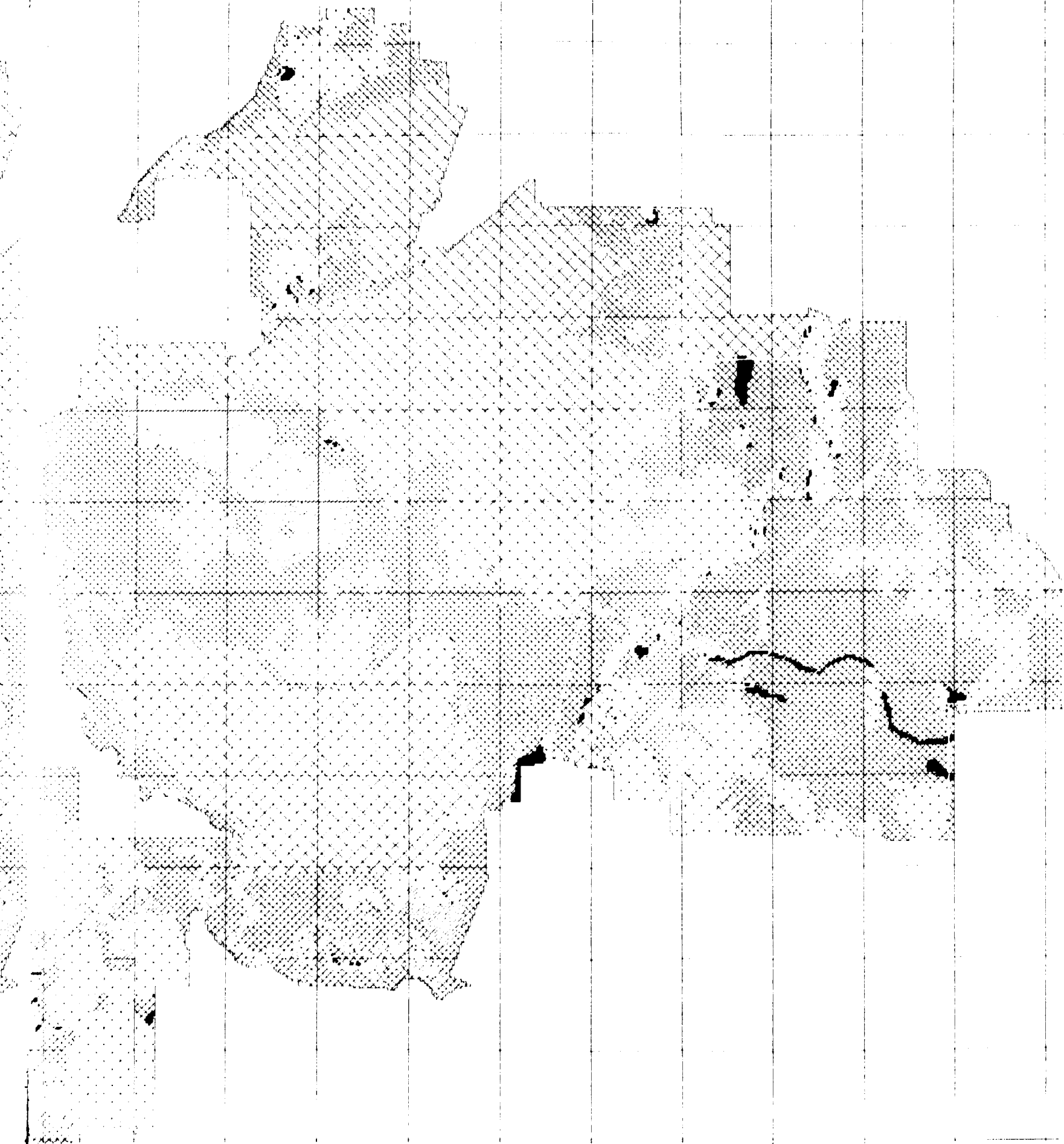
538

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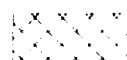
546





U. S. Army Corps of Engineers
Waterways
Experiment
Station

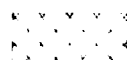
RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



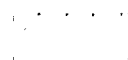
NO EROSION



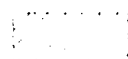
> 0 - 1



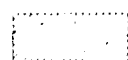
> 1 - 5



> 5 - 10



> 10 - 20



> 20 - 30



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

1000 PASSES

5200

5202

5204

5206

5208

5210

5212

5214

5216

5218

5220

5222

5224

546

548

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5214
5212
5210
5208
5206
5204
5202
5200
5198
5196
5194
5192
514

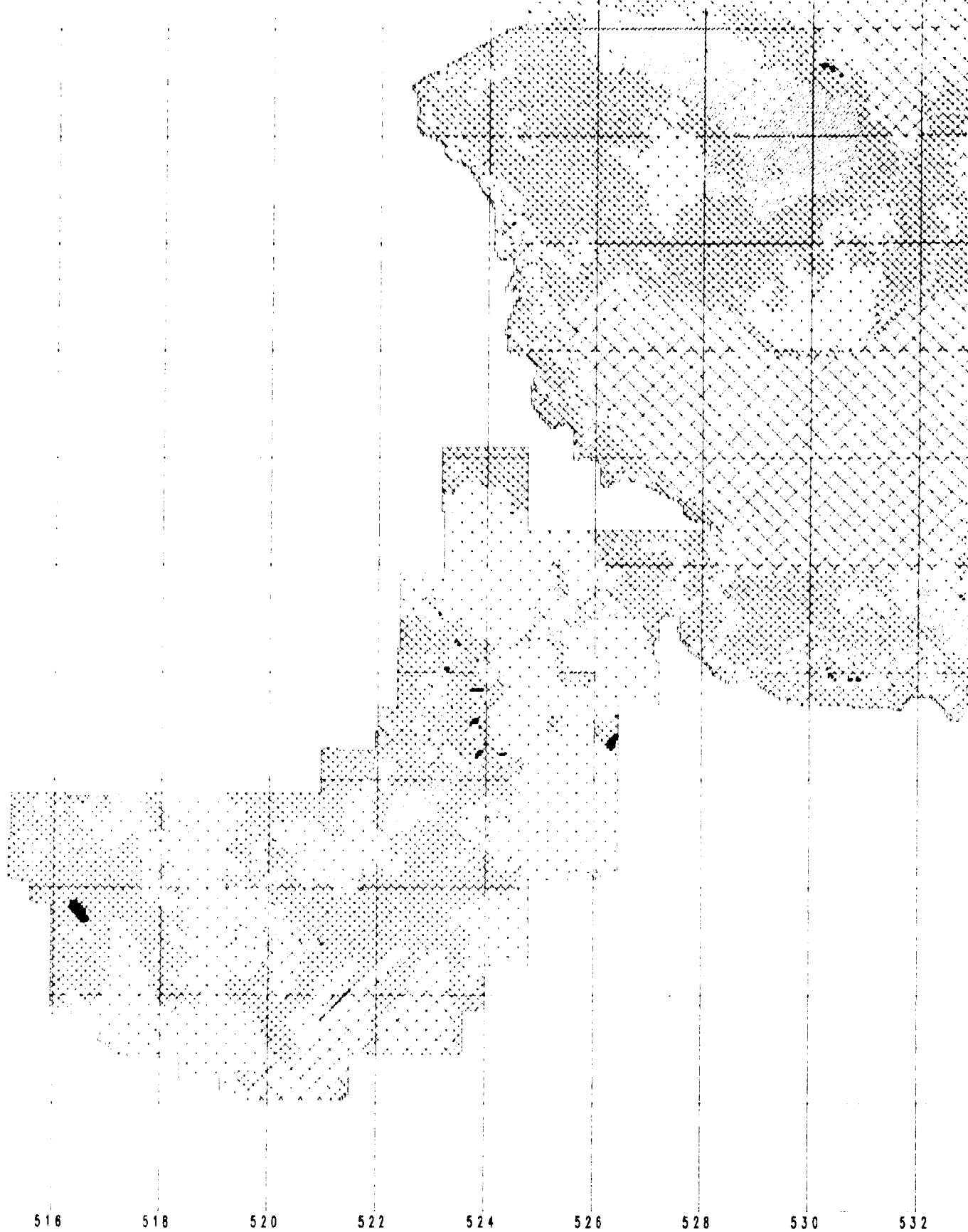
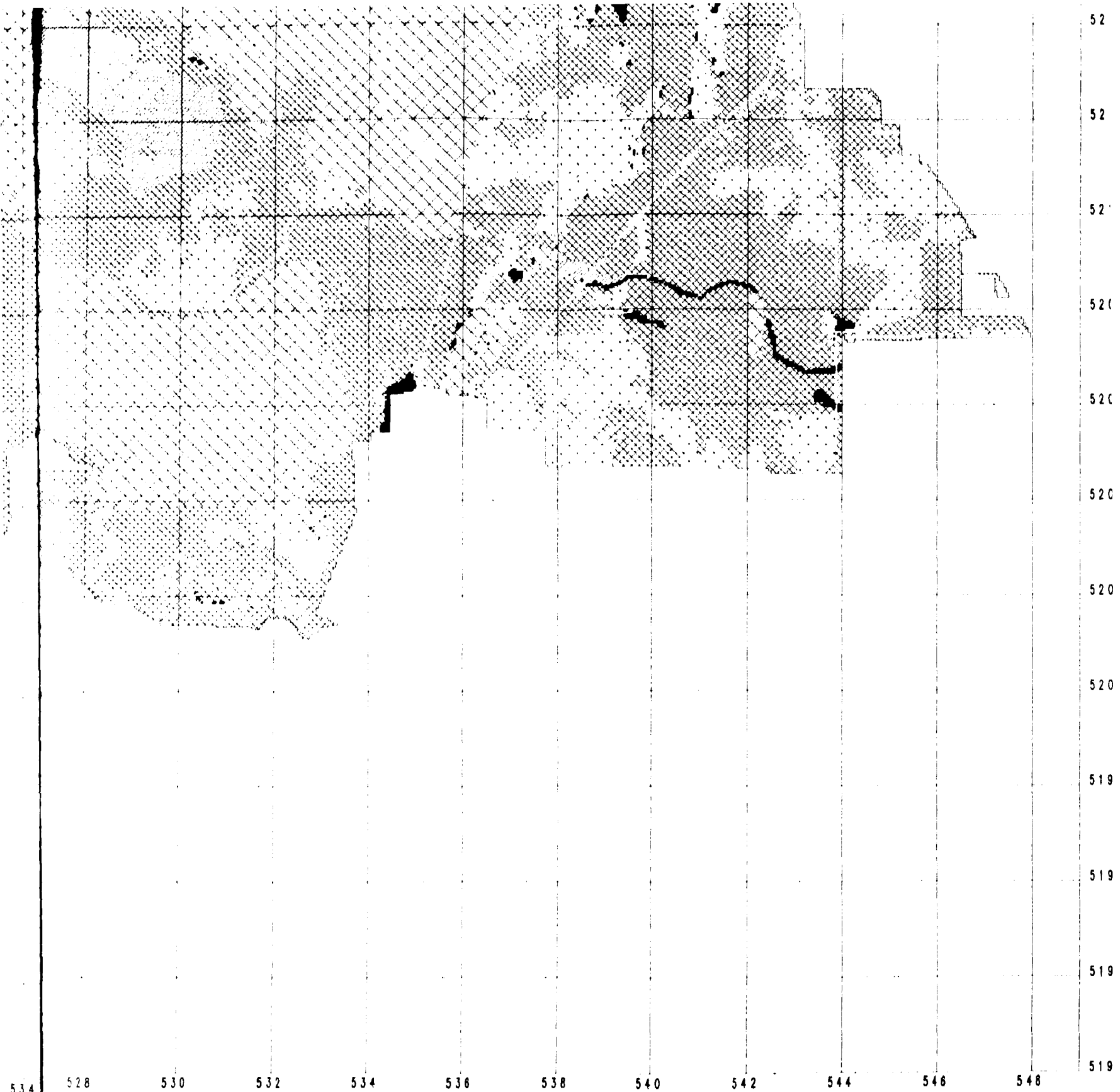
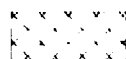


Plate 35. Rate of soil erosion for 3-3-5

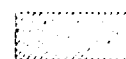


id 4 soil erosion for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal surface condi

5214



> 0 - 1



> 20 - 30

5212



> 1 - 5



> 30 - 40

5210



> 40

5208

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

1000 PASSES

5206

5204

5202

5200

5198

5196

5194

5192

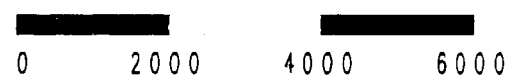
544

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N

METERS



ion the dry normal surface condition for one thousand passes

5224 514

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5222

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5212

5210

5208

5206

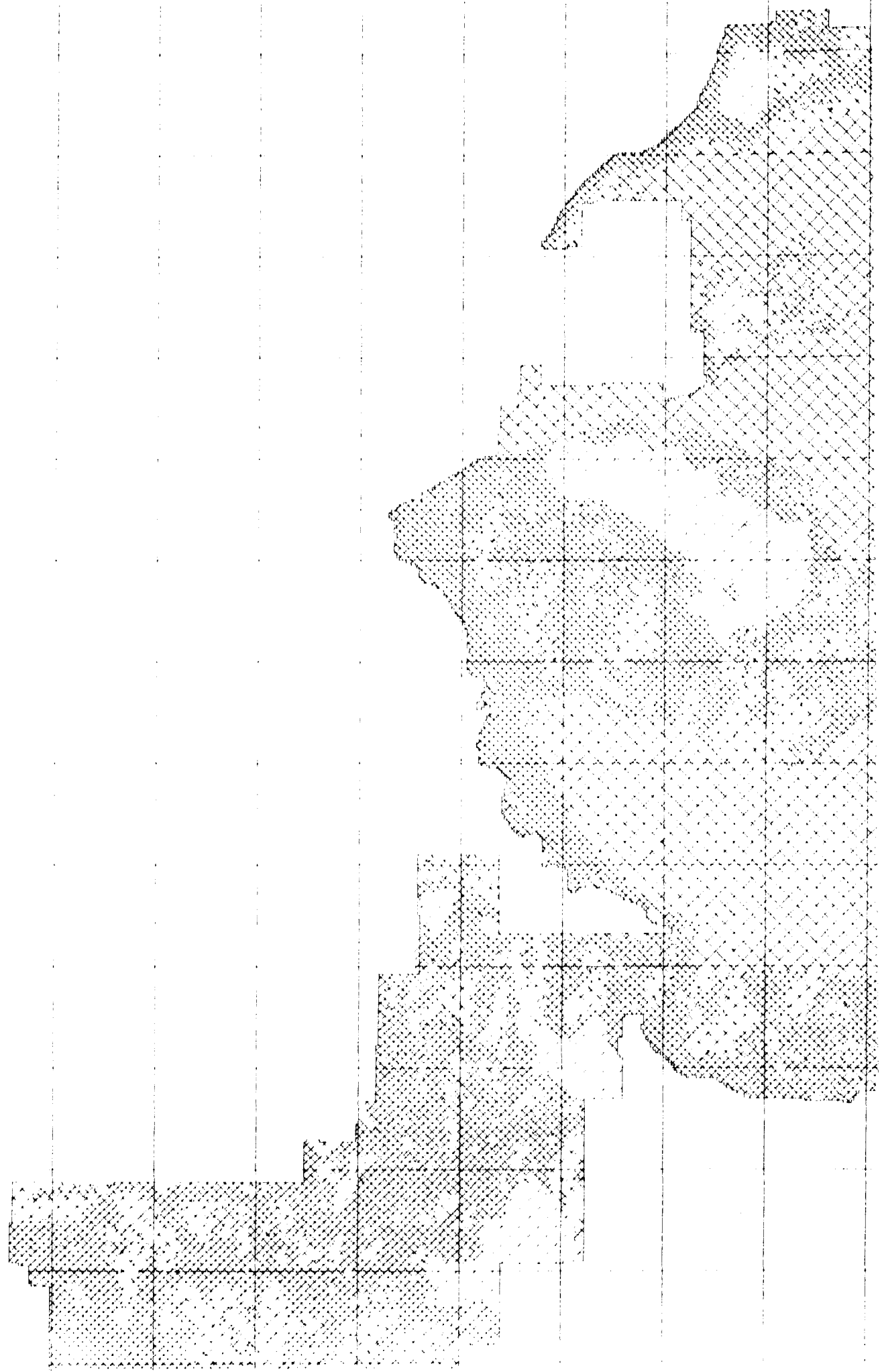
5204

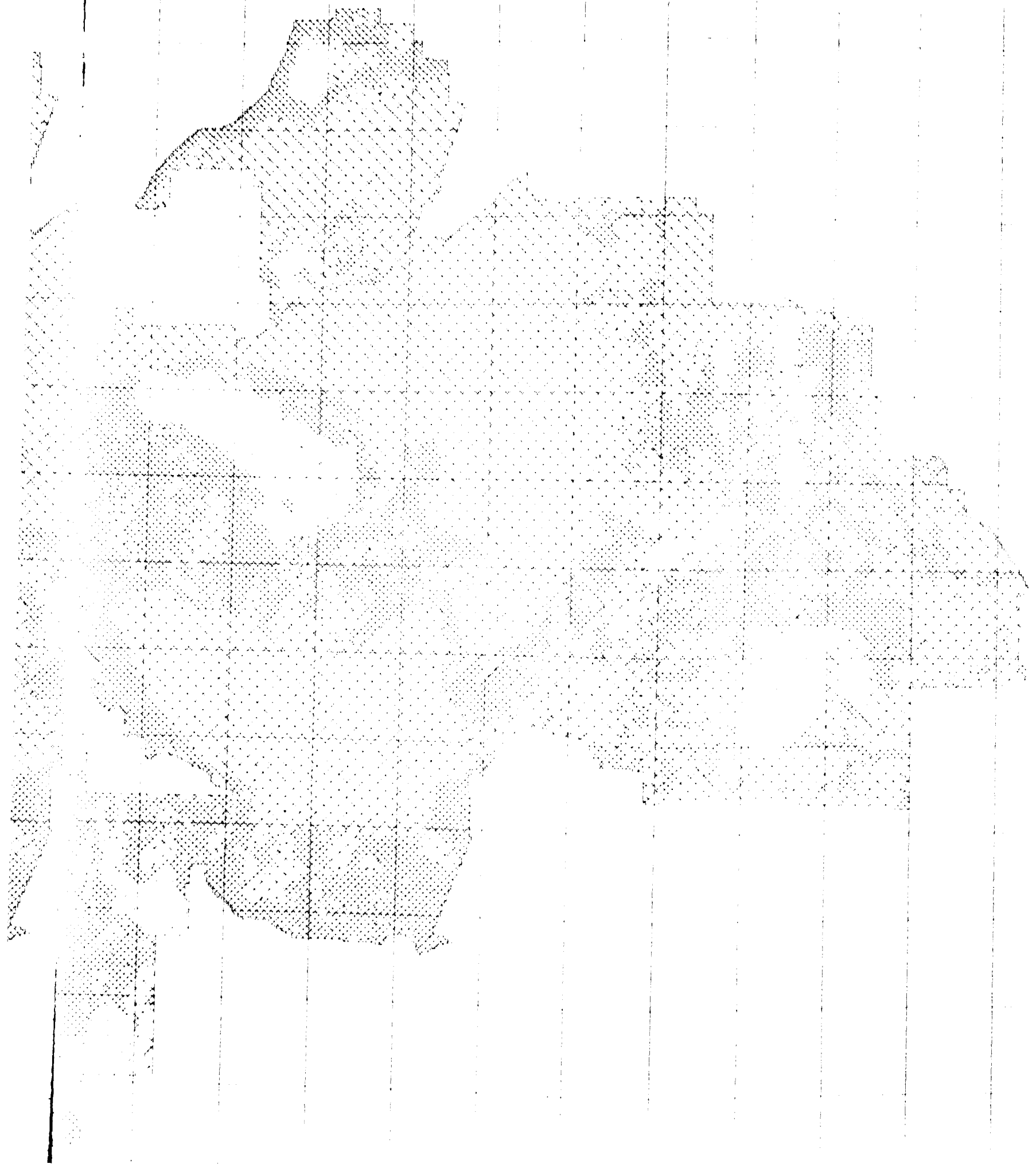
5202

5200

5198

5196







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Waterways
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RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



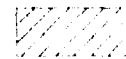
URBAN/
OFF LIMITS



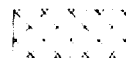
> 5 - 10



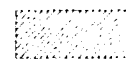
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40

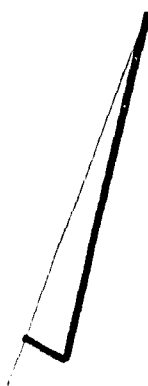


> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE
WET SEASON

SLIPPERY CONDITION
10 PASSES



METERS



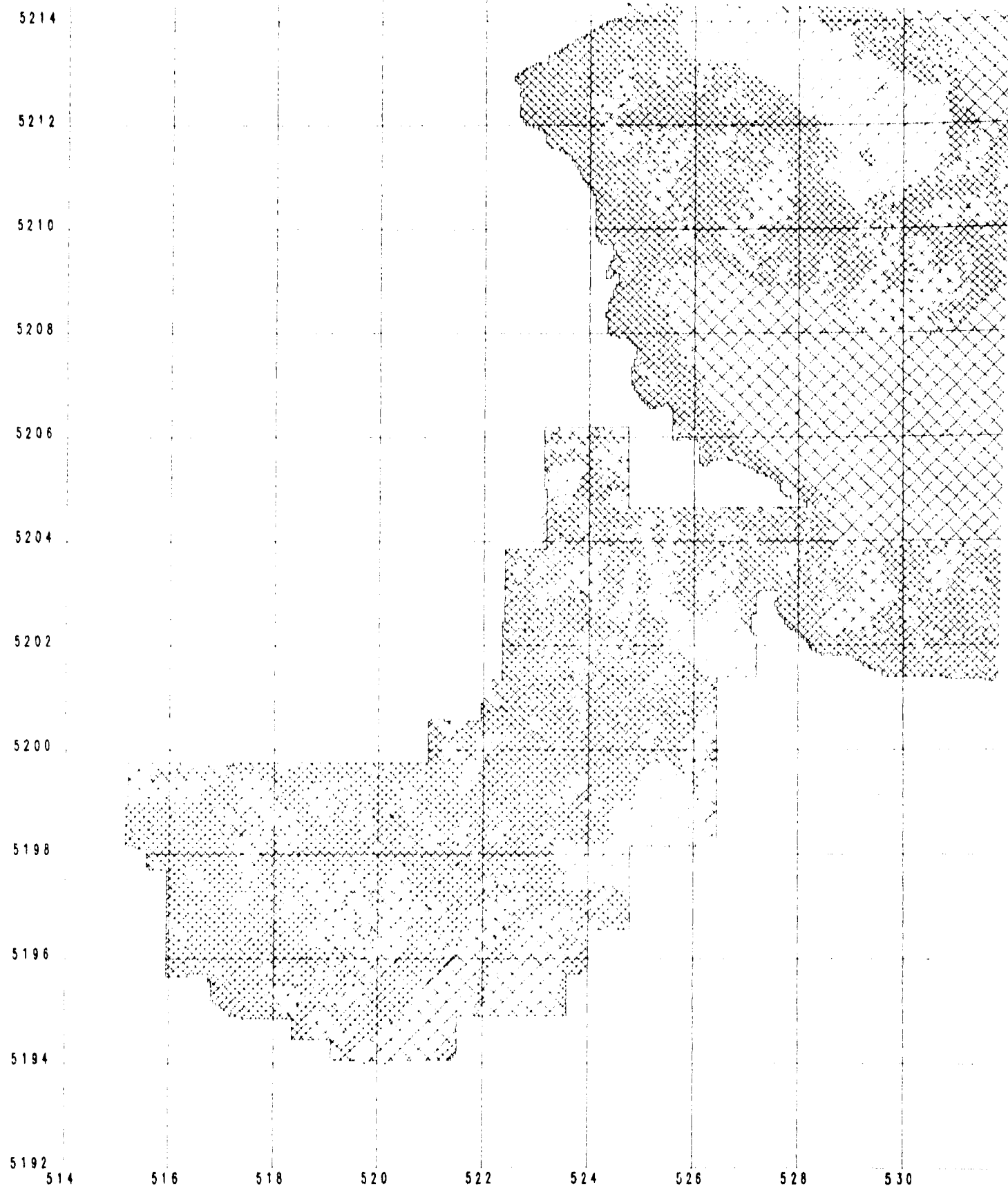
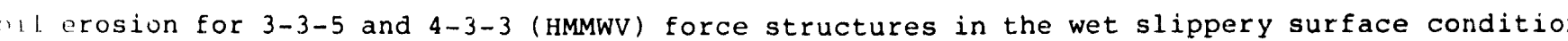
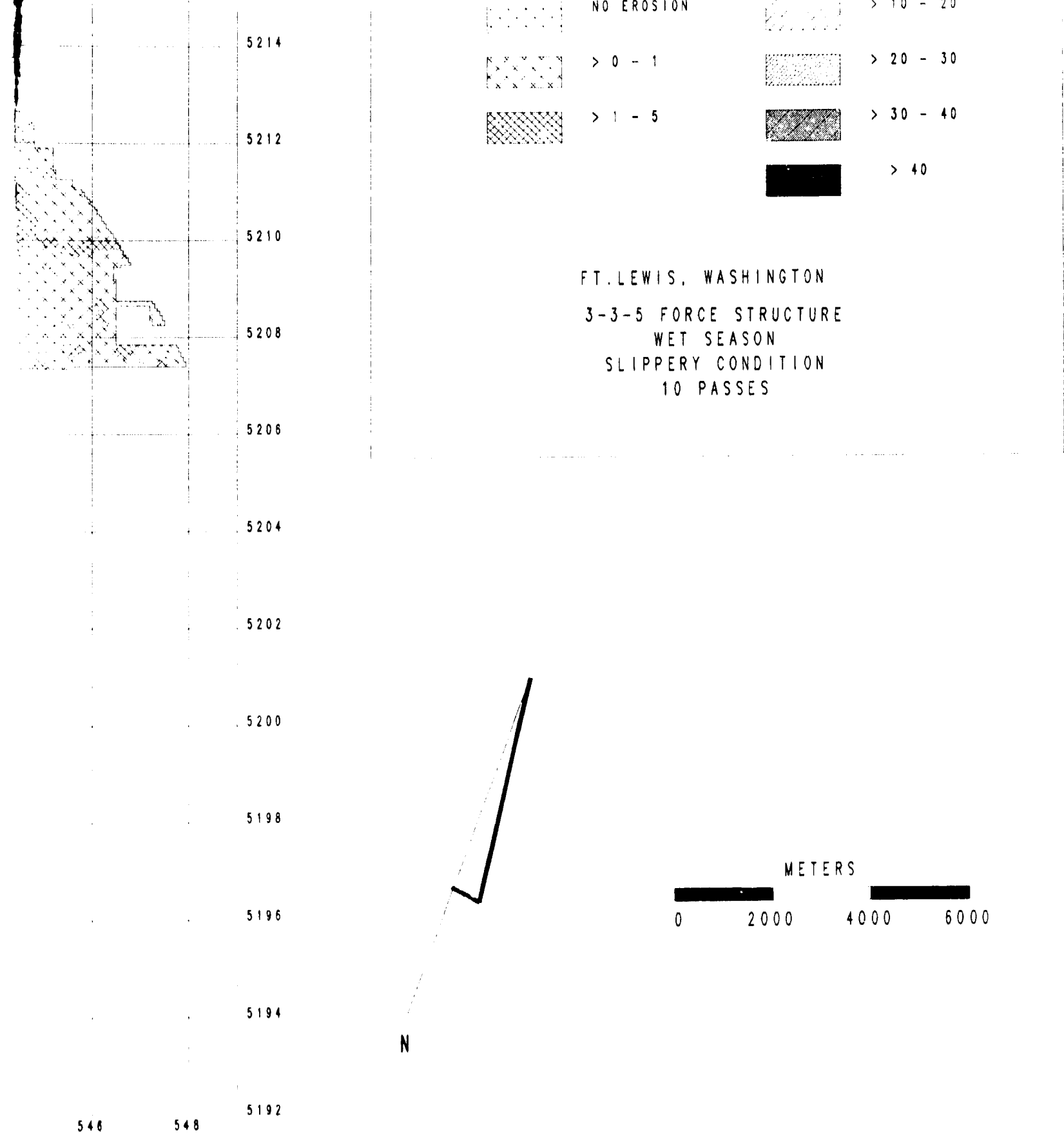


Plate 36. Rate of soil erosion for 3-3-





slippery surface condition for ten passes

5224⁵¹⁴ 516 518 520 522 524 526 528 530 532

5222

5220

5218

5216

5214

5212

5210

5208

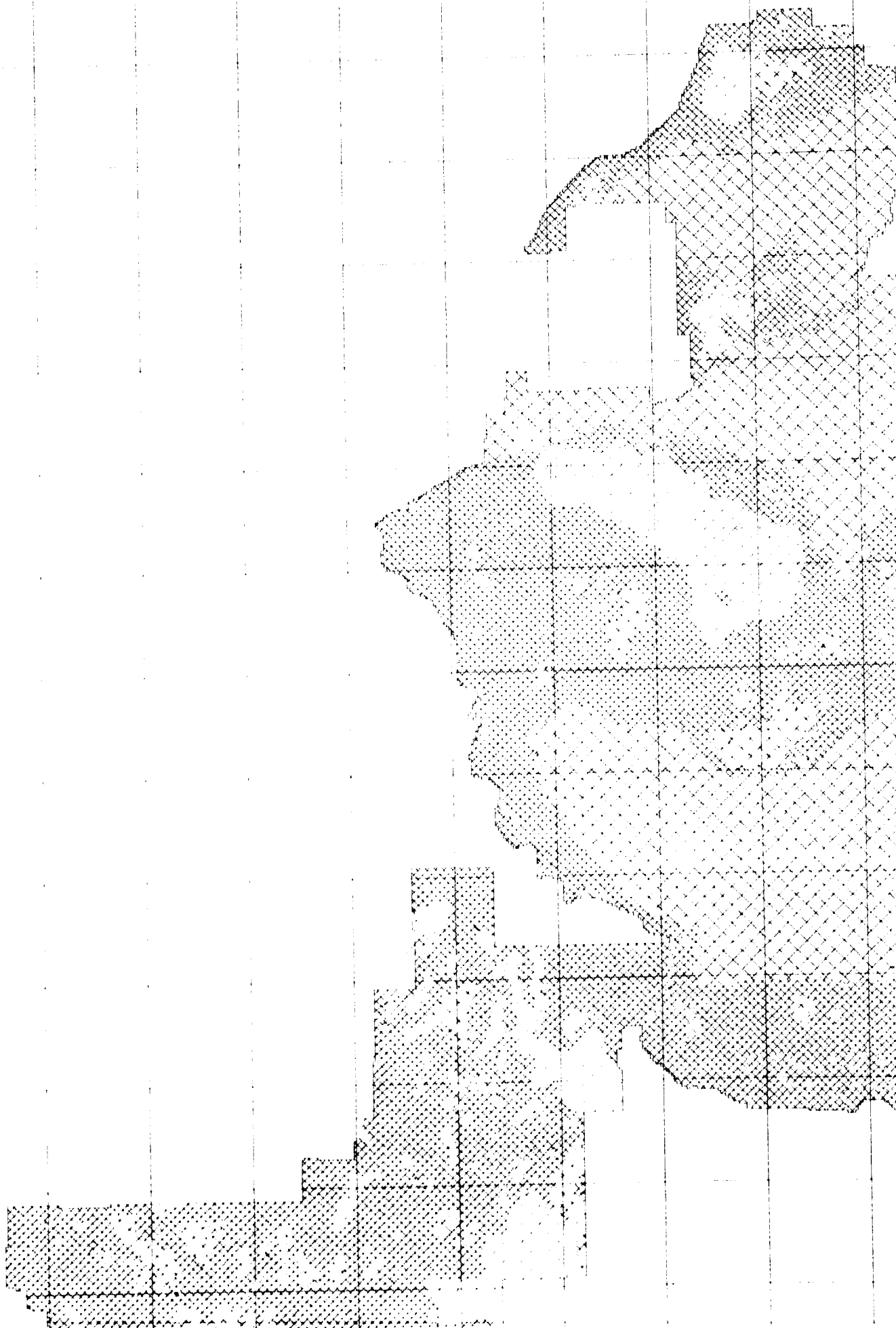
5206

5204

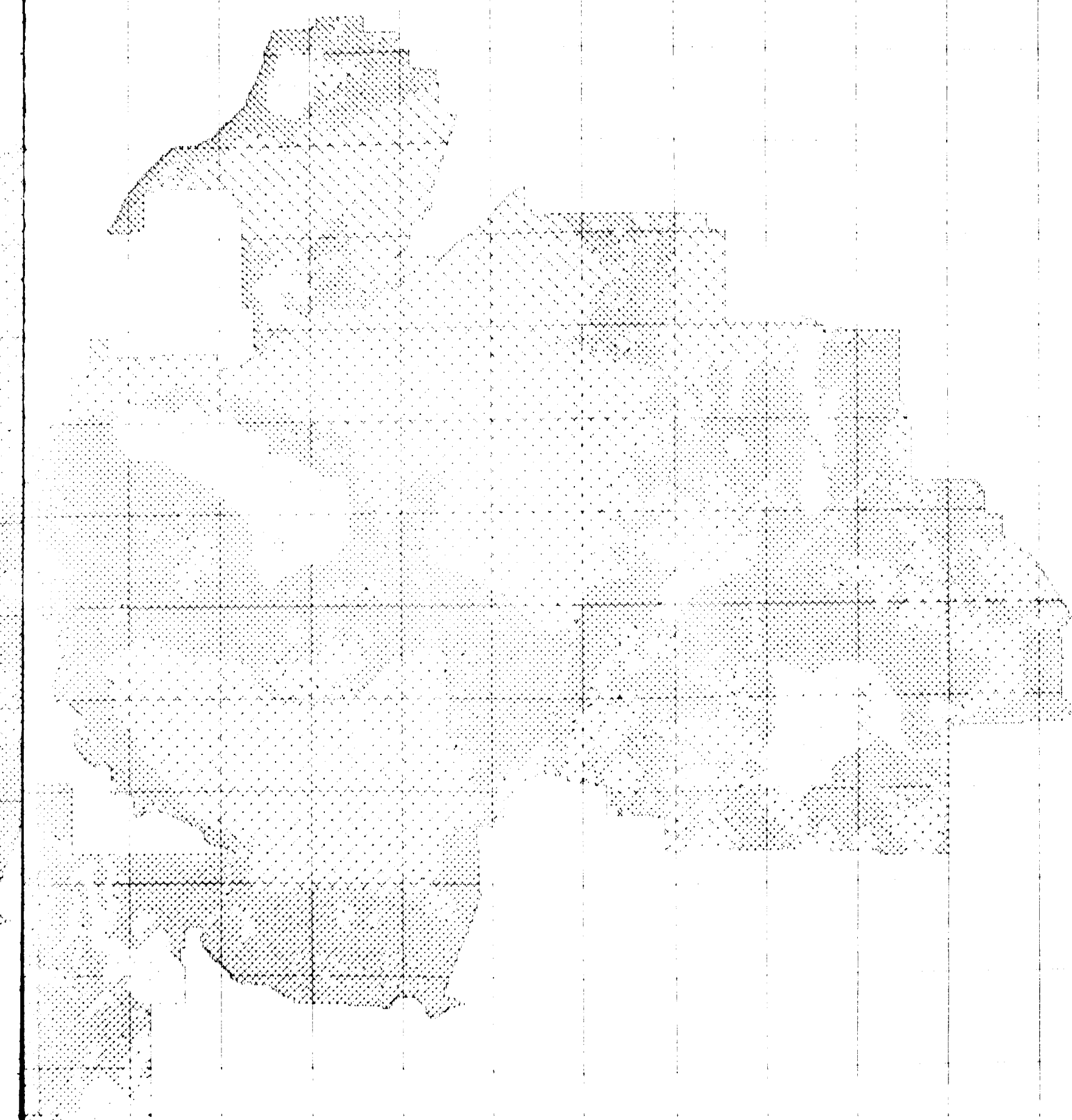
5202

5200

5198



524 526 528 530 532 534 536 538 540 542 544 546



5

544

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

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5204

5202

5200

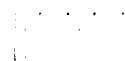


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Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



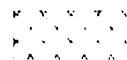
> 5 - 10



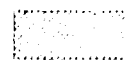
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
50 PASSES

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192
514

516

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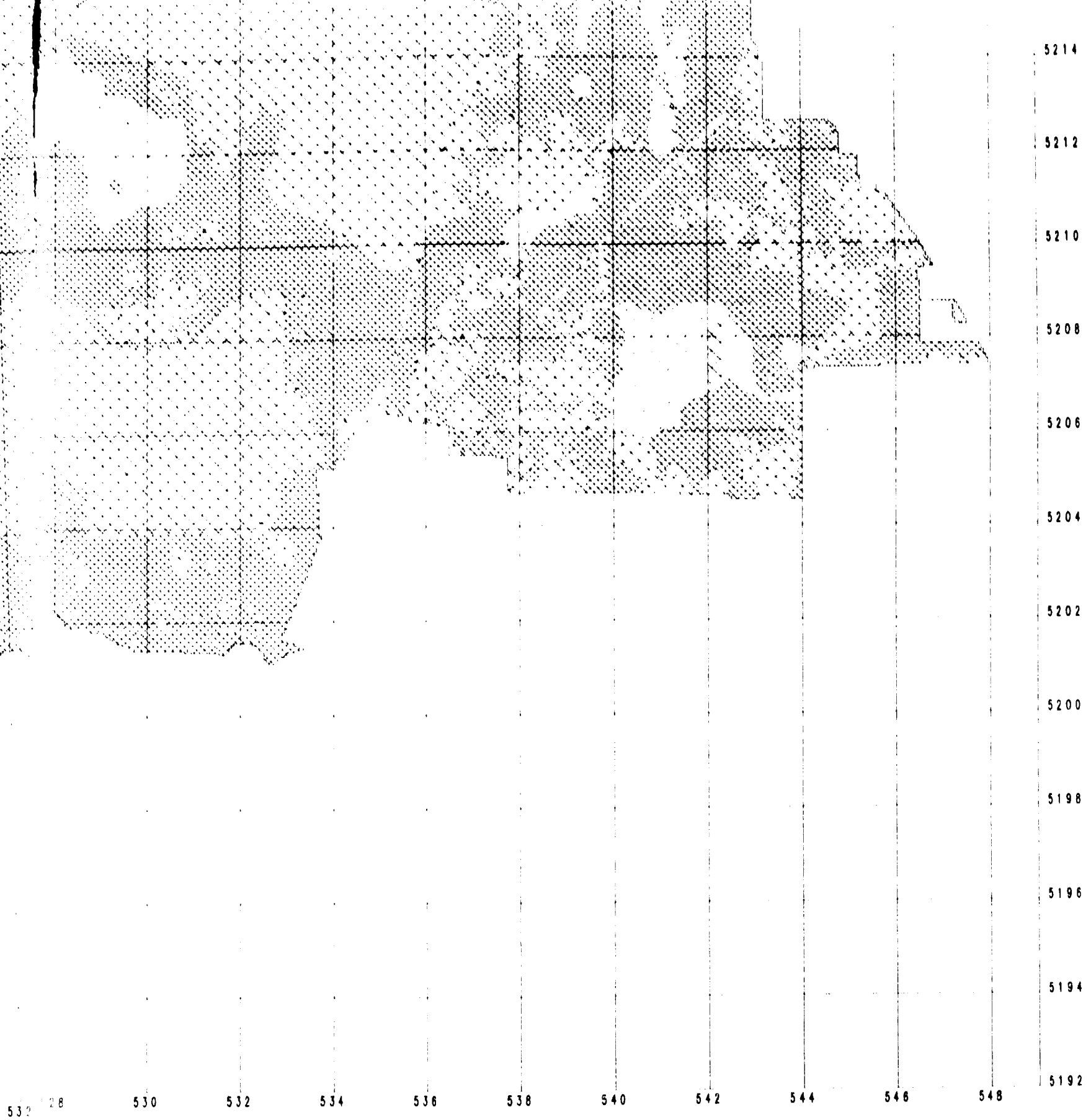
524

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Plate 37. Rate of soil erosion for



3-5 erosion for 3-3-5 and 4-3-3 (HMMWV) force structures in the wet slippery surface condition

5214

5212

5210

5208

5206

5204

5202

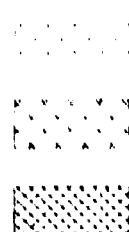
5200

5198

5196

5194

5192



NO EROSION

> 0 - 1

> 1 - 5

> 10 - 20

> 20 - 30

> 30 - 40

> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

50 PASSES

N

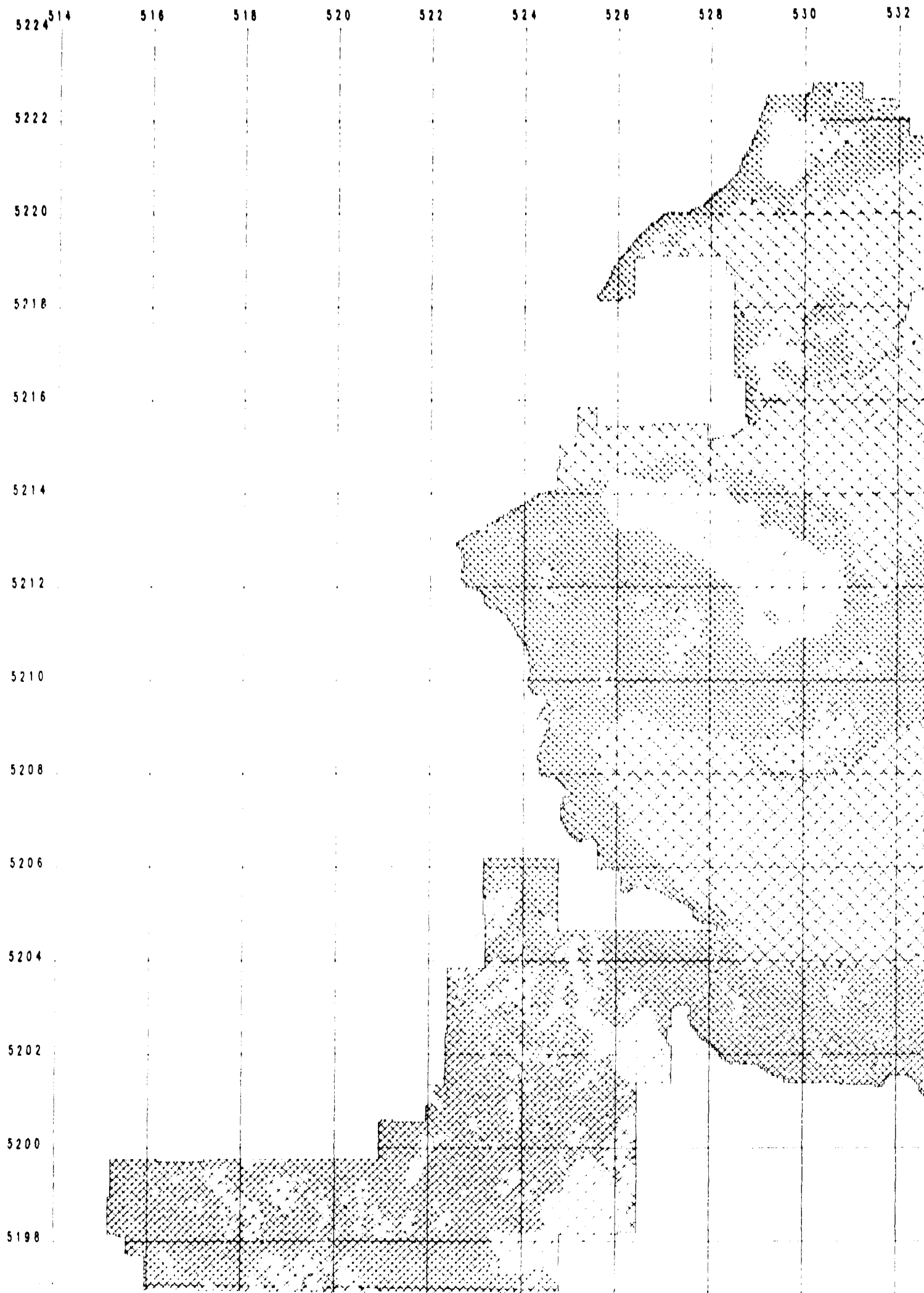
METERS

0 2000 4000 6000

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for
y surface condition for fifty passes



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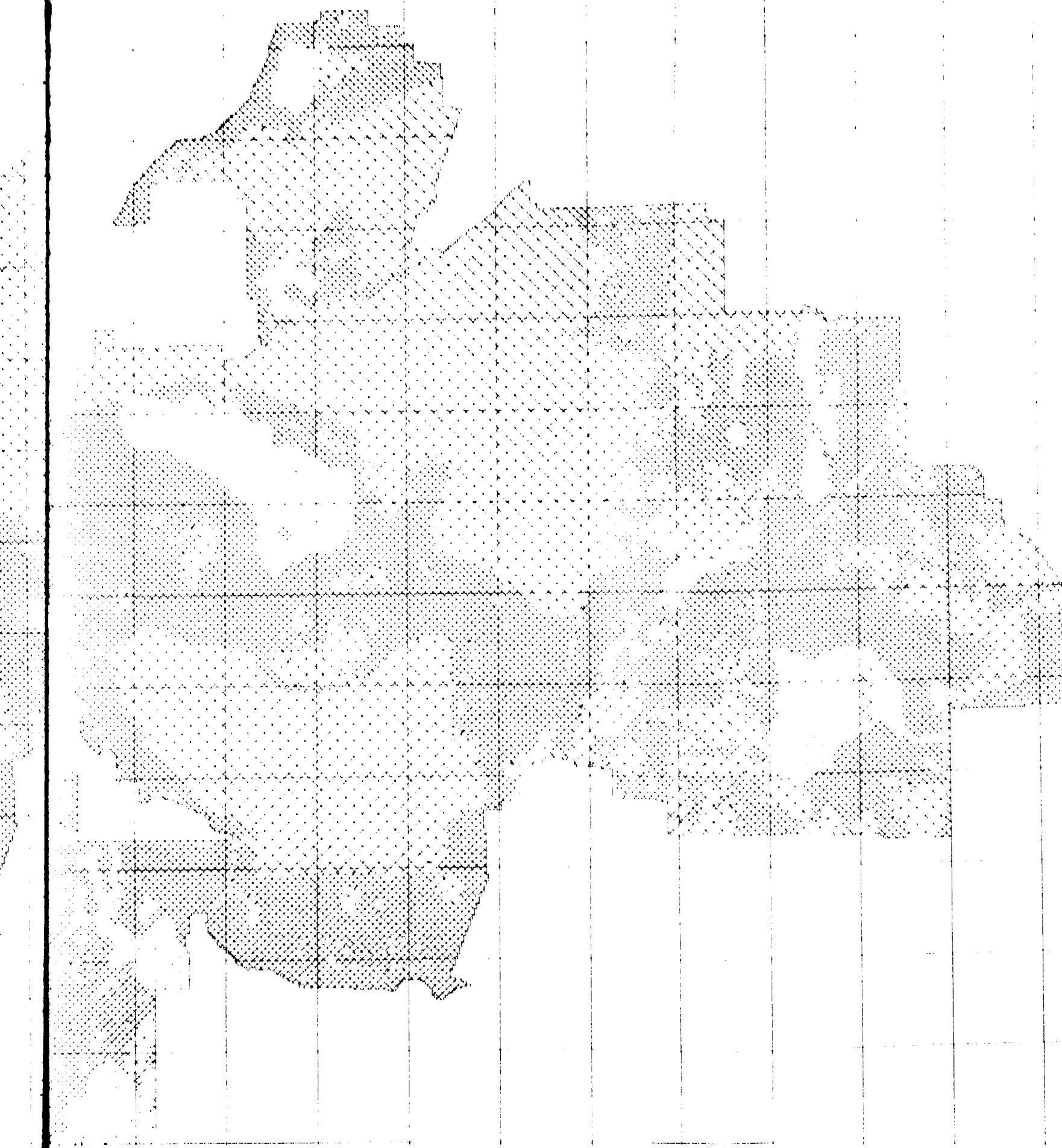
538

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5224

5222

5220

5218

5216

5214

5212

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5208

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5204

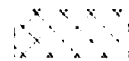
5202

5200

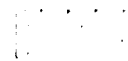


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Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



> 5 - 10



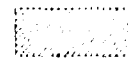
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE
WET SEASON

SLIPPERY CONDITION
1000 PASSES

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

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524

526

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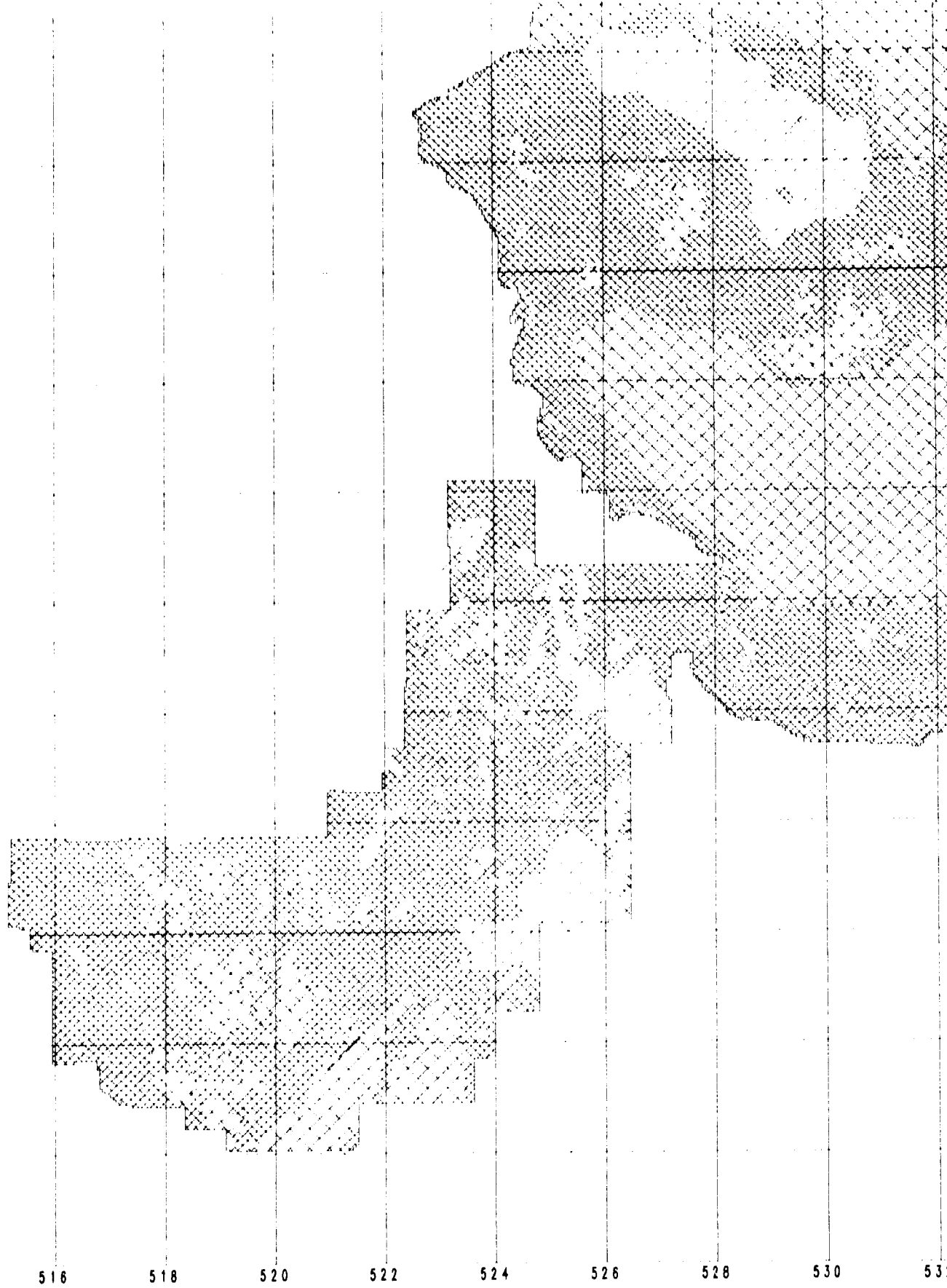
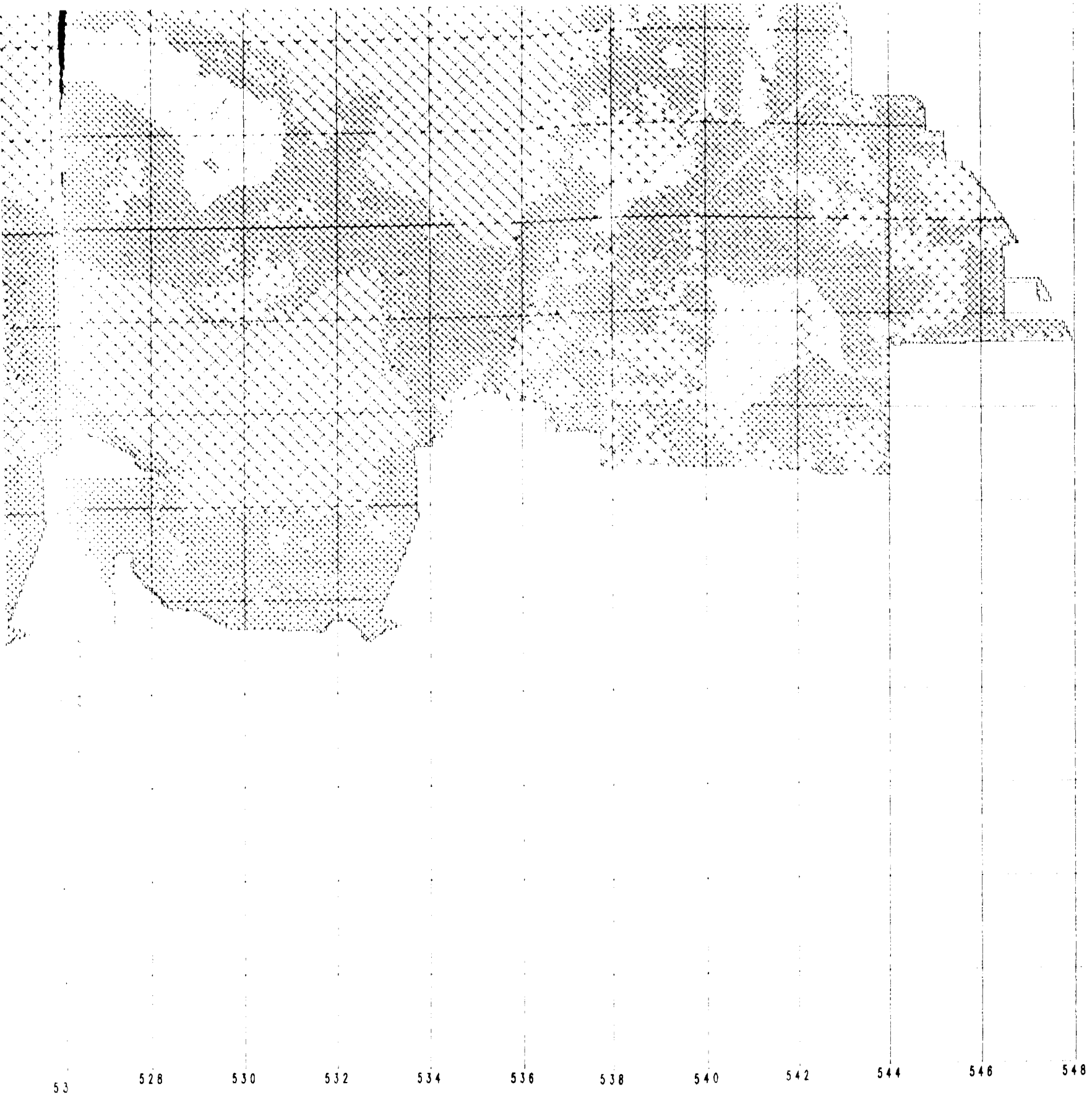
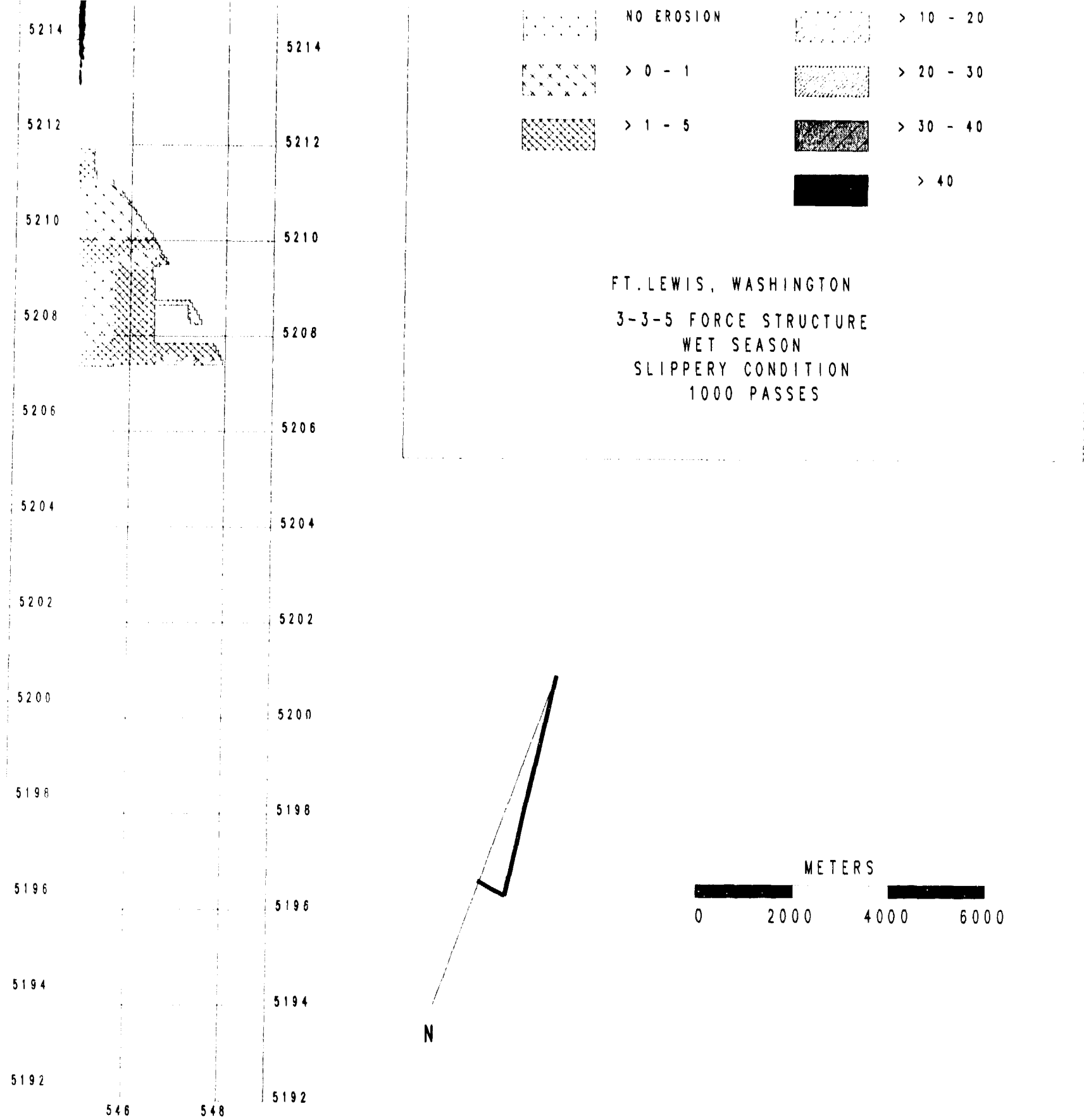


Plate 38. Rate of soil erosion for 3-3-5 and 5-3-3



3-3 oil erosion for 3-3-5 and 4-3-3 (HMMWV) force structures in the wet slippery surface condi



on for surface condition for one thousand passes

5224⁵¹⁴

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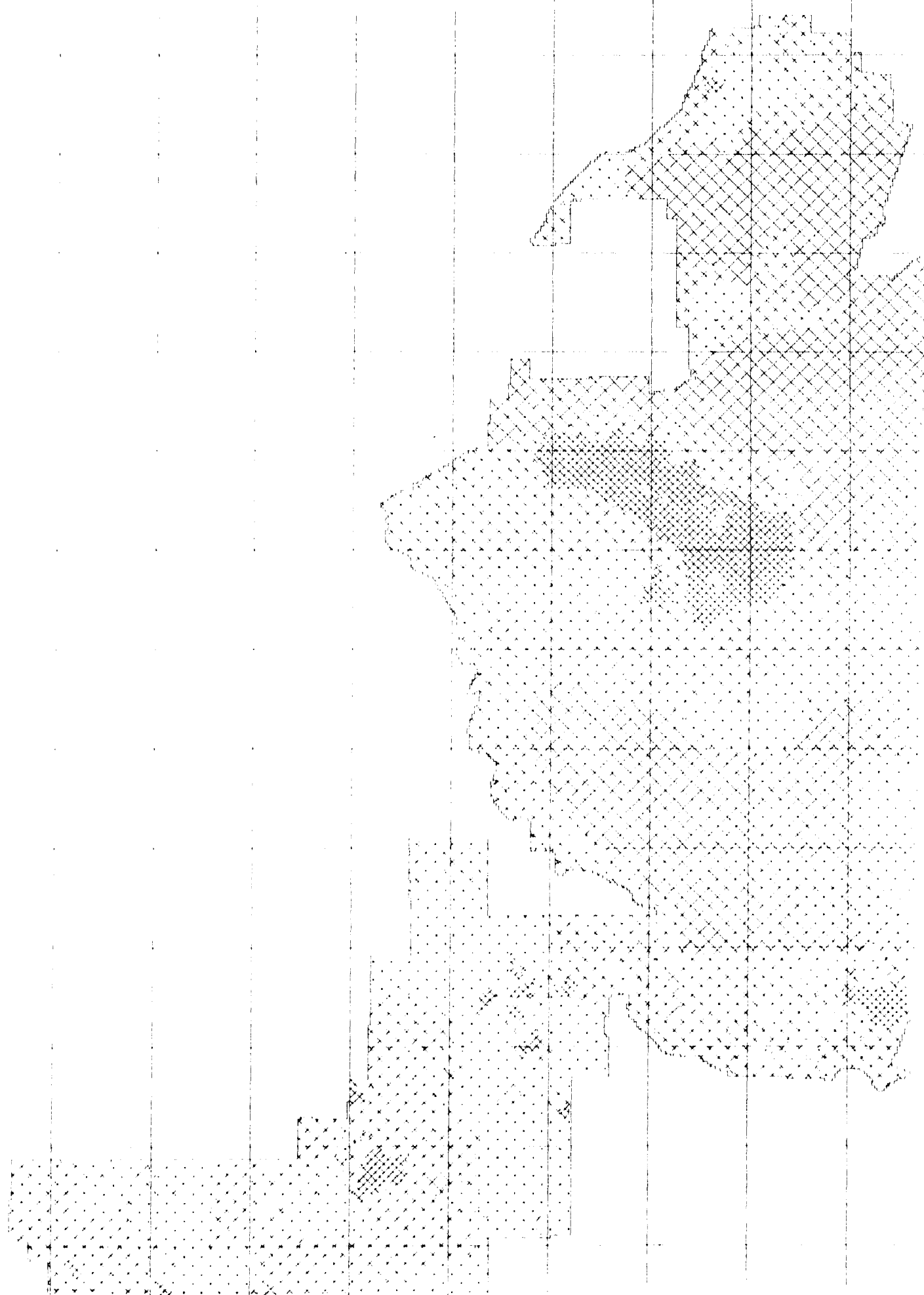
5206

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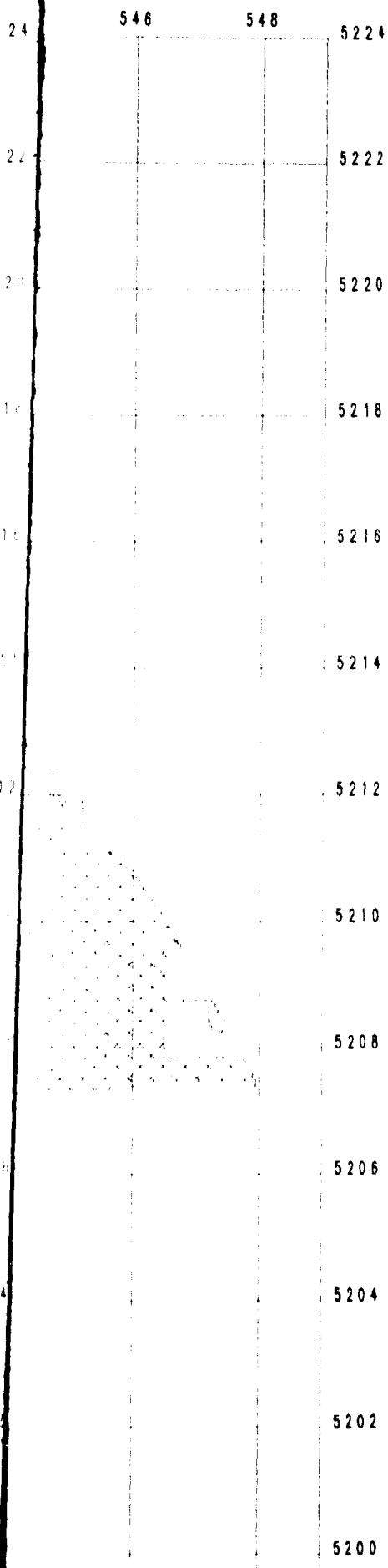
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U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

FT. LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
10 PASSES

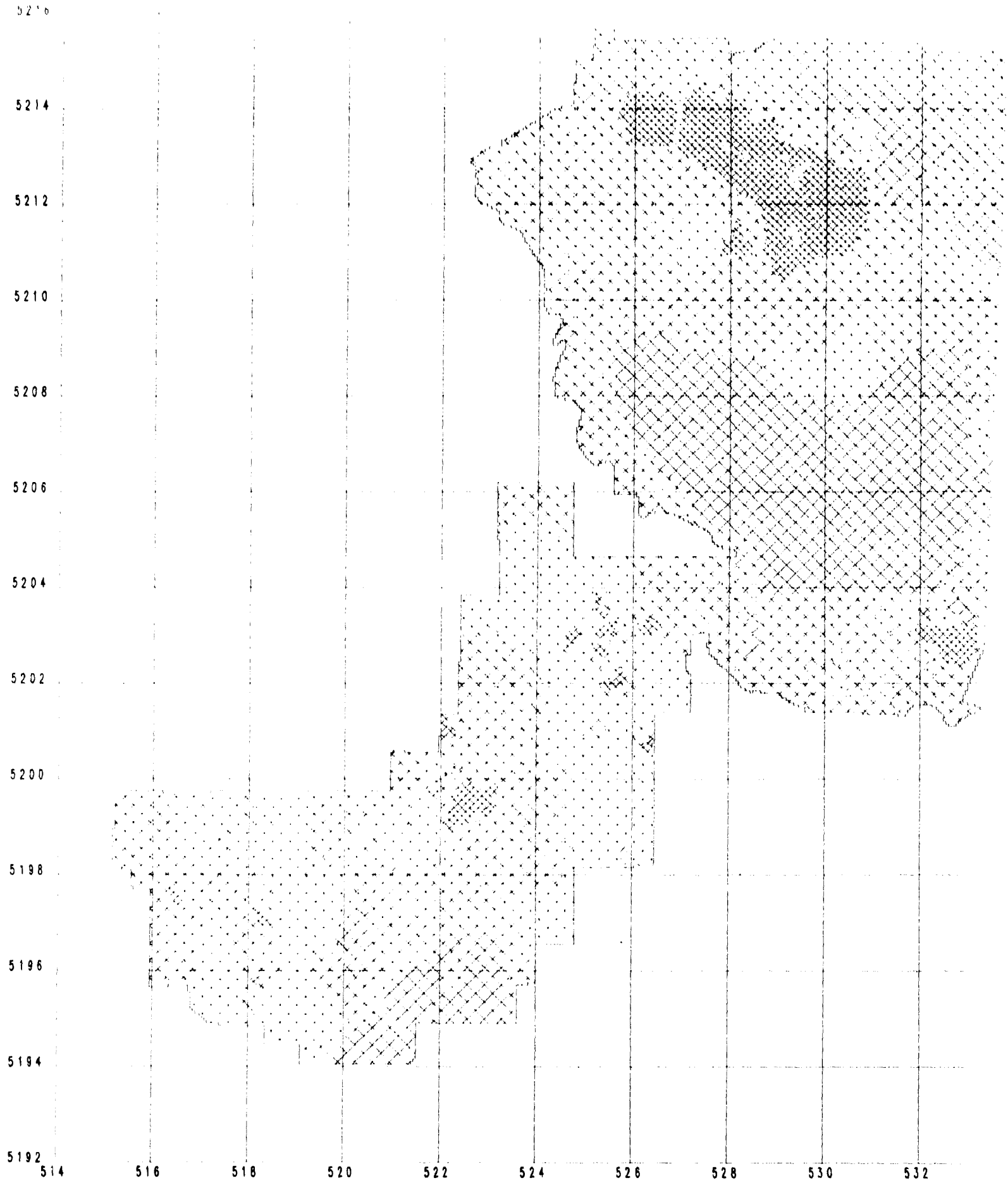
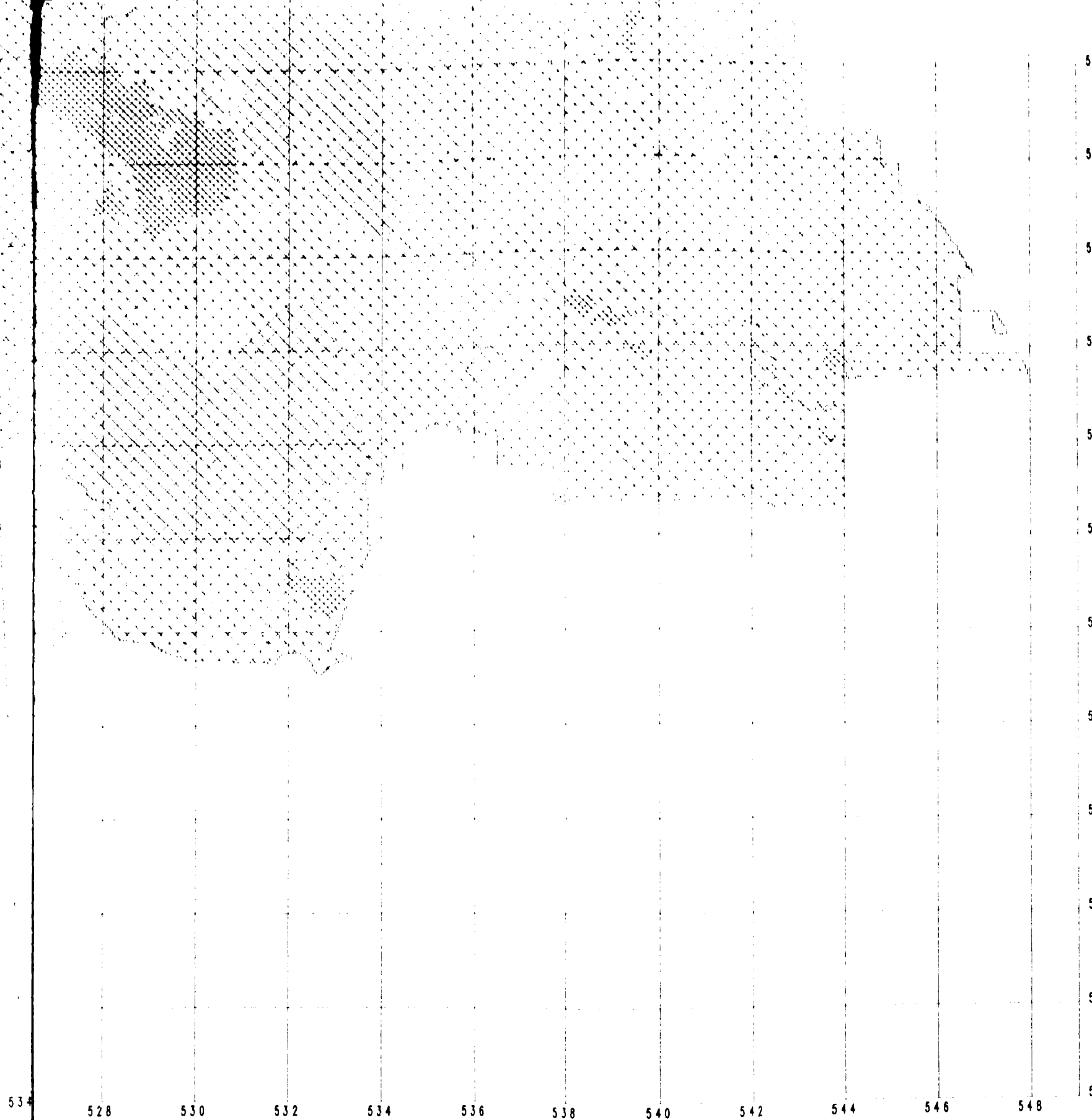
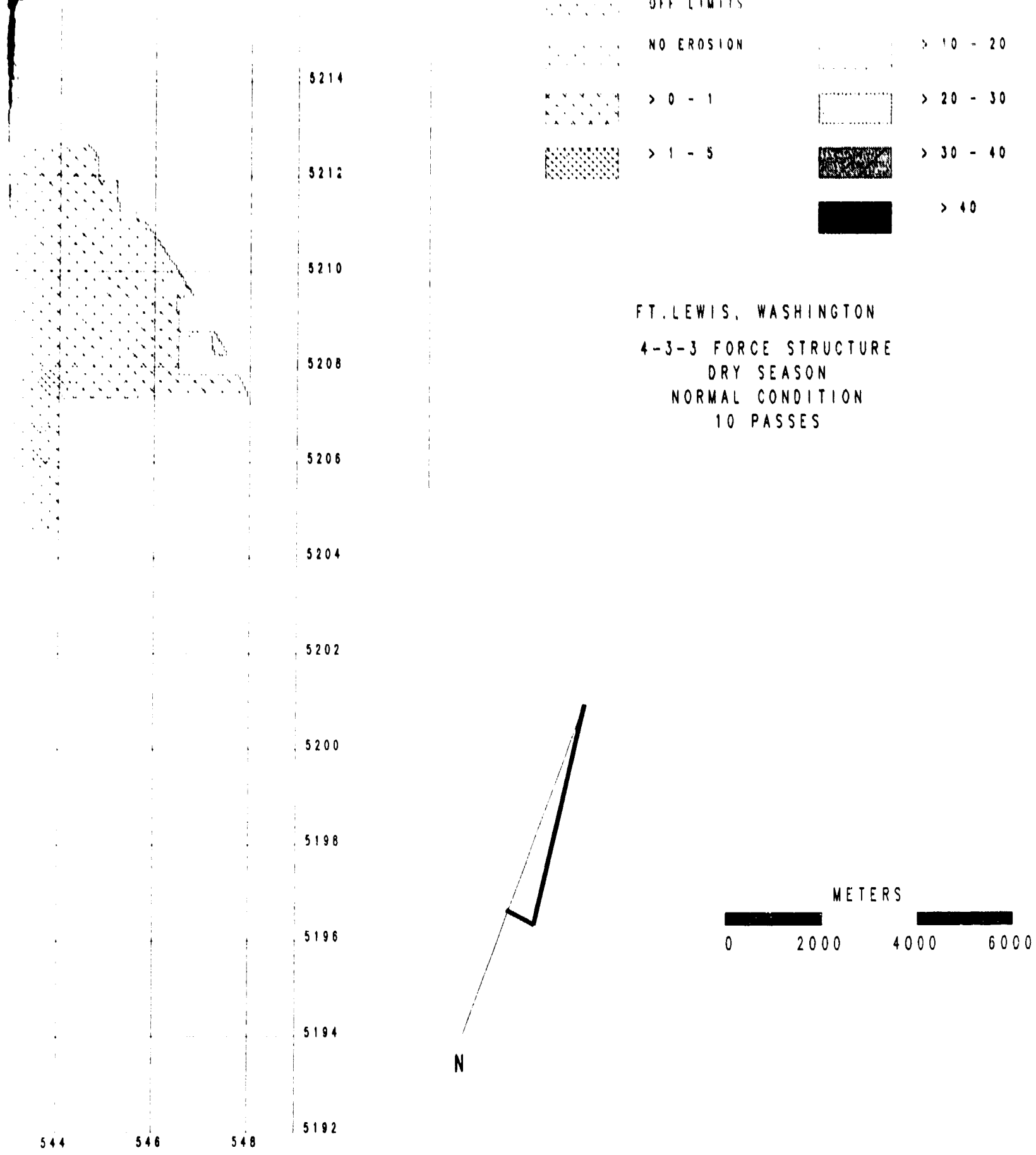


Plate 39. Rate of soil erosion for



Rate of soil erosion for the 4-3-3 (8X8) force structure in the dry normal surface condition



fo
lry normal surface condition for ten passes

5224⁵¹⁴

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5222

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5214

5212

5210

5208

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5204

5202

5200

5198



526 528 530 532 534 536 538 540 542 544 546 5



548

548

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U. S. Army Corps of Engineers
Waterways
Experiment
Station

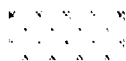
RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



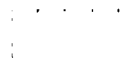
NO EROSION



> 0 - 1



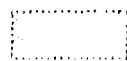
> 1 - 5



> 5 - 10



> 10 - 20



> 20 - 30



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

50 PASSES

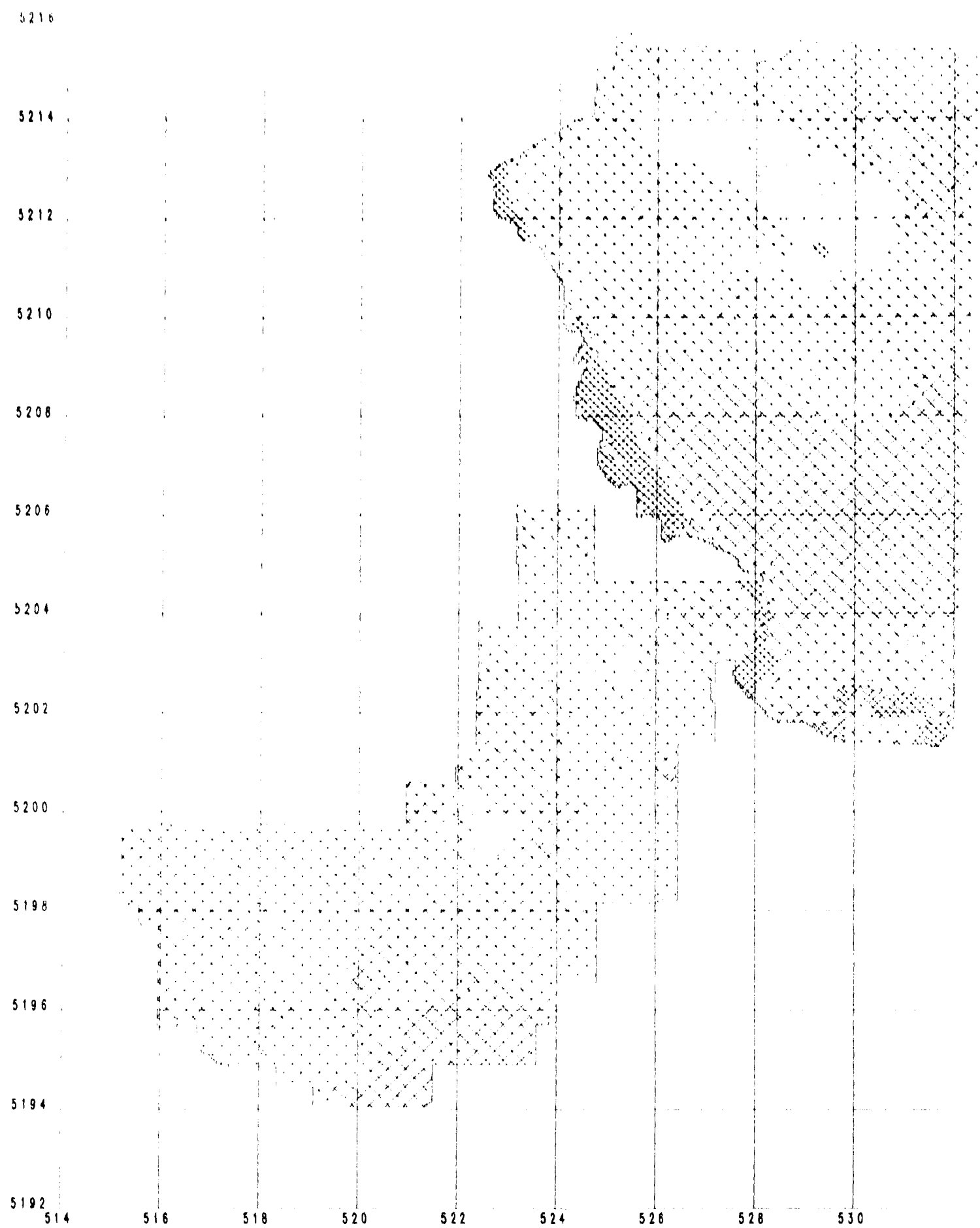


Plate 40. Rate of soil erosion

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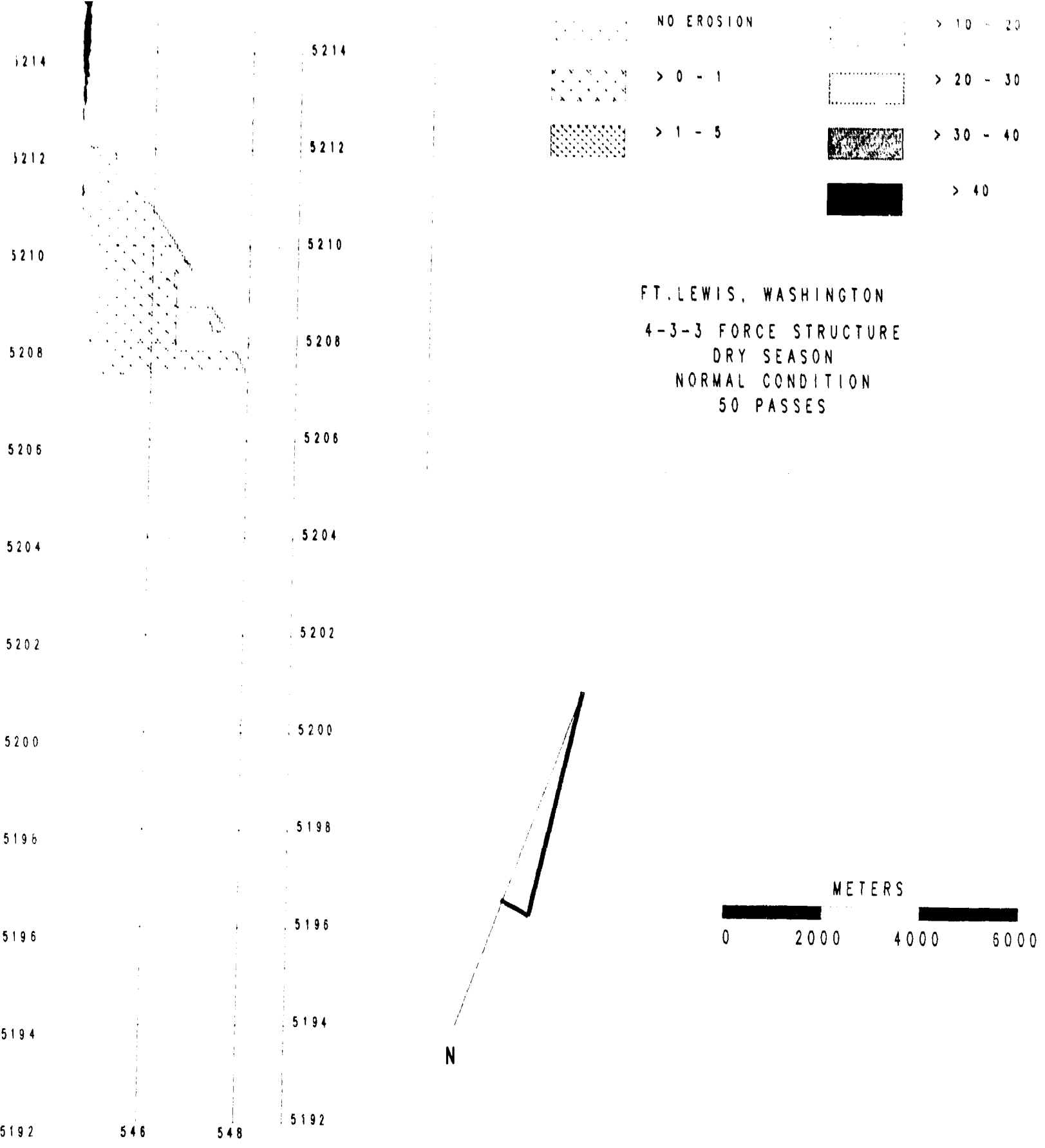
542

544

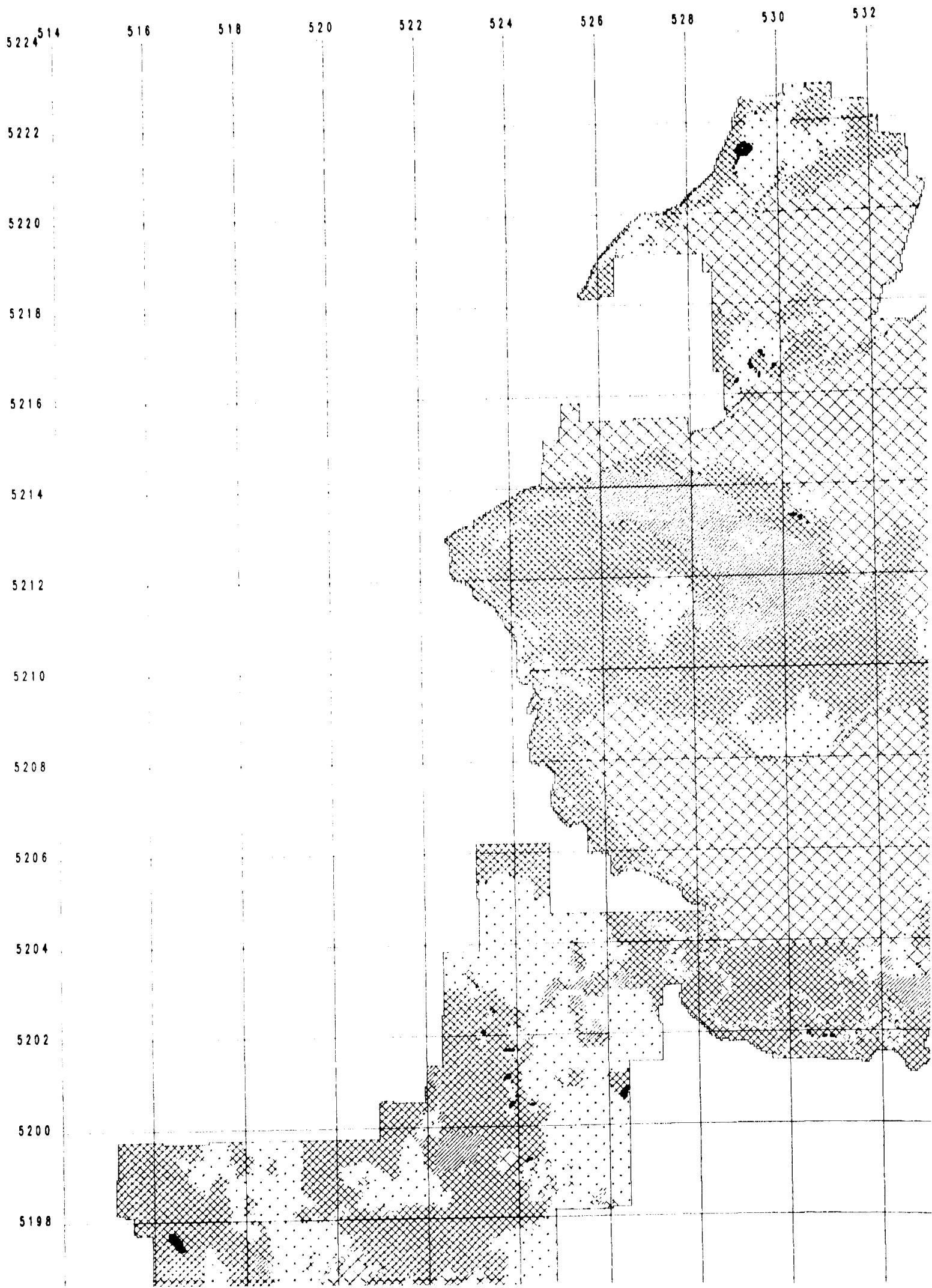
546

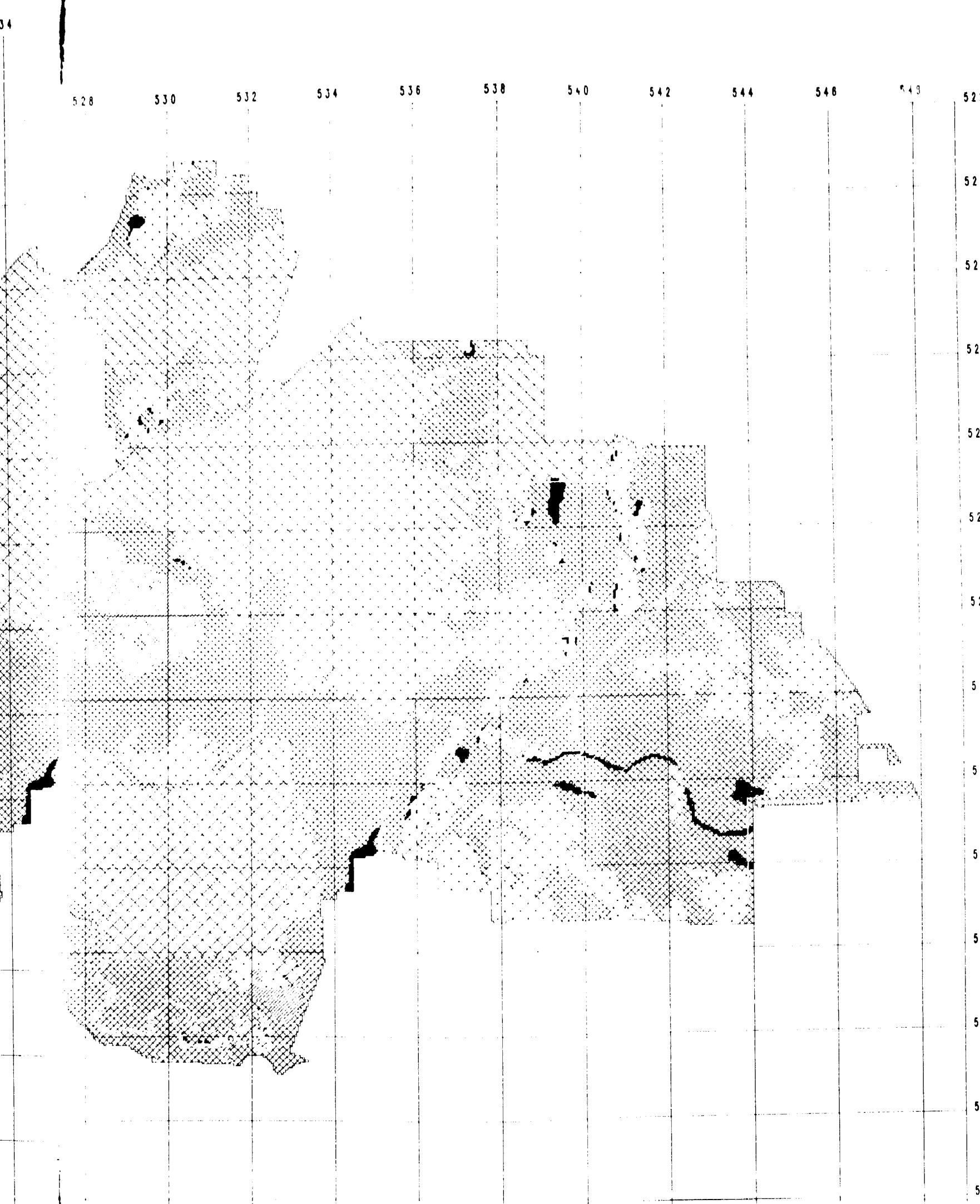
548

the rate of soil erosion for the 4-3-3 (8X8) force structure in the dry normal surface condit



n for 1 surface condition for fifty passes





549

5224

5222



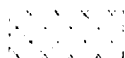
U. S. Army Corps of Engineers
Waterways
Experiment
Station

5220

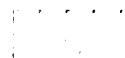
RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000

5218

5216



URBAN/
OFF LIMITS

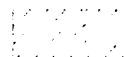


> 5 - 10

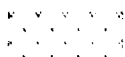
5214



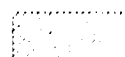
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30

5212



> 1 - 5



> 30 - 40



> 40

5210

FT. LEWIS, WASHINGTON

5208

4-3-3 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

1000 PASSES

5205

5204

5202

5200

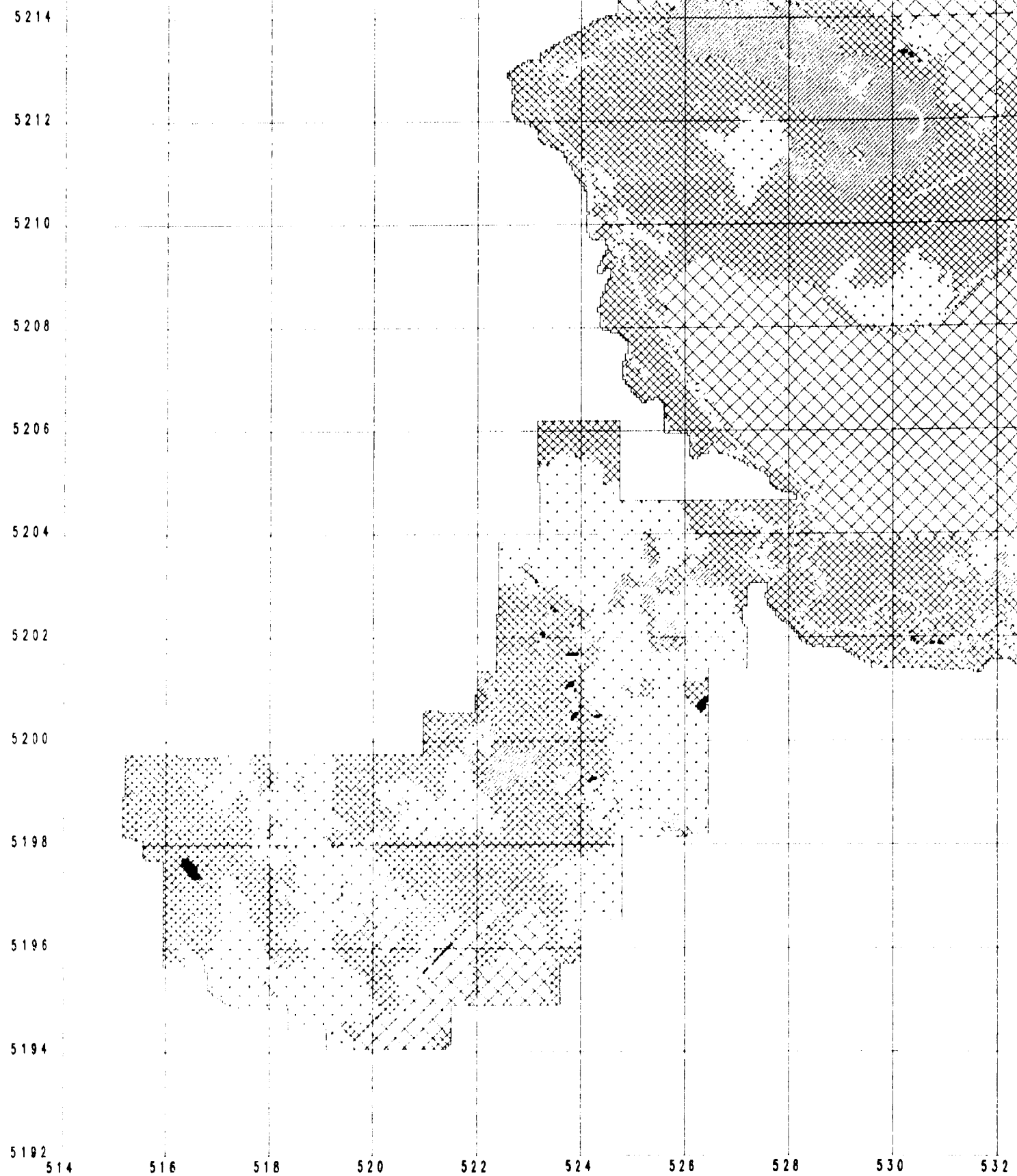
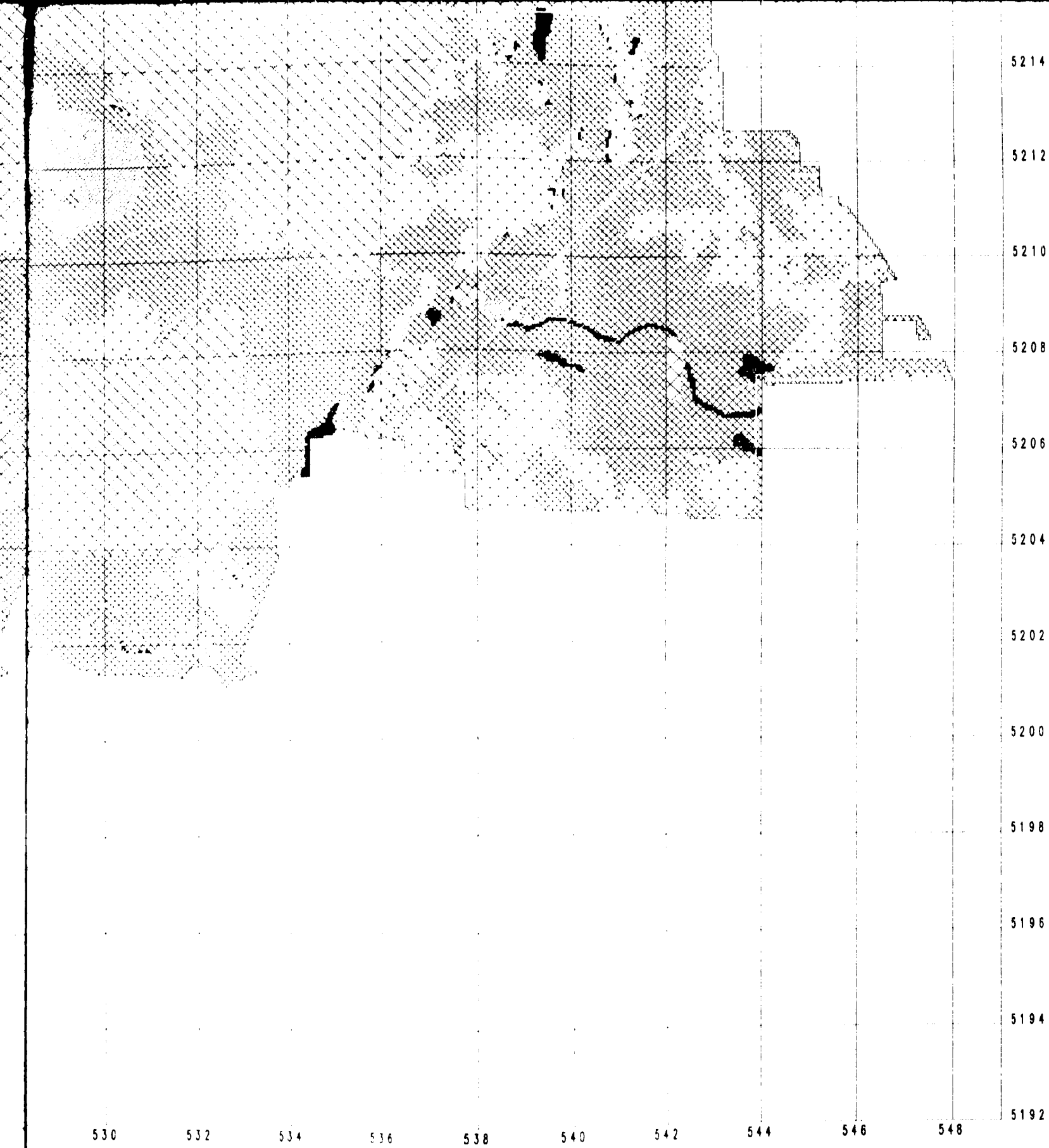


Plate 41. Rate of soil erosion for t



4-soil erosion for the 4-3-3 (8X8) force structure in the dry normal surface condition for one t

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192



NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

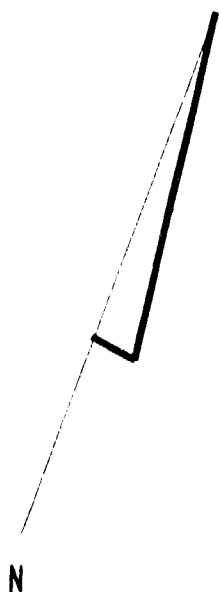
FT. LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

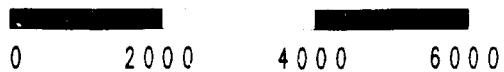
DRY SEASON

NORMAL CONDITION

1000 PASSES



METERS



546

548

surface condition for one thousand passes

5224 514 516 518 520 522 524 526 528 530 532

5222

5220

5218

5216

5214

5212

5210

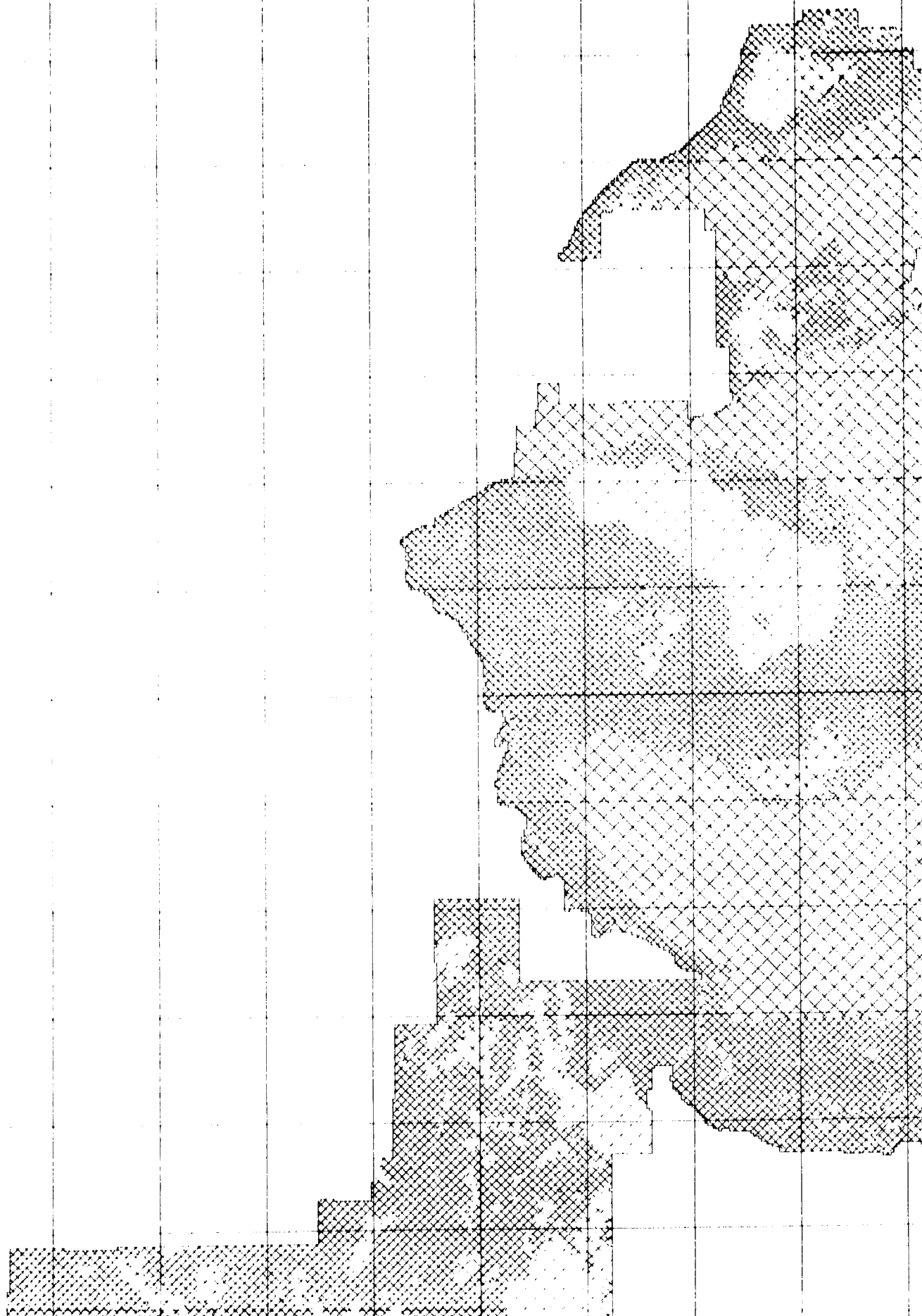
5208

5206

5204

5202

5200



526

528

530

532

534

536

538

540

542

544

546

548



540

540

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

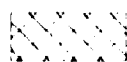
5202

5200

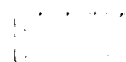


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Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



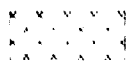
> 5 - 10



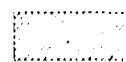
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

10 PASSES

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

522

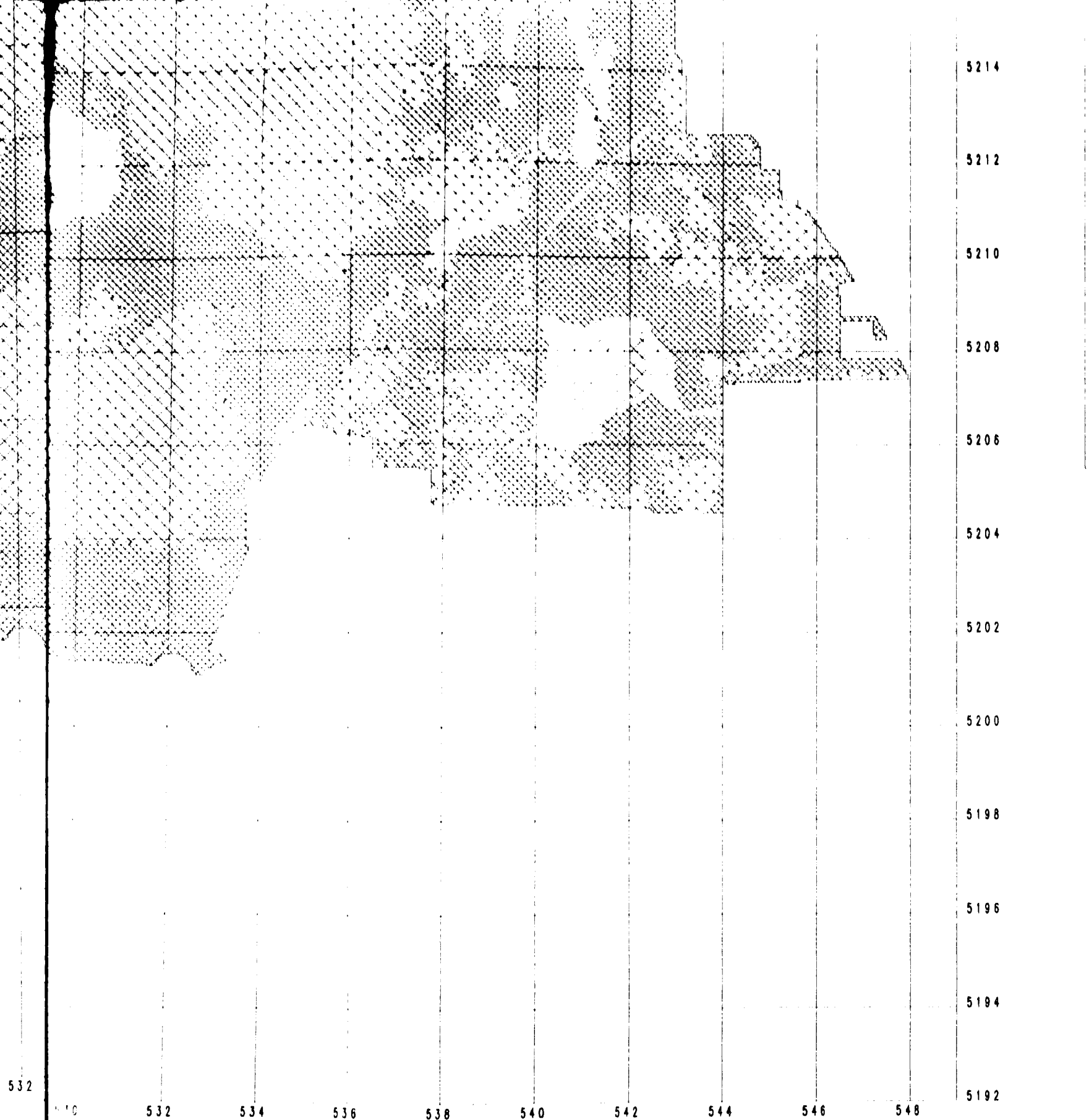
524

526

528

530

plate 42. Rate of soil ero



on f
l erosion for the 4-3-3 (8x8) force structure in the wet slippery surface condition for

ORDINARY
OFF LIMITS

NO EROSION

> 0 - 1

> 1 - 5

> 10 - 20

> 20 - 30

> 30 - 40

> 40

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

548

FT. LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

10 PASSES

METERS

0 2000 4000 6000

N

en pa
surface condition for ten passes

5224 514 518 518 520 522 524 526 528 530 532

5222

5220

5218

5216

5214

5212

5210

5208

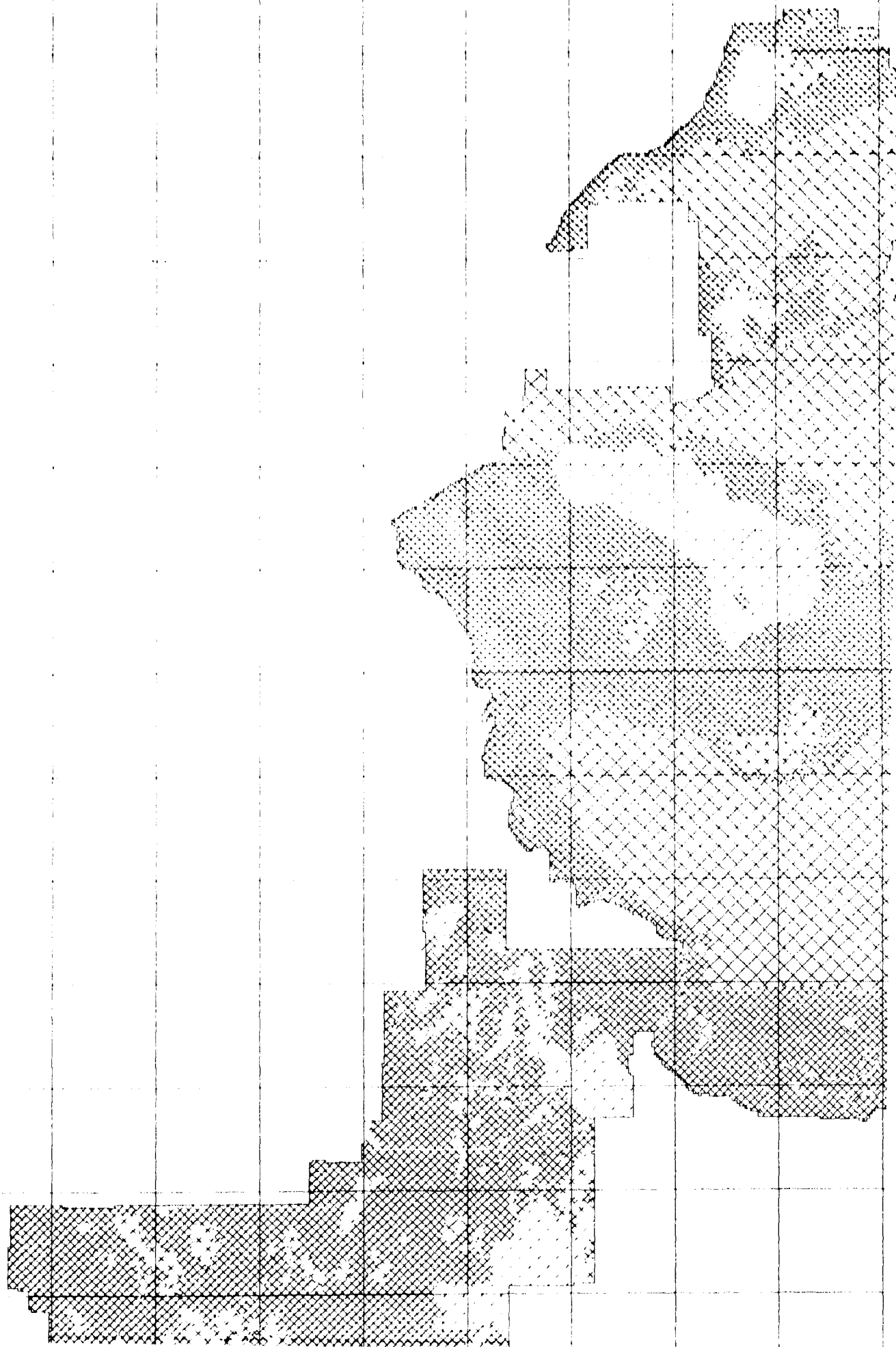
5206

5204

5202

5200

5198



528

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532

534

536

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540

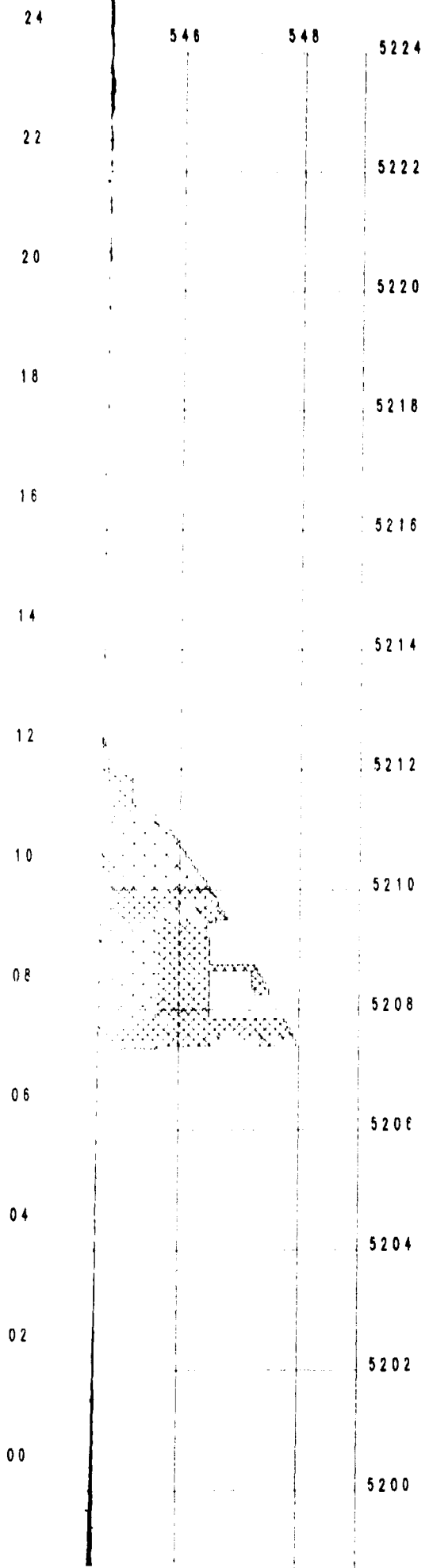
542

544

546

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Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

FT. LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
50 PASSES

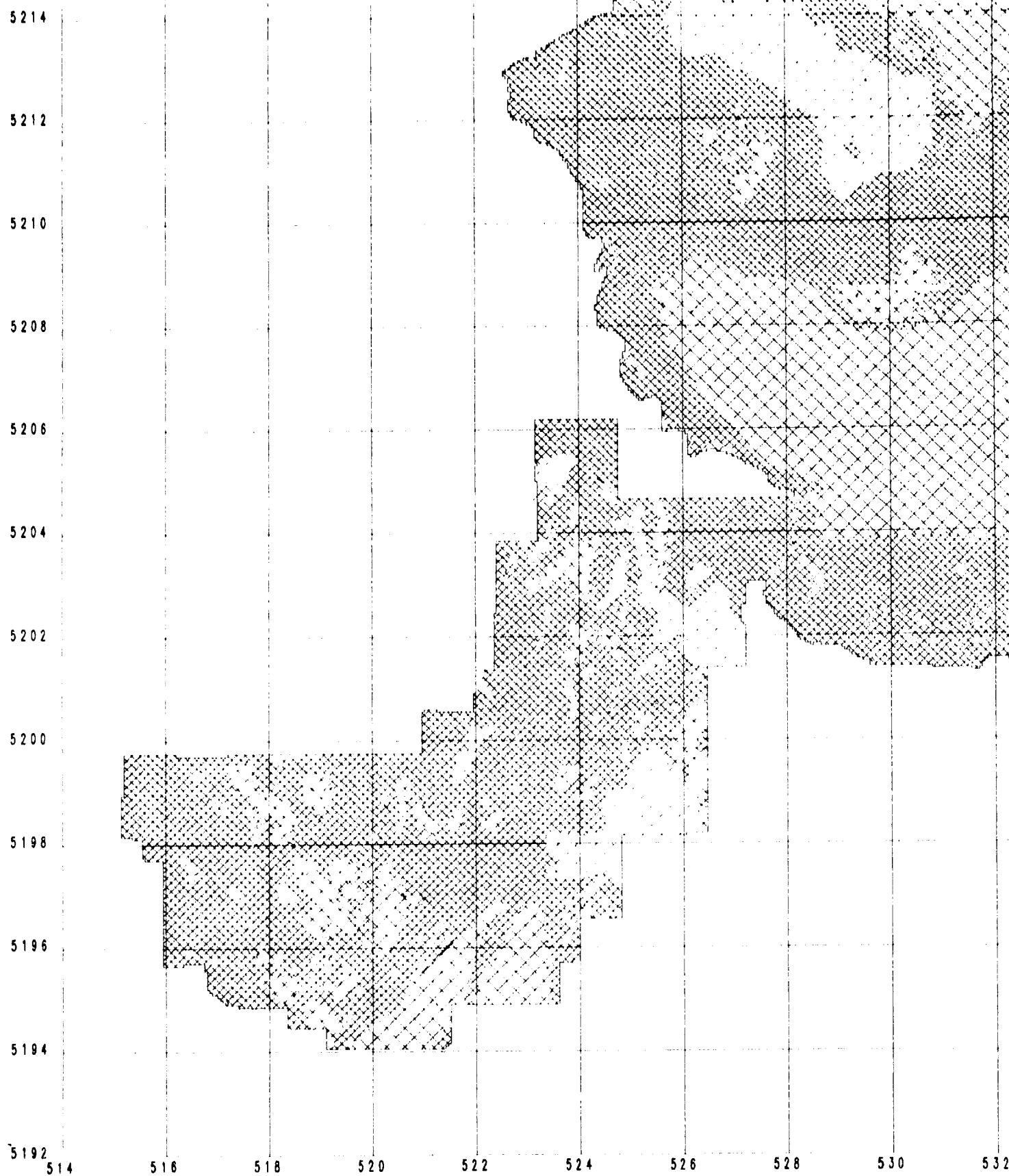
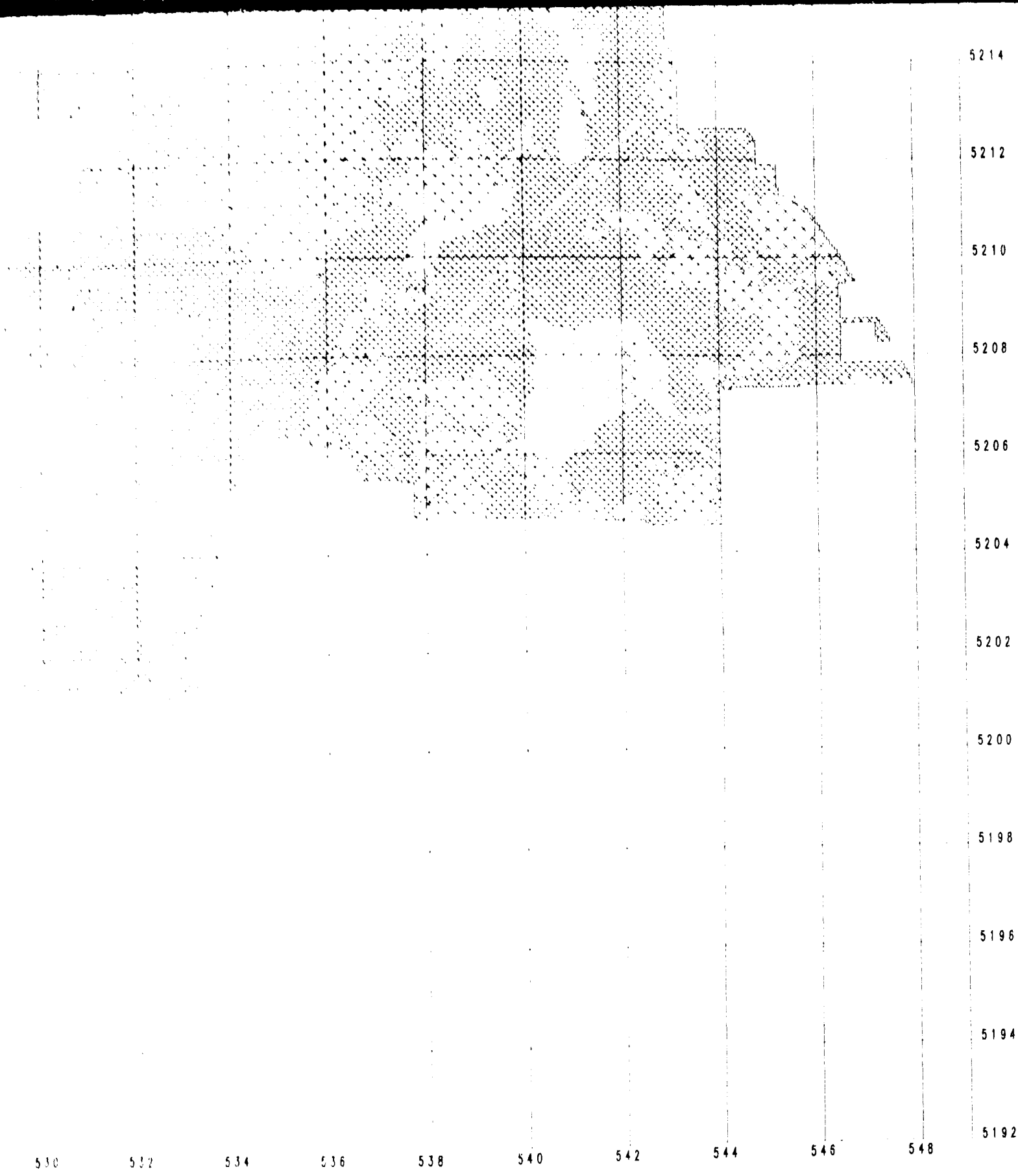


Plate 43. Rate of soil erosion for



erosion for the 4-3-3 (8X8) force structure in the wet slippery surface condition for

NO EROSION

5214

> 0 - 1

> 20 - 30

5212

> 1 - 5

> 30 - 40

5210

> 40

5208

FT. LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

50 PASSES

5206

5204

5202

5200

5198

5196

5194

5192

METERS

0

2000

4000

6000

N

546

548

slippery surface condition for fifty passes

5224 514 516 518 520 522 524 526 528 530 532

5222

5220

5218

5216

5214

5212

5210

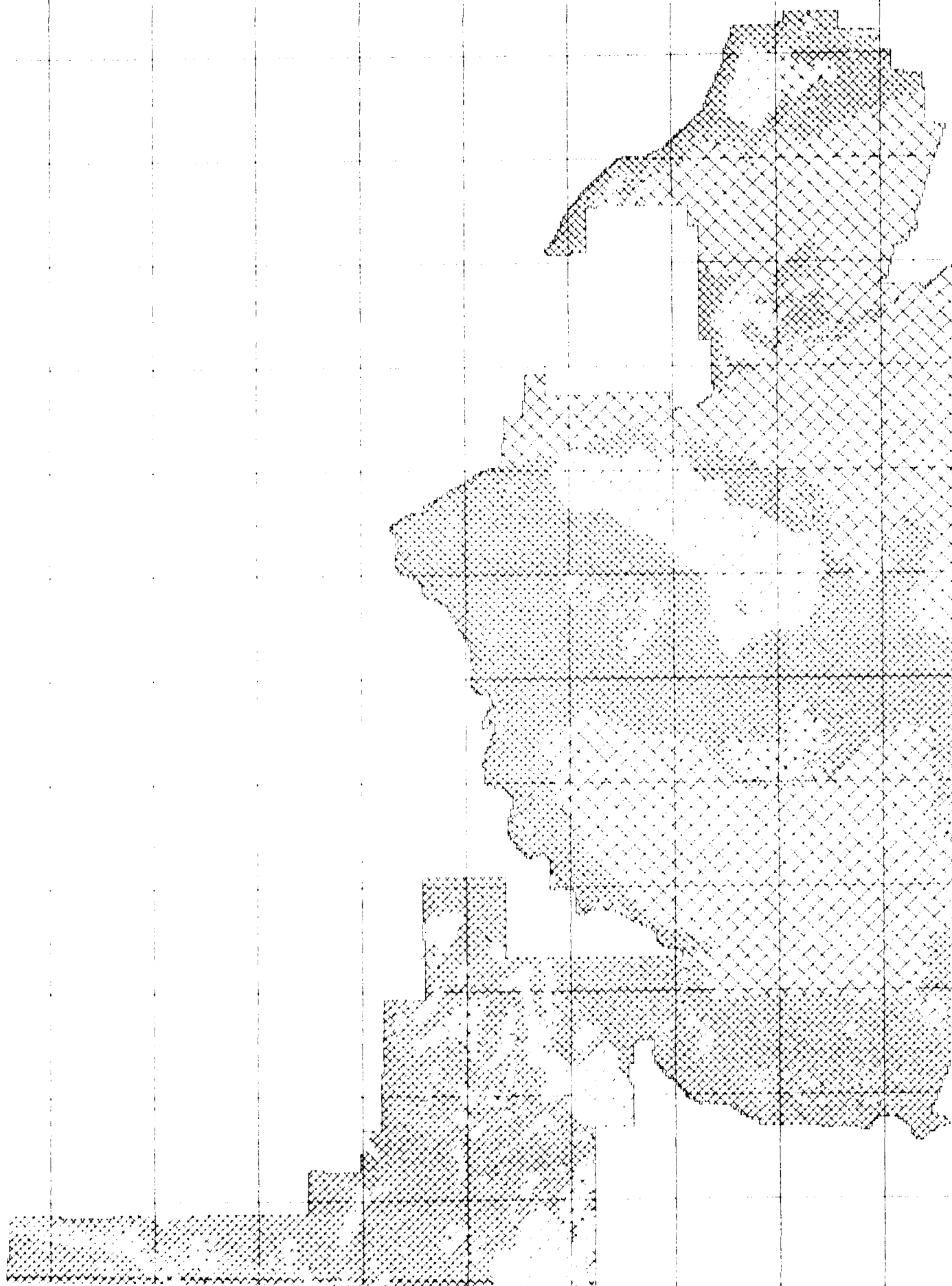
5208

5206

5204

5202

5200



530 532 534 536 538 540 542 544 546 548 5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



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RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



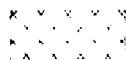
> 5 - 10



NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

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4-3-3 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
1000 PASSES

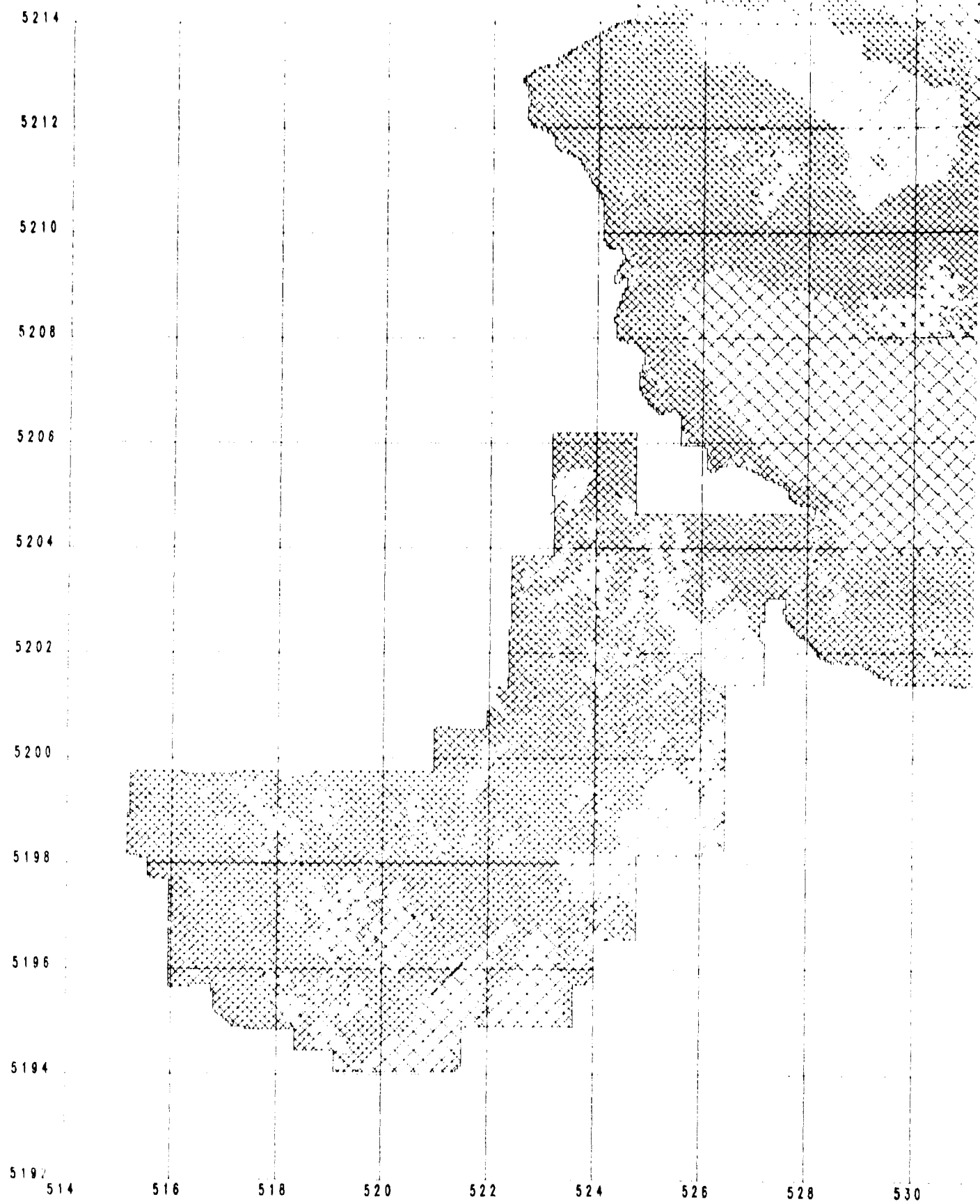
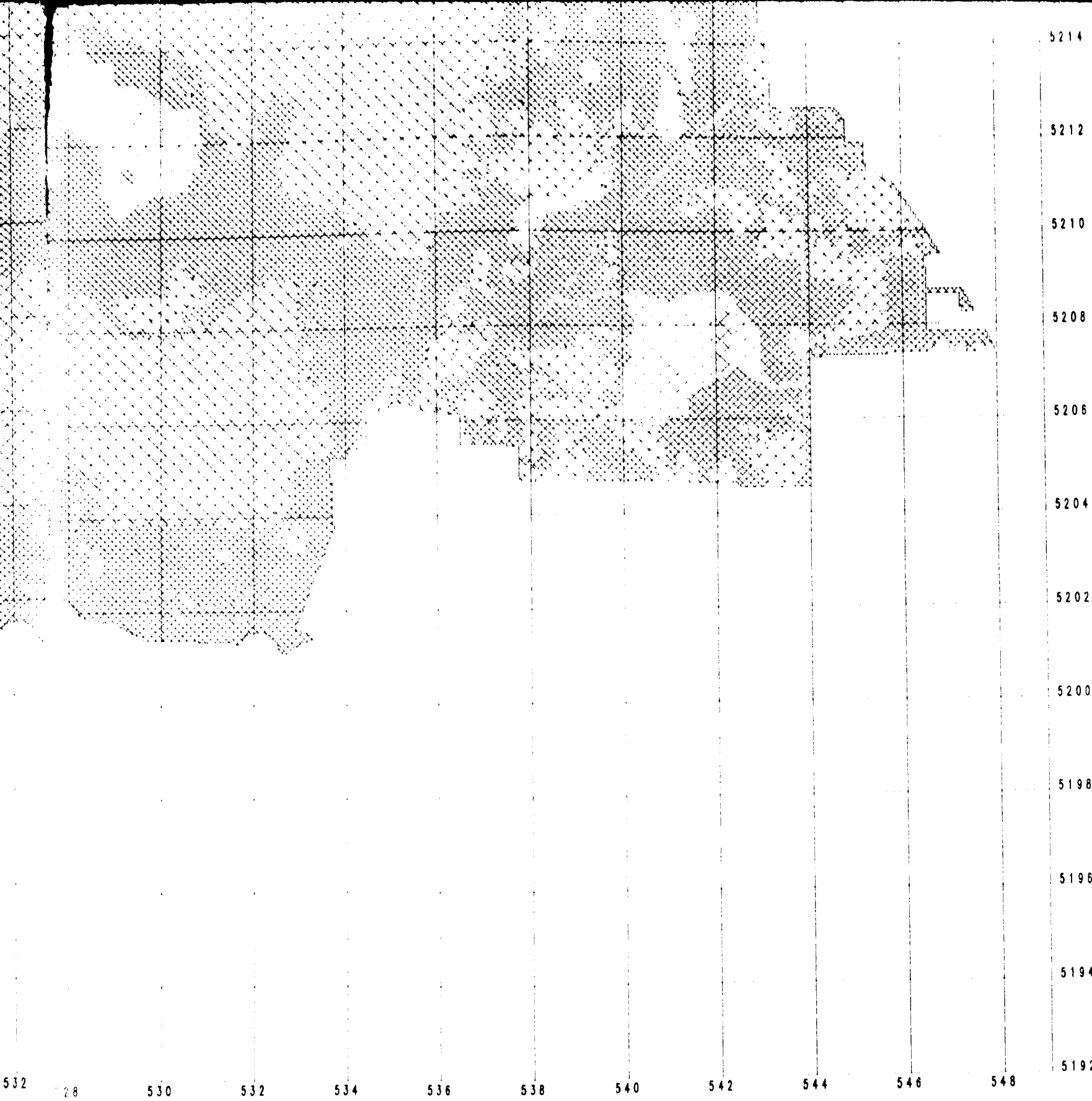
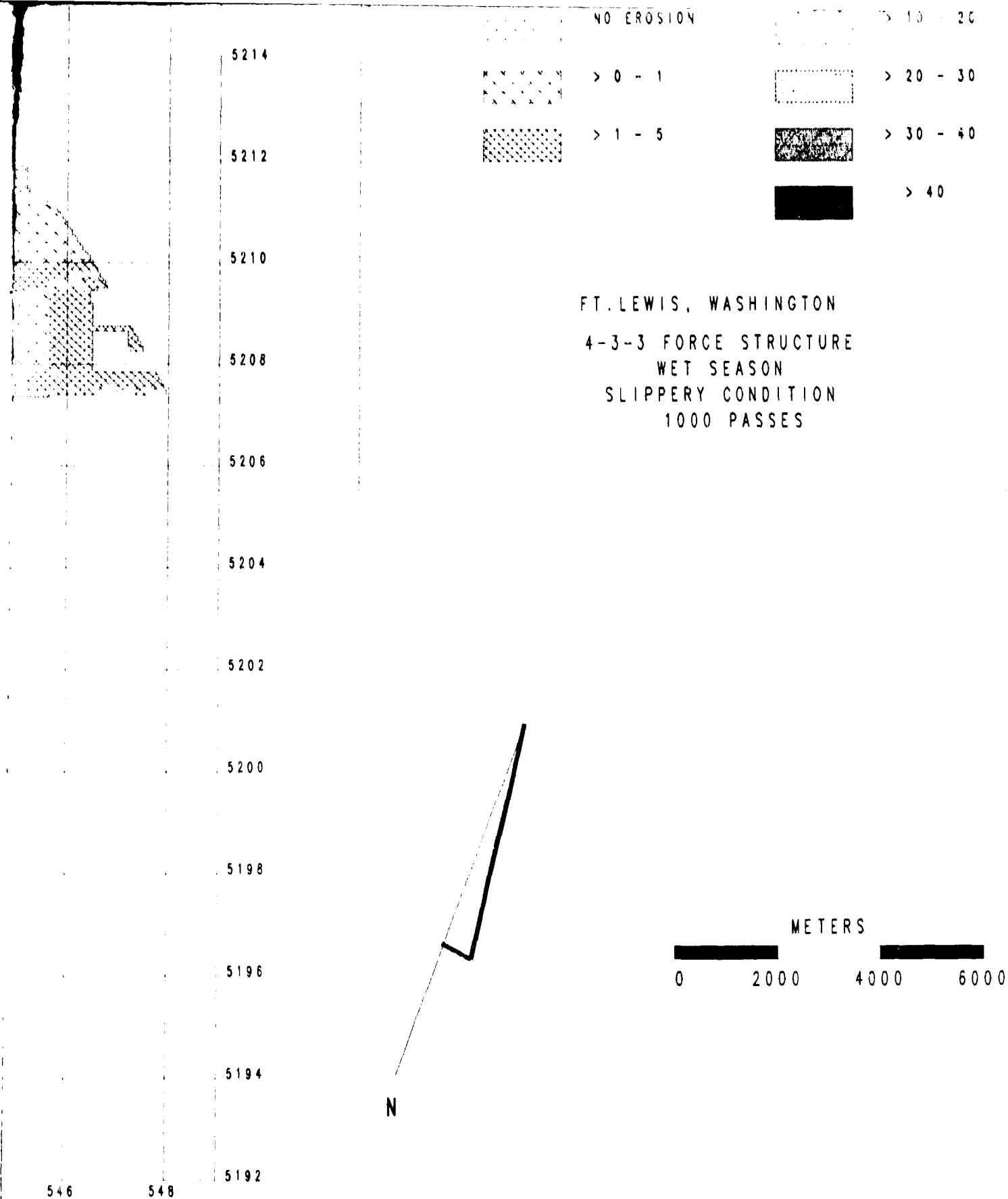


Plate 44. Rate of soil erosion for



the soil erosion for the 4-3-3 (8X8) force structure in the wet slippery surface condition fo



one t surface condition for one thousand passes

514 516 518 520 522 524 526 528 530

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



532

528

530

532

534

536

538

540

542

544

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

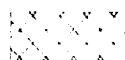
5202

5200

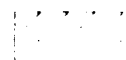


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RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



> 5 - 10



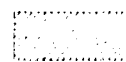
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

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5-5-0 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
10 PASSES

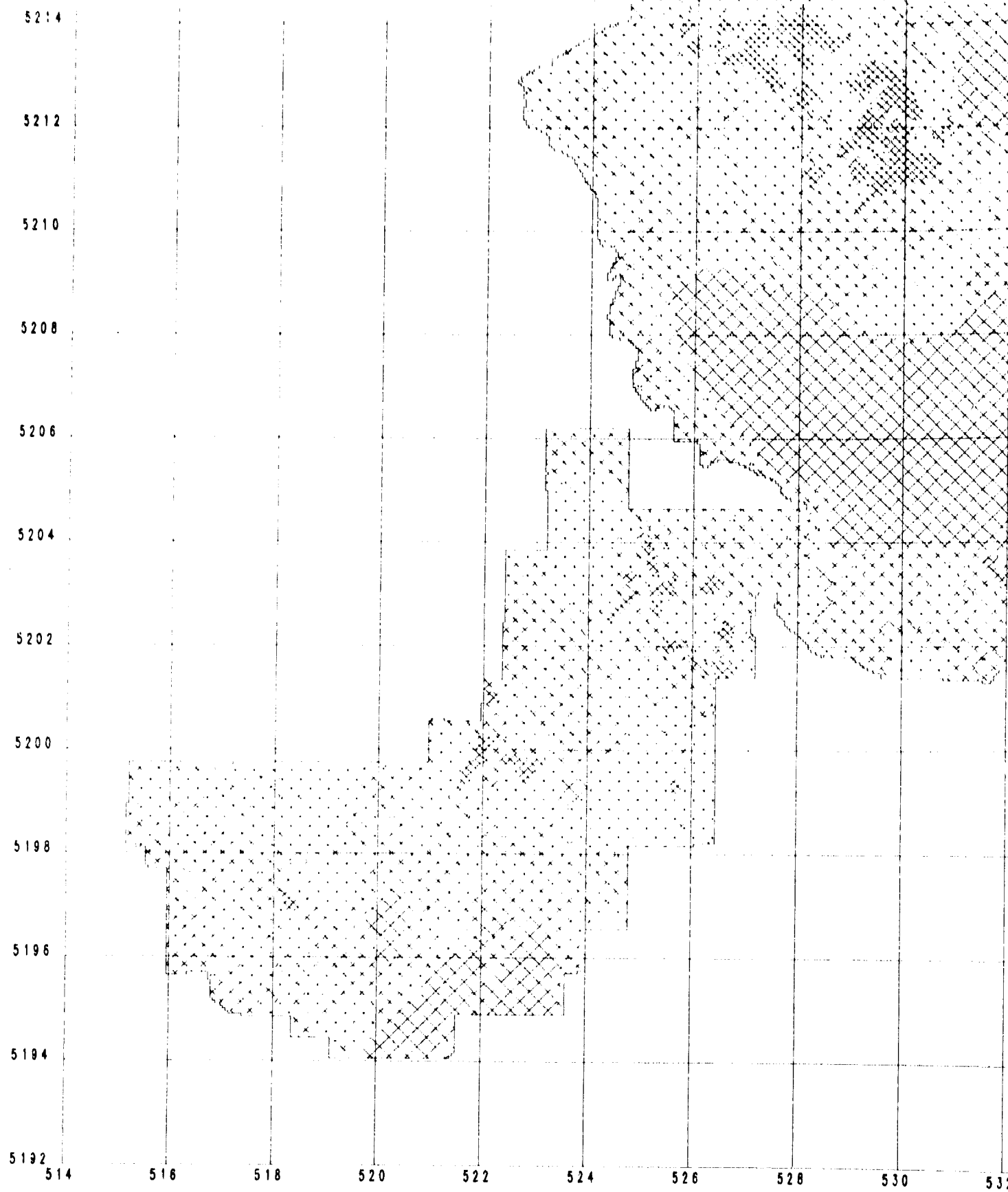
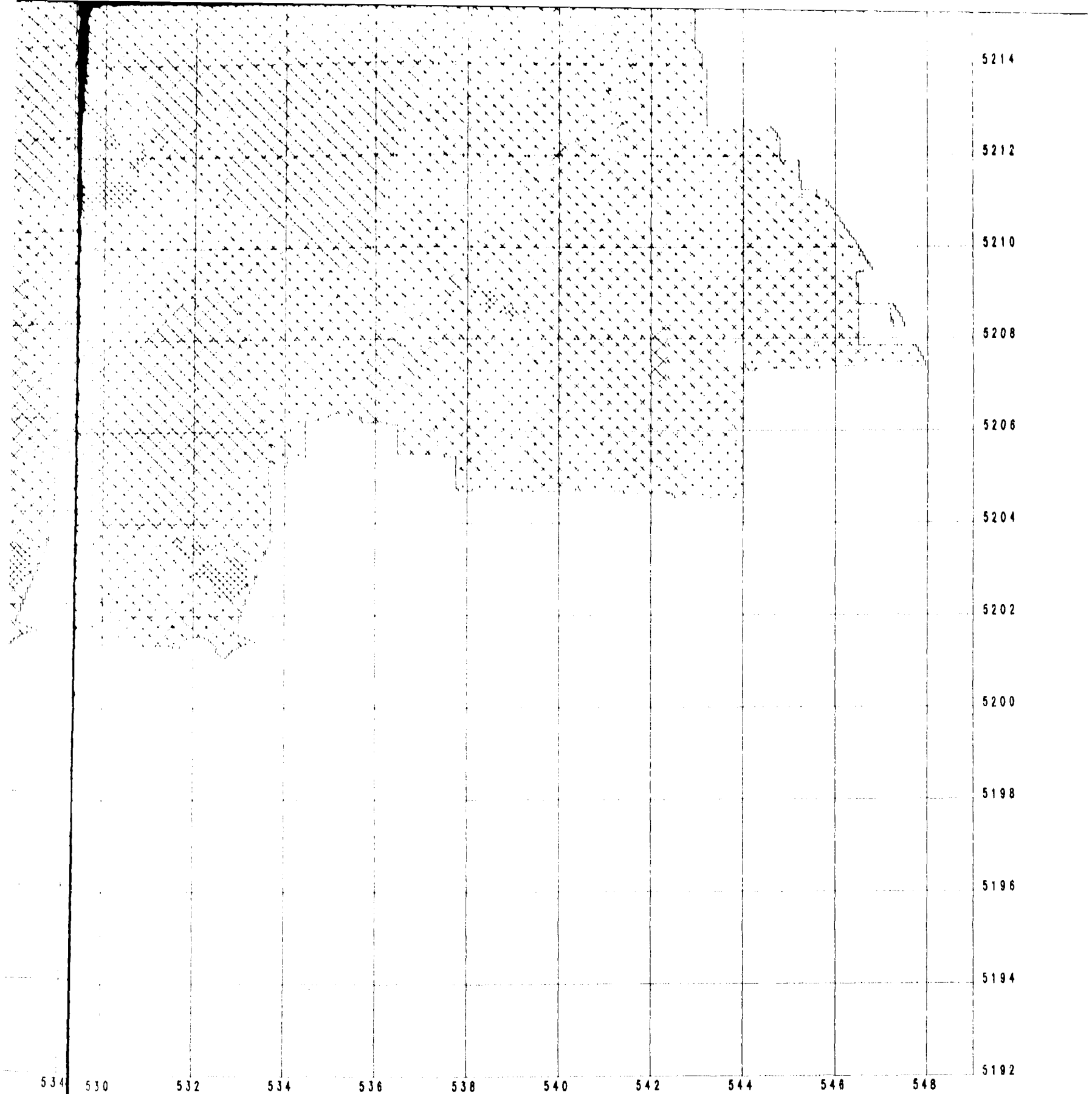


Plate 45. Rate of soil erosion for



the 5- erosion for the 5-5-0 force structure in the dry normal surface condition for ten pa

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

N

es condition for test passed

514 516 518 520 522 524 526 528 530 532

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

5198

528

530

532

534

536

538

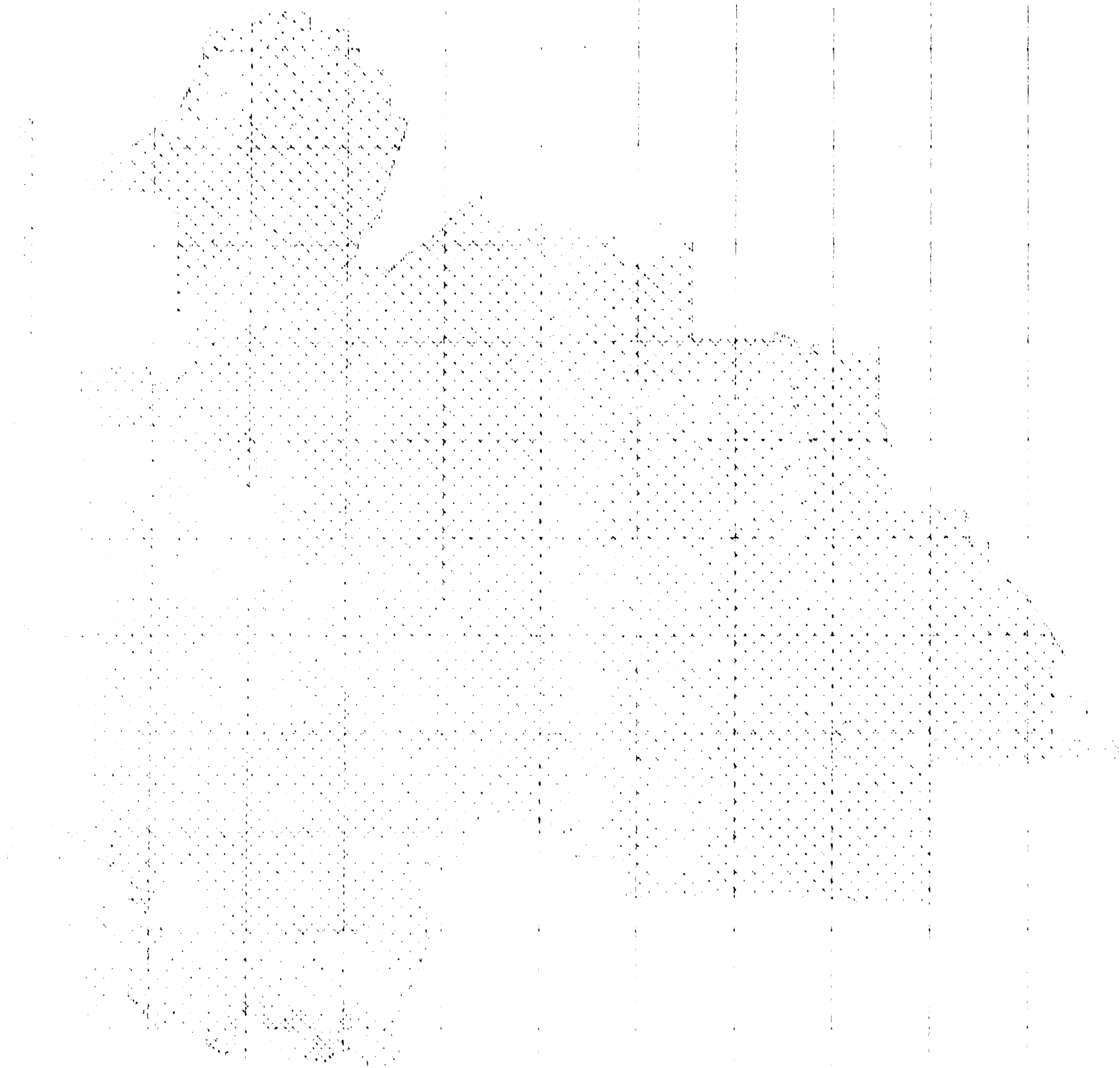
540

542

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546

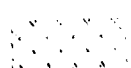
548





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Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



NO EROSION



> 0 - 1



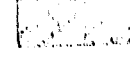
> 1 - 5



> 5 - 10



> 10 - 20



> 20 - 30



> 30 - 40



> 40

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D-5-0 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

50 PASSES

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

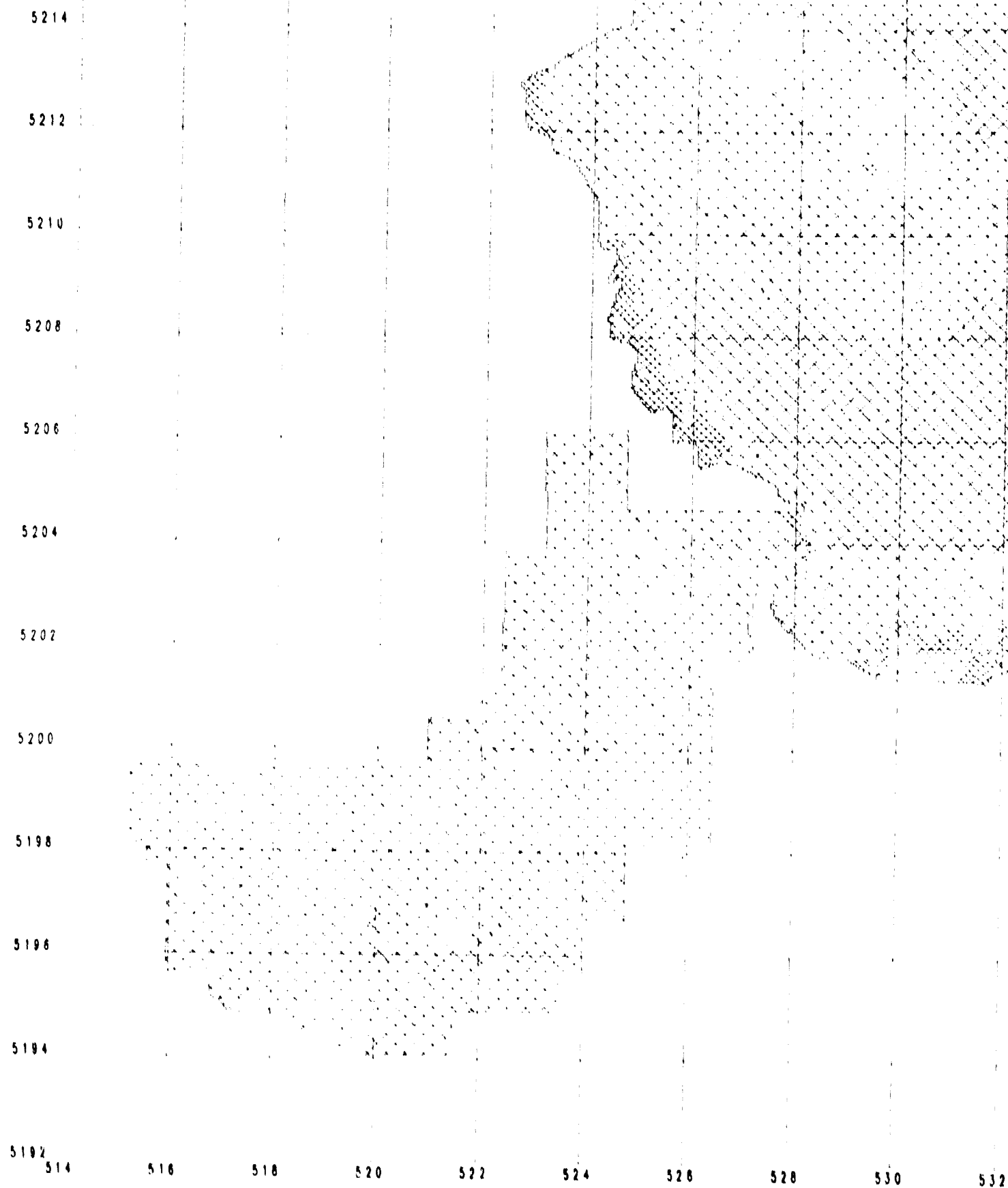


Plate 46. Rate of soil erosion fo

528

530

532

534

536

538

540

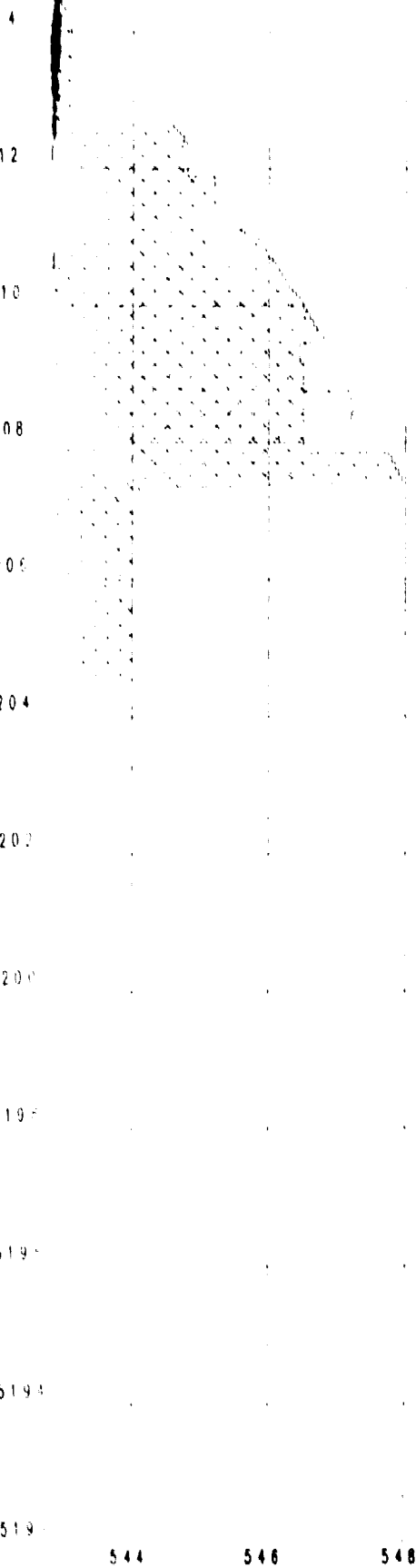
542

544

546

548

Rate of soil erosion for the 5-5-0 force structure in the dry normal surface condition



5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

> 0 - 1

> 1 - 5

> 20 - 30

> 30 - 40

> 40

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5-5-0 FORCE STRUCTURE

DRY SEASON

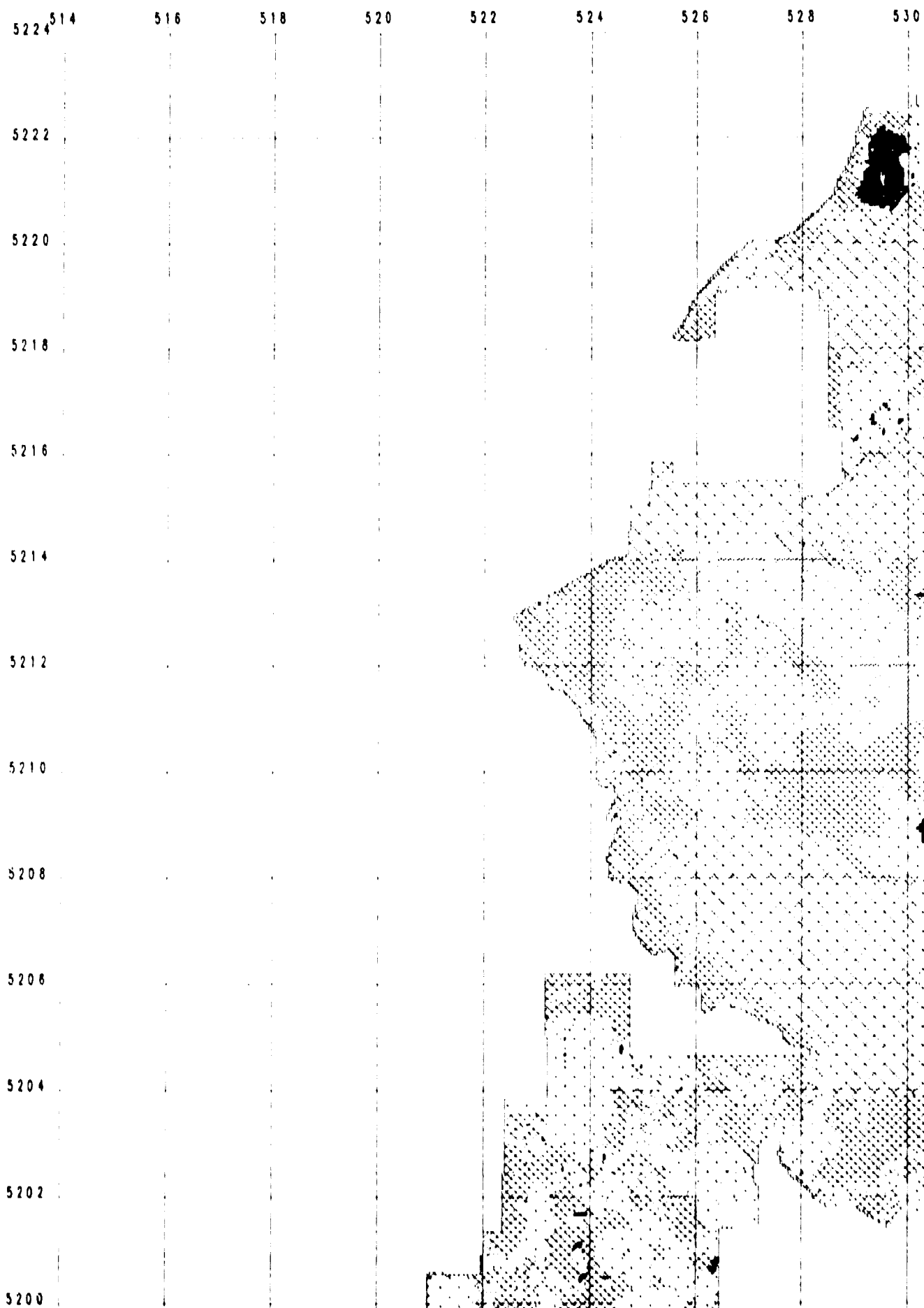
NORMAL CONDITION

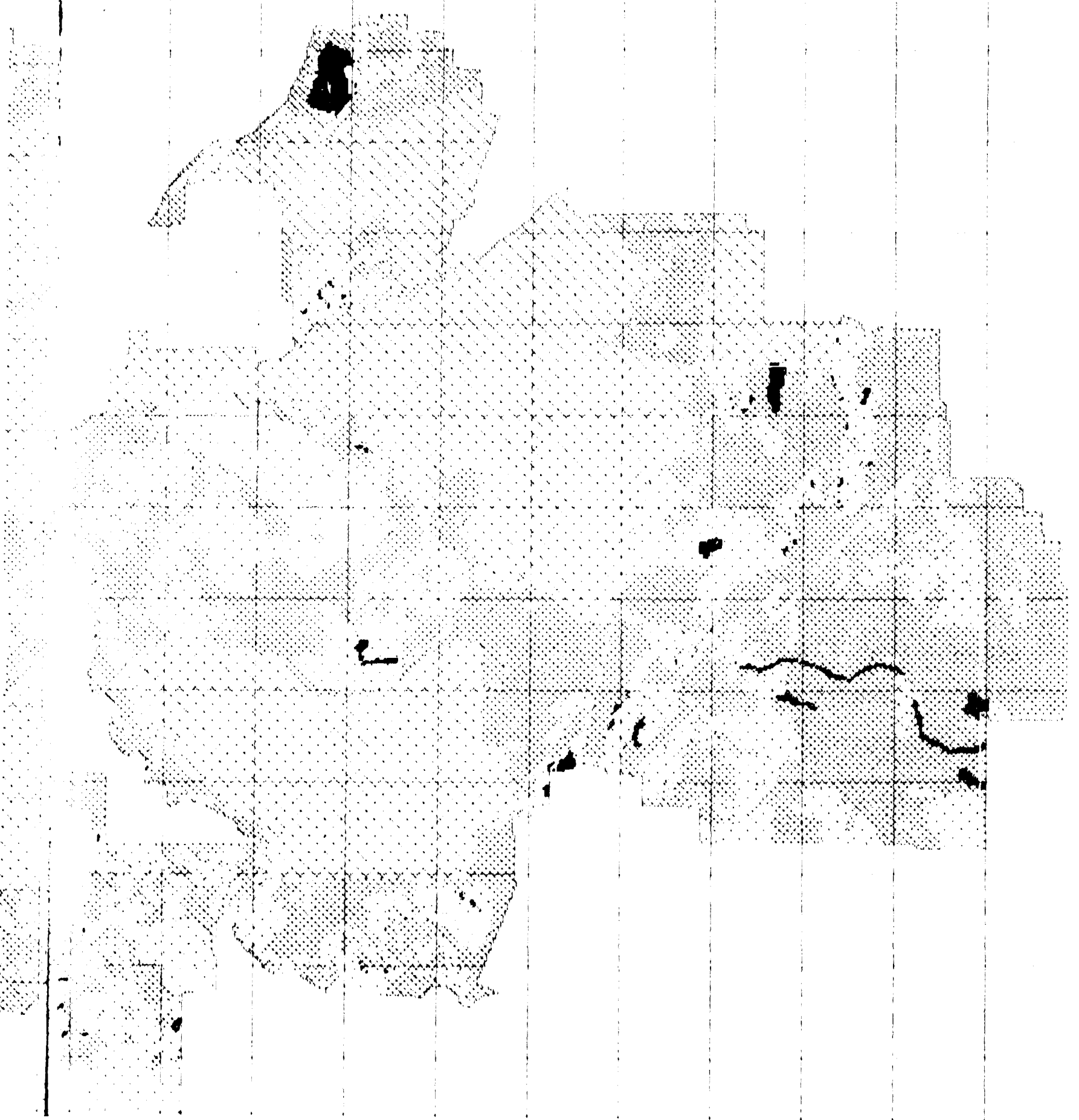
50 PASSES

METERS

0 2000 4000 6000

Final surface condition for fifty passes





546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

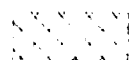
5202

5200



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Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



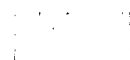
NO EROSION



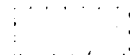
> 0 - 1



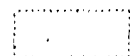
> 1 - 5



> 5 - 10



> 10 - 20



> 20 - 30



> 30 - 40



> 40

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5-5-0 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
1000 PASSES

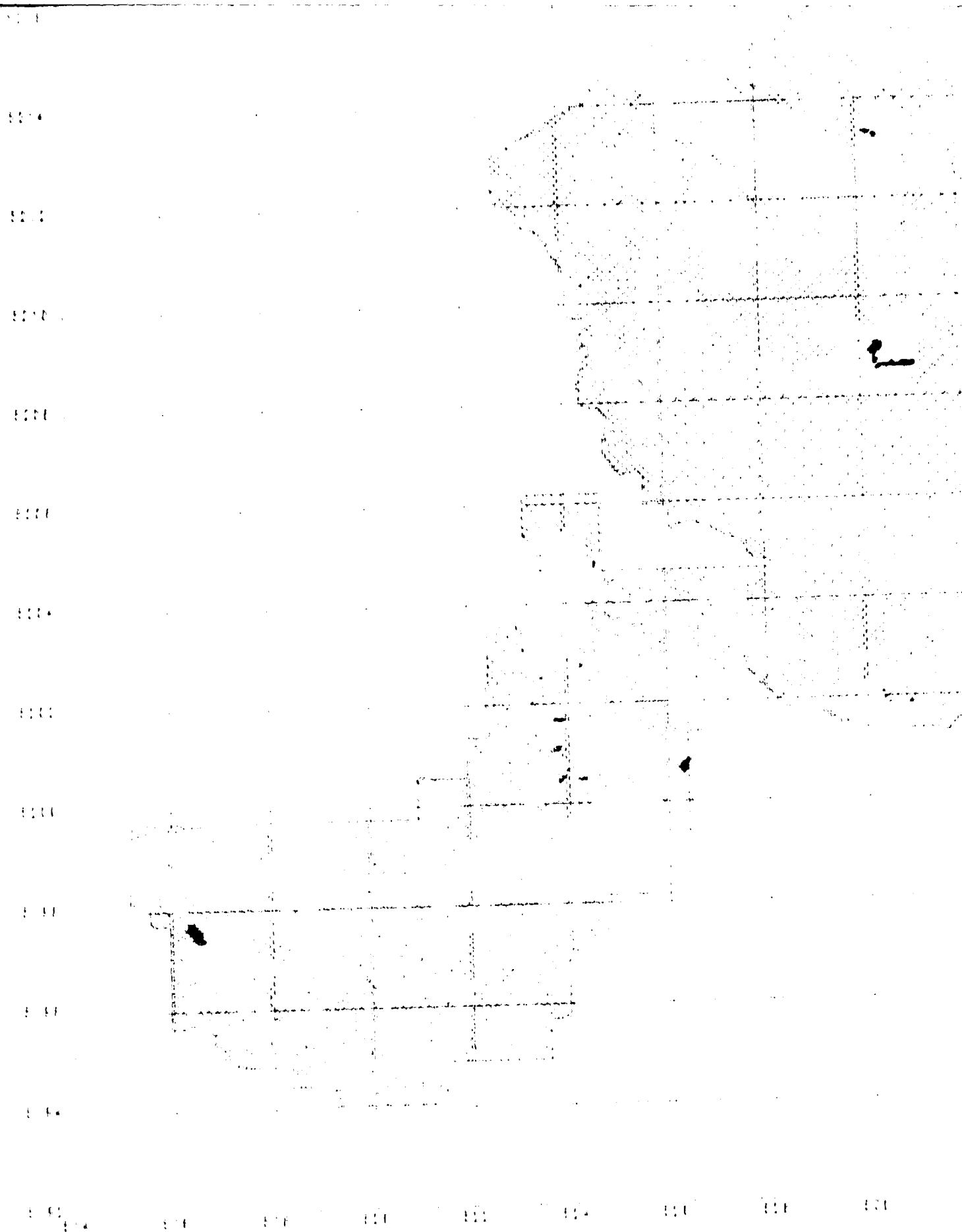
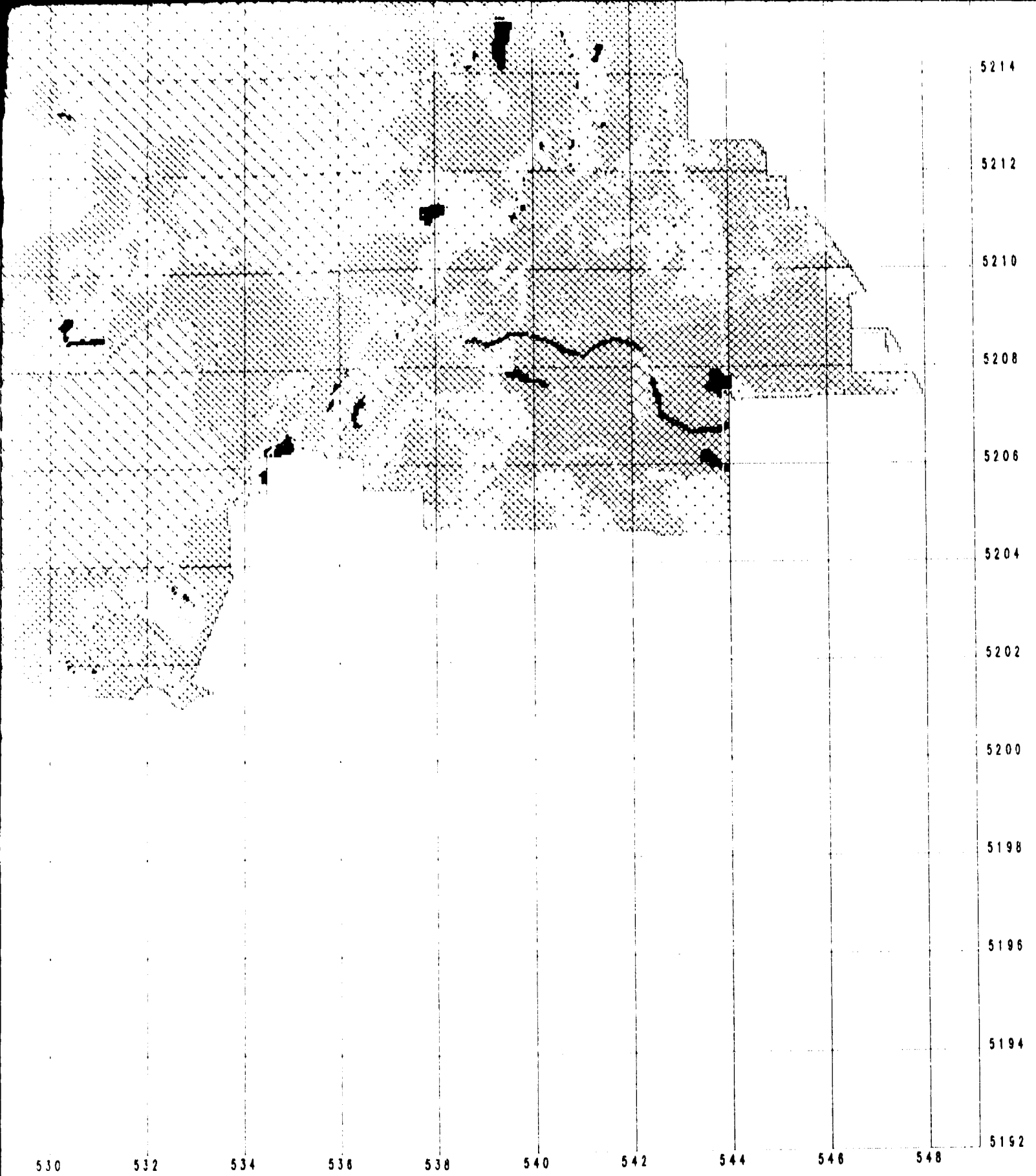


Plate 47. Rate of soil erosion



soil erosion for the 5-5-0 force structure in the dry normal surface condition for one

OFF LIMITS

5214

NO EROSION

> 10 - 20

> 0 - 1

> 20 - 30

5212

> 1 - 5

> 30 - 40

> 40

5210

FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

1000 PASSES

5208

5206

5204

5202

5200

5198

5196

5194

5192

548

N

METERS

0 2000 4000 6000

N

housan

condition for one thousand passes

5224⁵¹⁴

516

518

520

522

524

526

528

530

5222

5220

5218

5216

5214

5212

5210

5208

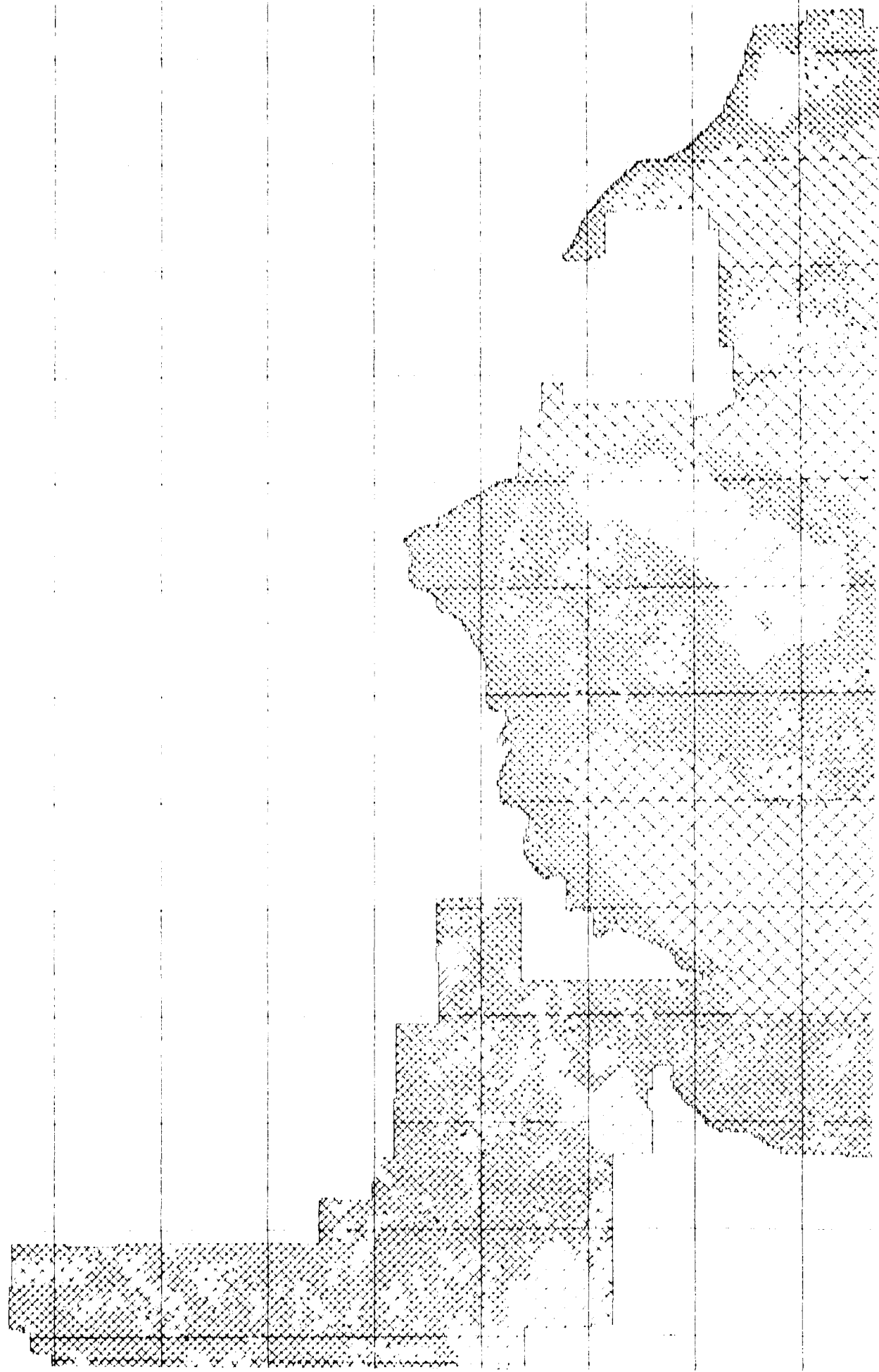
5206

5204

5202

5200

5198



528

530

532

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536

538

540

542

544

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548



546

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5222

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5216

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5210

5208

5206

5204

5202

5200



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Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



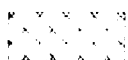
> 5 - 10



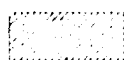
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

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5-5-0 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
10 PASSES

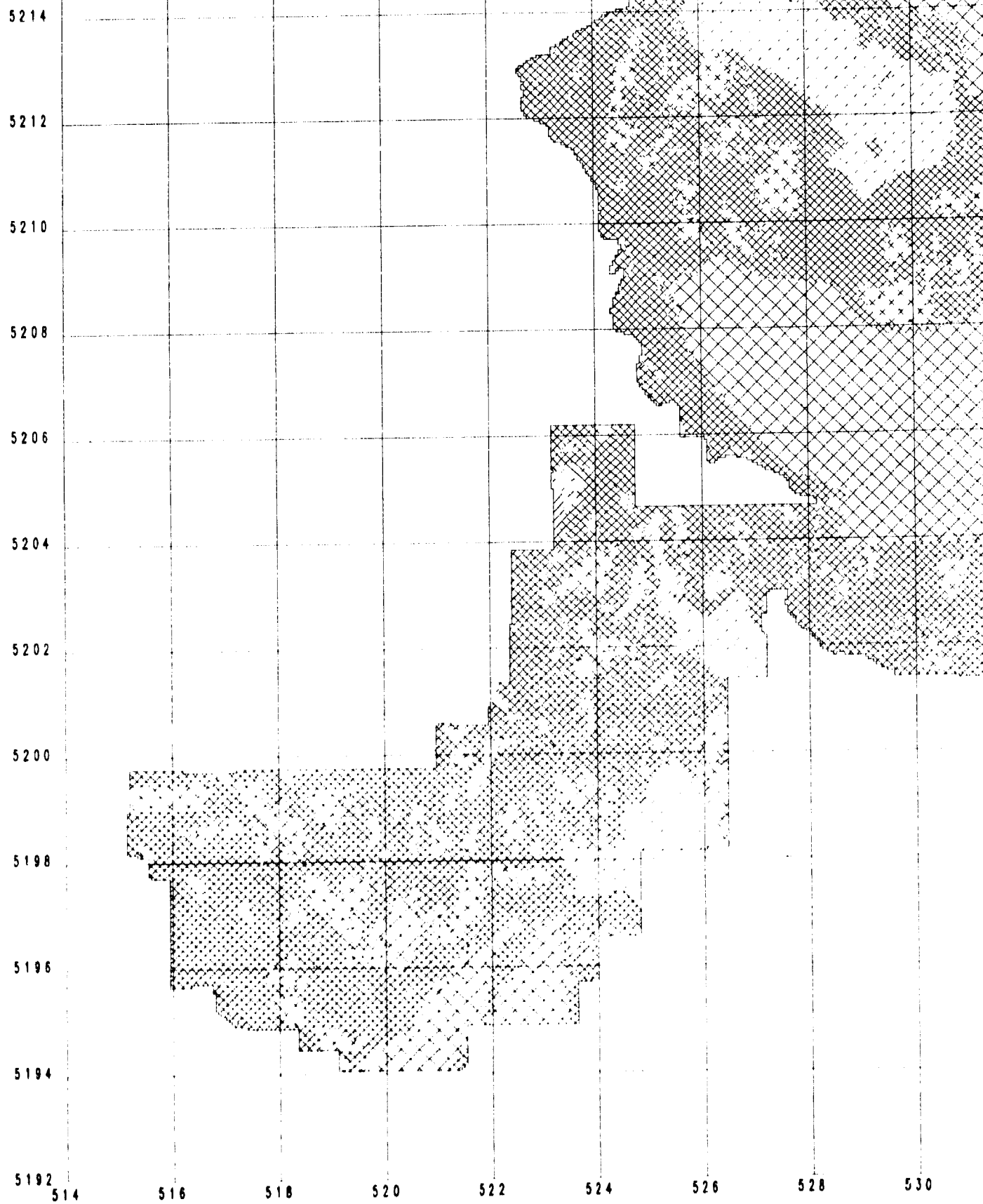
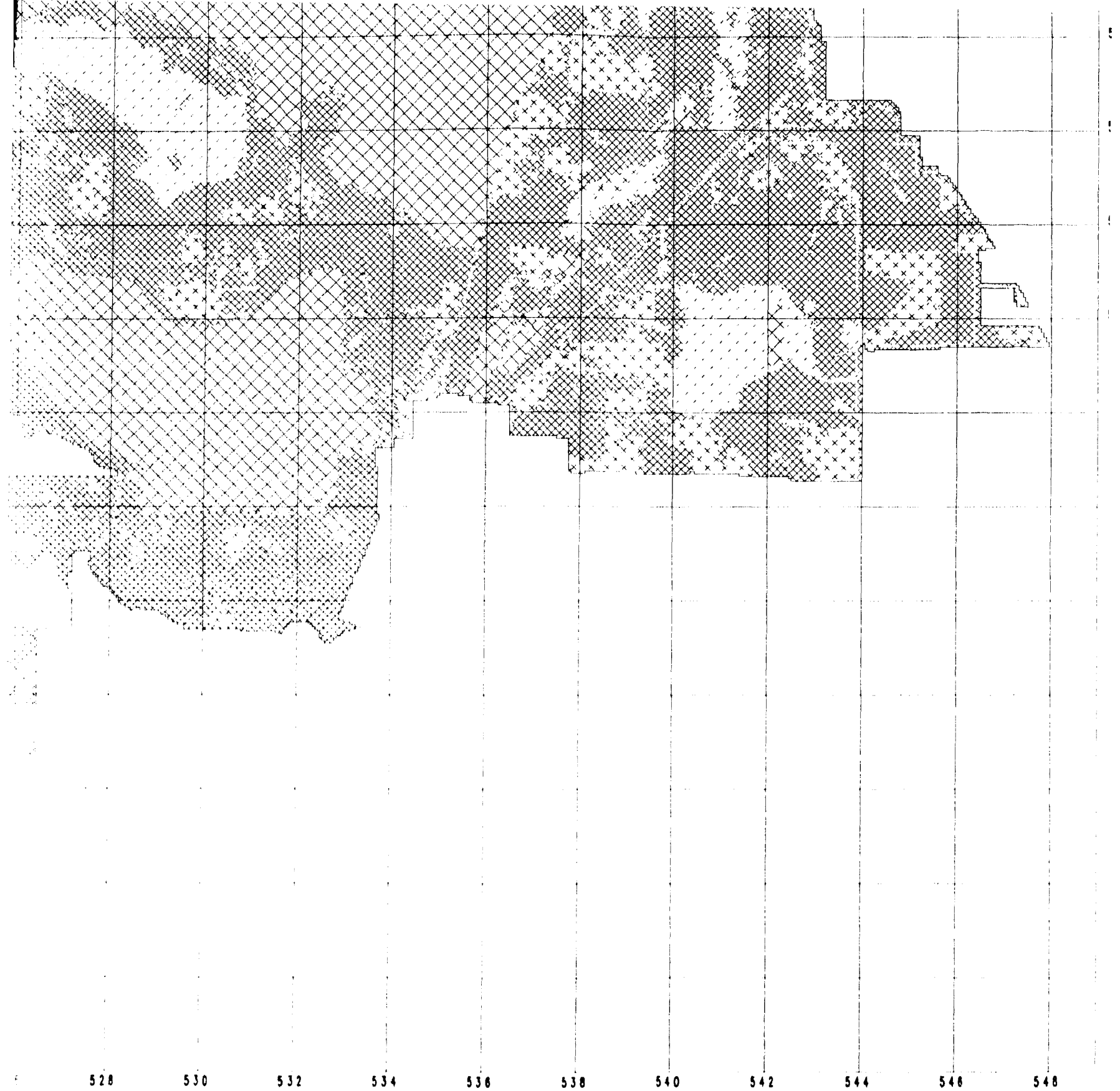
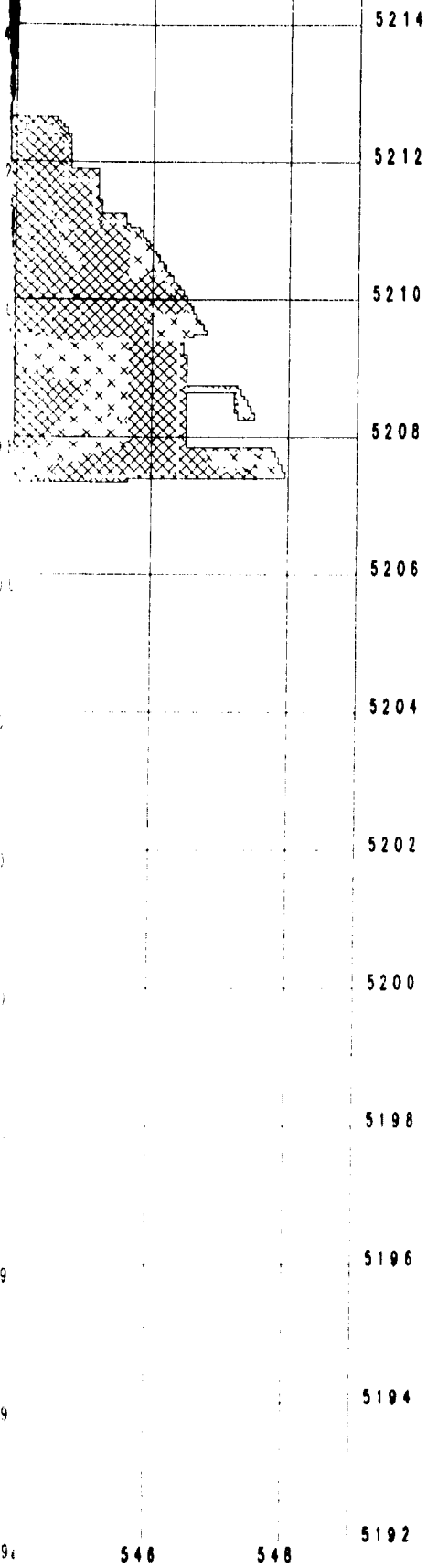


plate 48. Rate of soil erosion 1



Rate of soil erosion for the 5-5-0 force structure in the wet slippery surface condition for



> 0 - 1

> 1 - 5



> 20 - 30



> 30 - 40



> 40

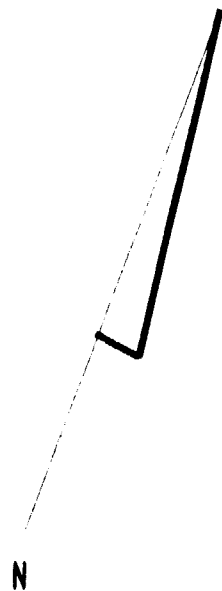
FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

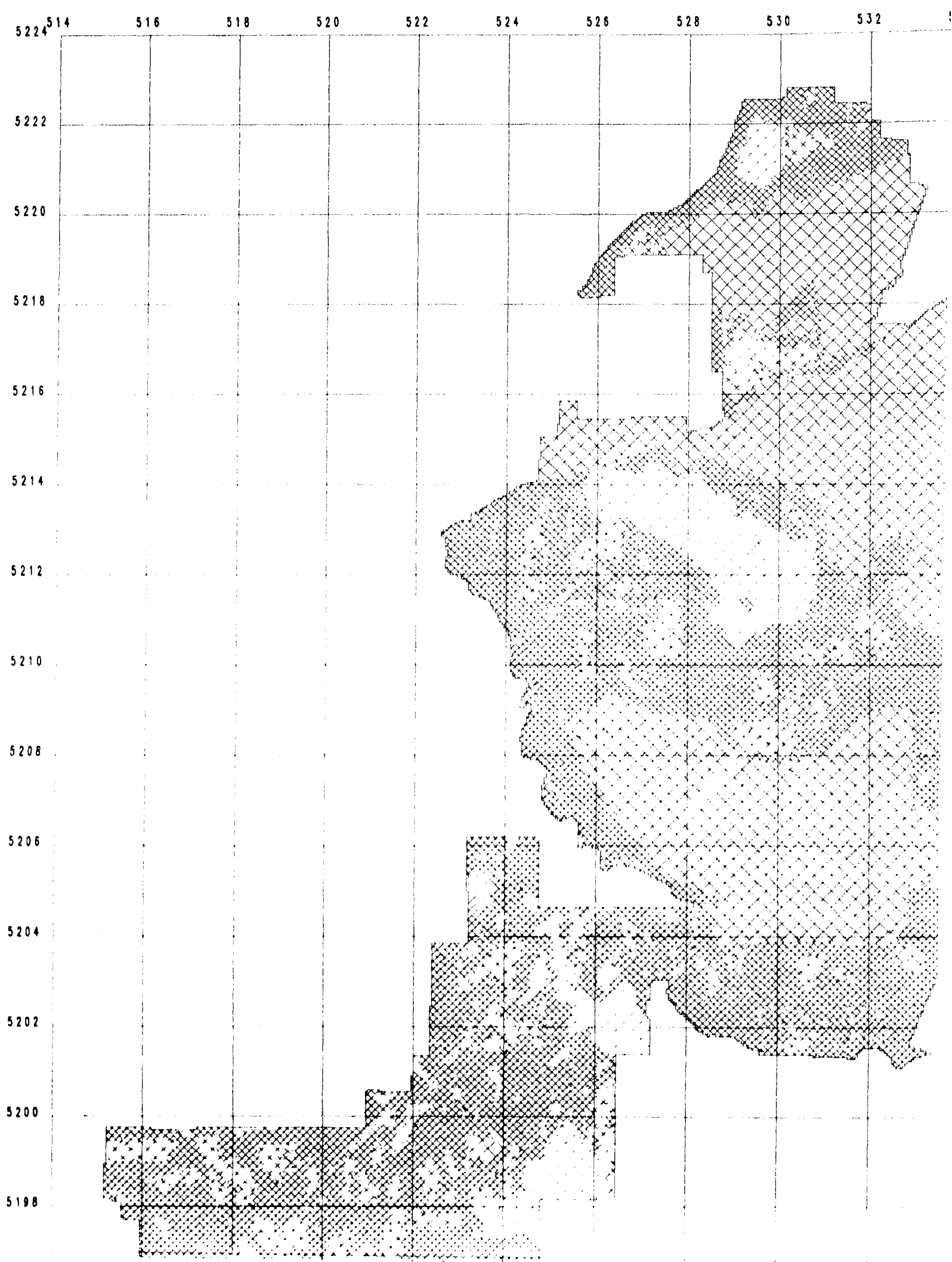
10 PASSES



METERS



face condition for ten passes



528

530

532

534

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538

540

542

544

546

548

5

5

5

5

5

5

5

5

5

5

5

5

5

546

548

5224

5222

5220

5218

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5210

5208

5206

5204

5202

5200

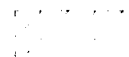


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Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



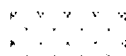
> 5 - 10



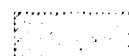
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



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FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

50 PASSES

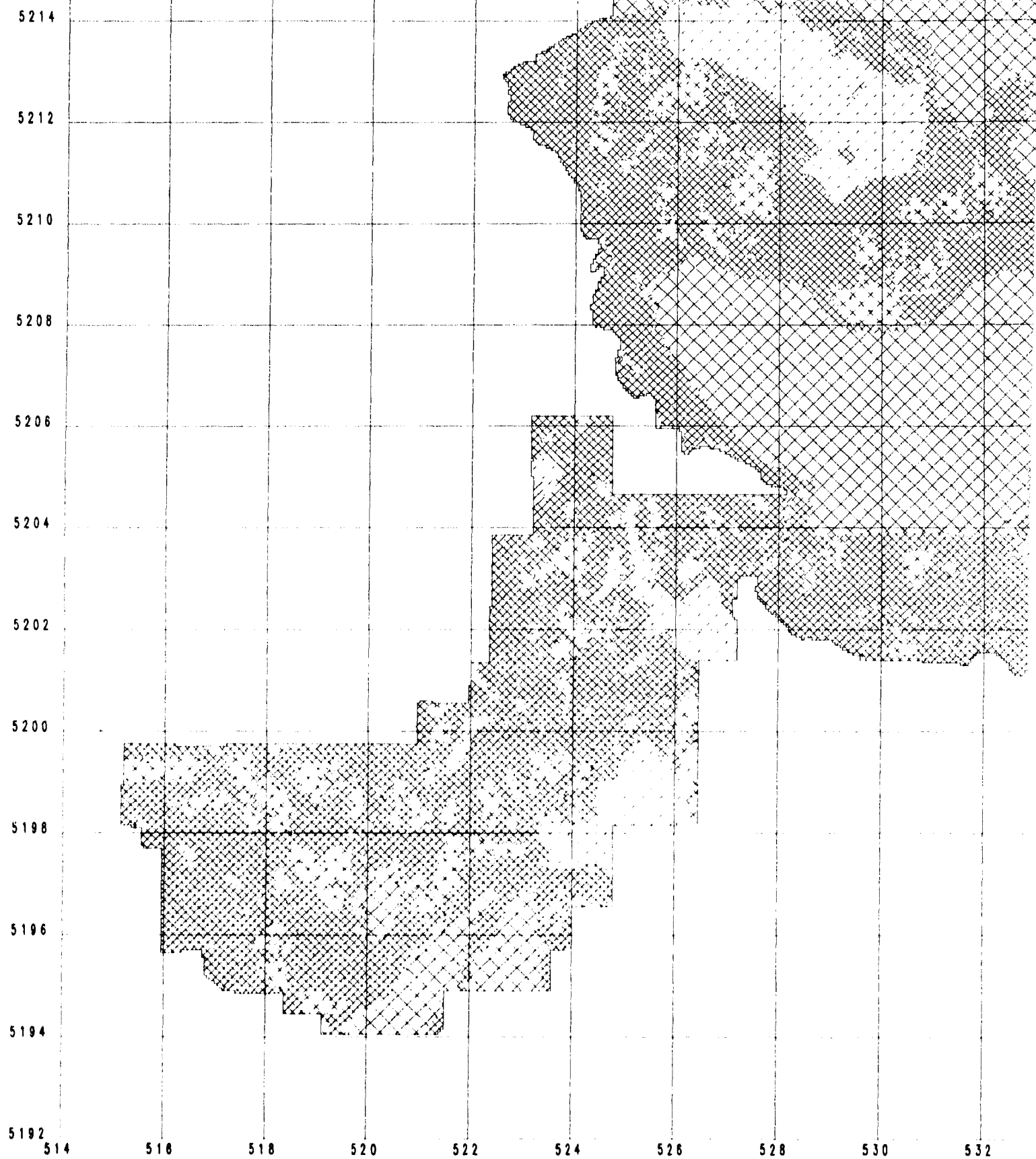
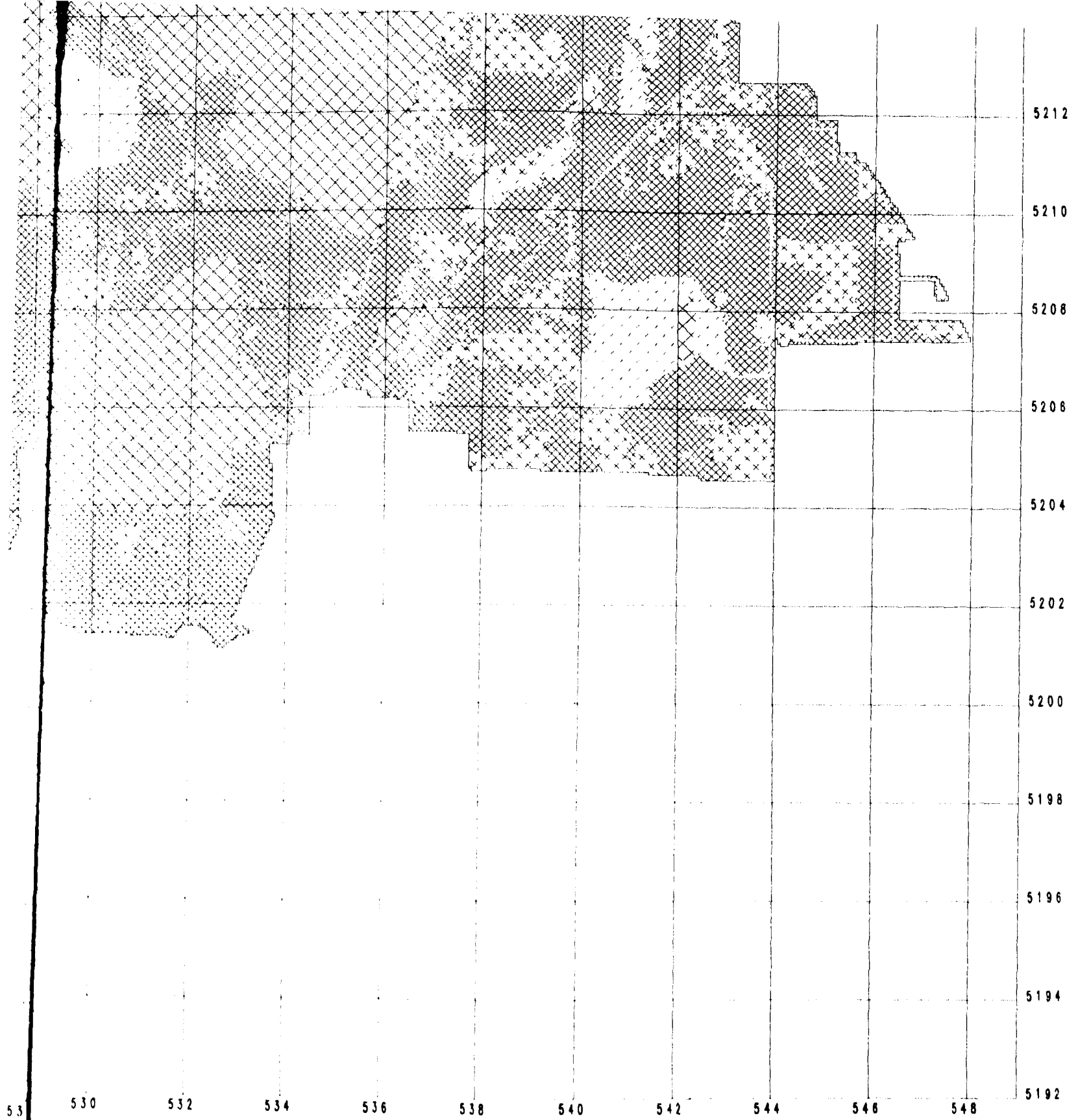
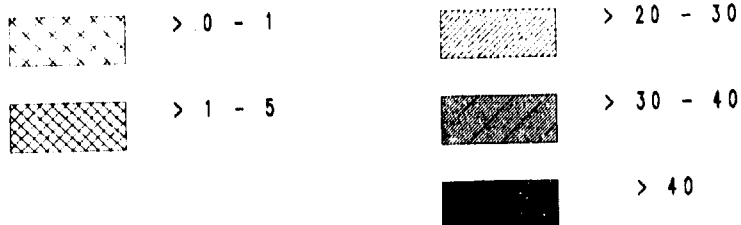
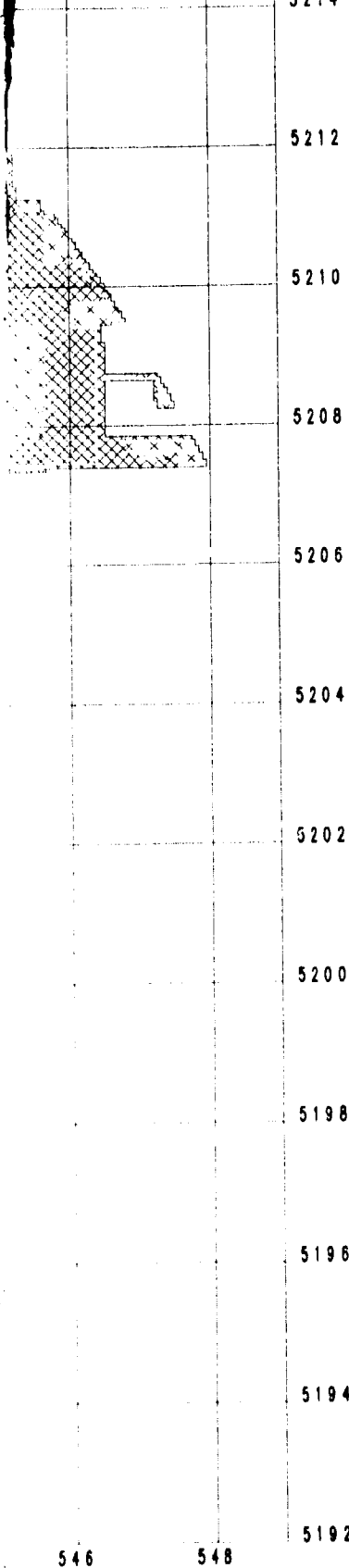


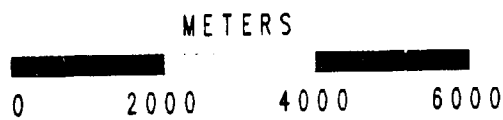
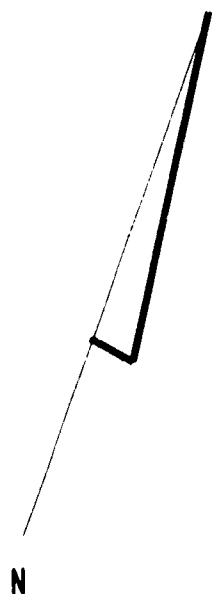
Plate 49. Rate of soil erosion for t



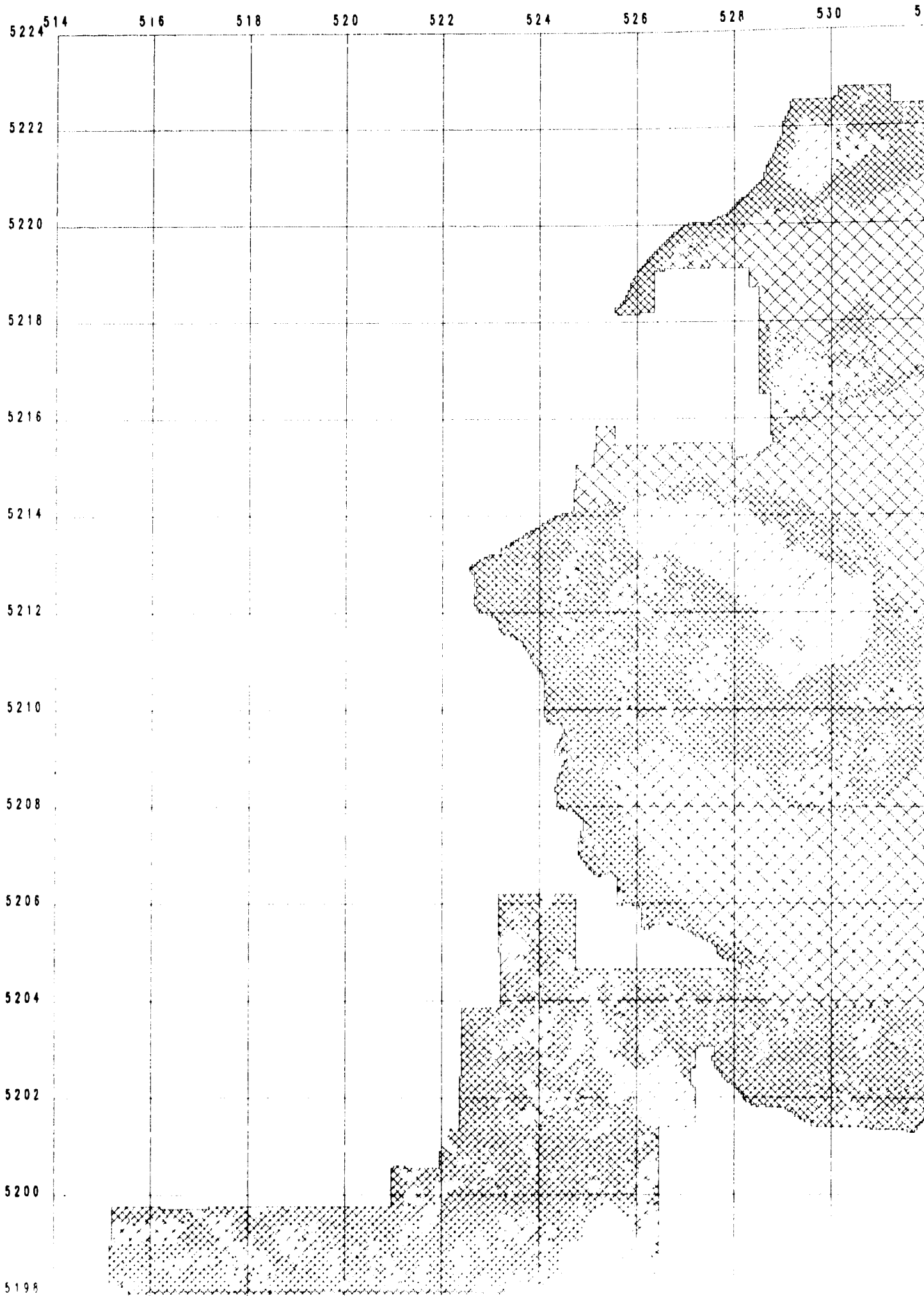
5-11 erosion for the 5-5-0 force structure in the wet slippery surface condition for fifty pa



FT. LEWIS, WASHINGTON
5-5-0 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
50 PASSES



es
face condition for fifty passes



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U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000

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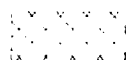
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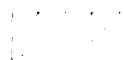
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URBAN/
OFF LIMITS



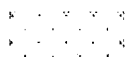
> 5 - 10



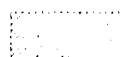
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



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FT. LEWIS, WASHINGTON
5-5-0 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
1000 PASSES

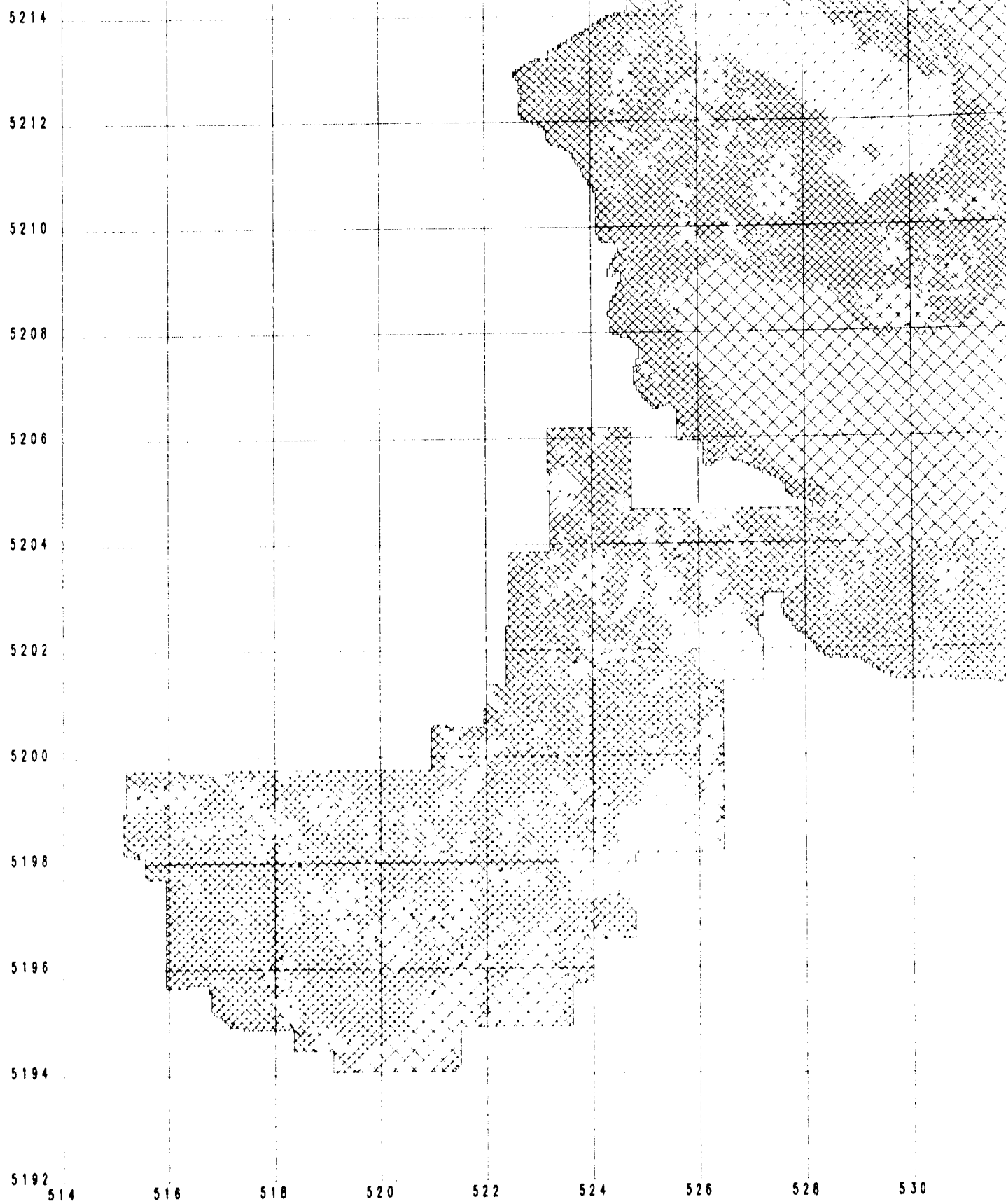
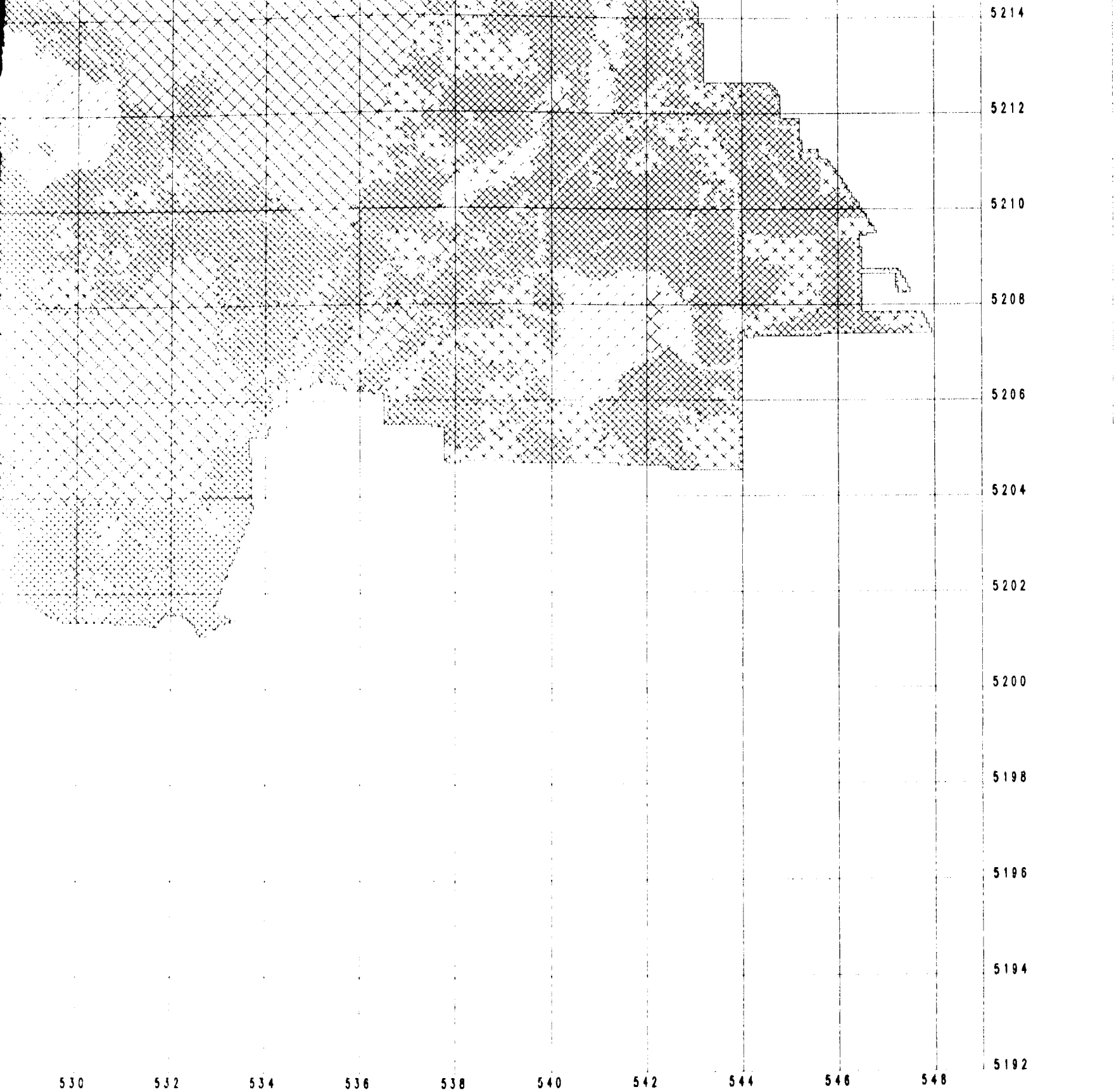
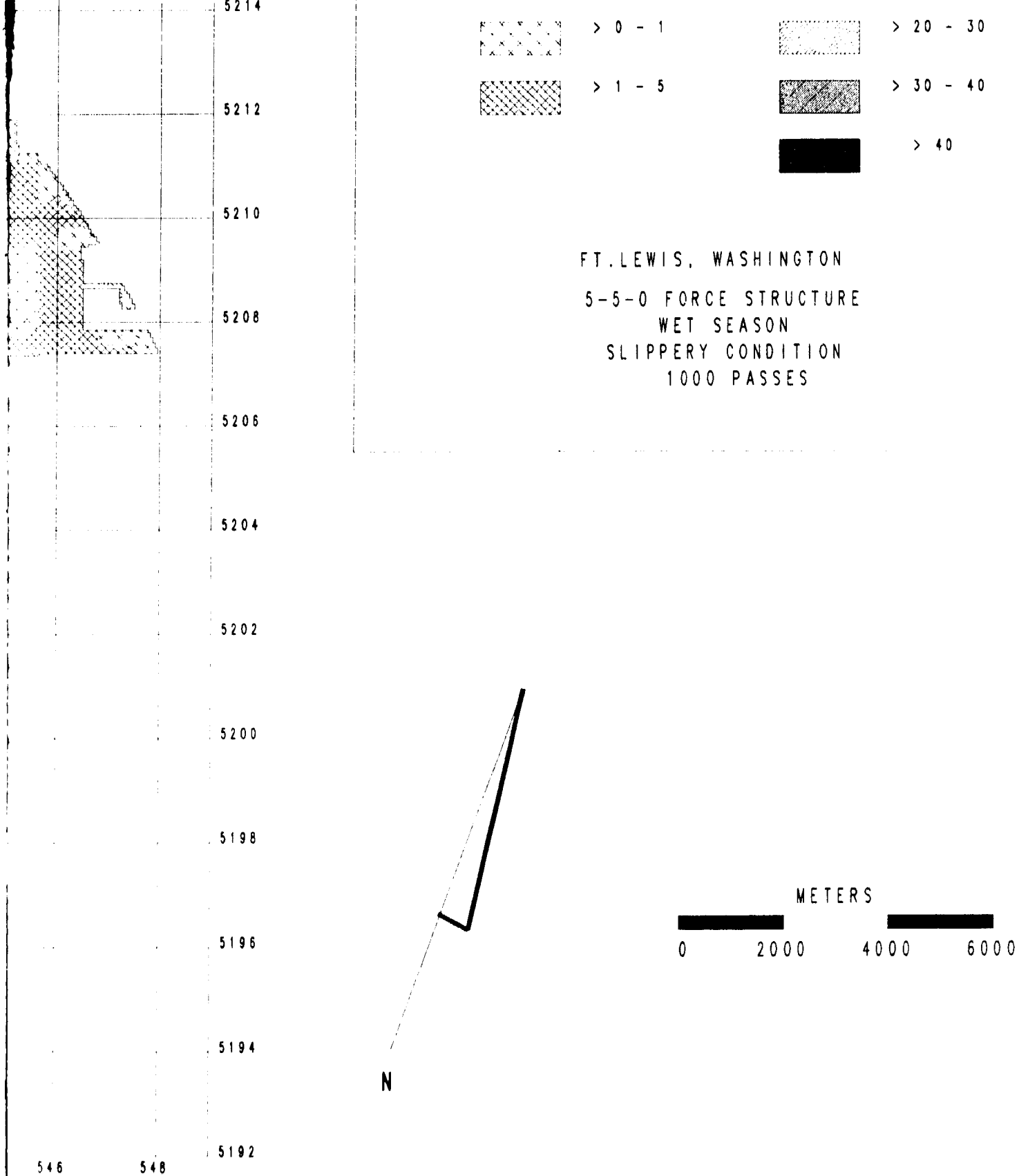


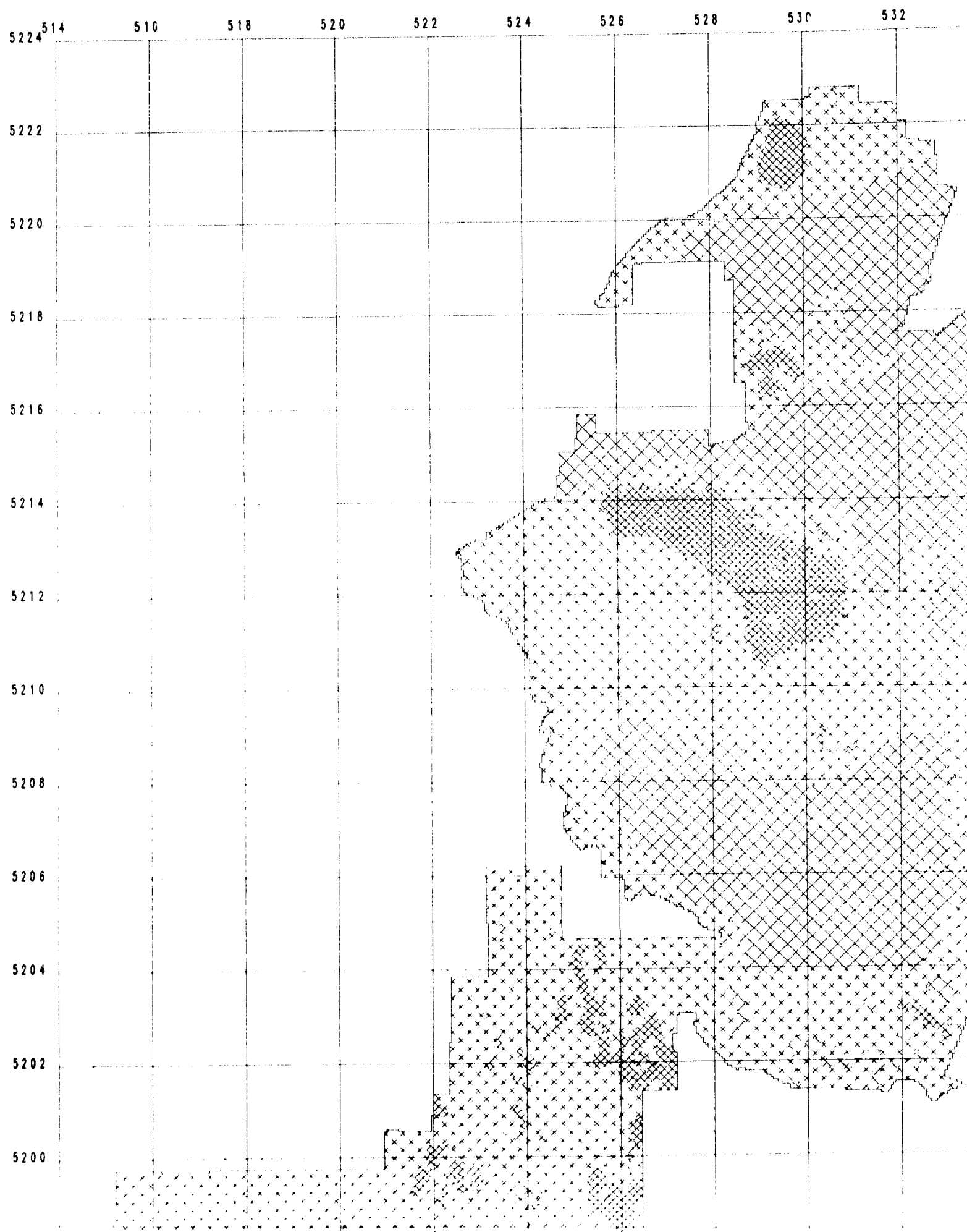
Plate 50. Rate of soil erosion for



erosion for the 5-5-0 force structure in the wet slippery surface condition for one thousand



condition for one thousand passes



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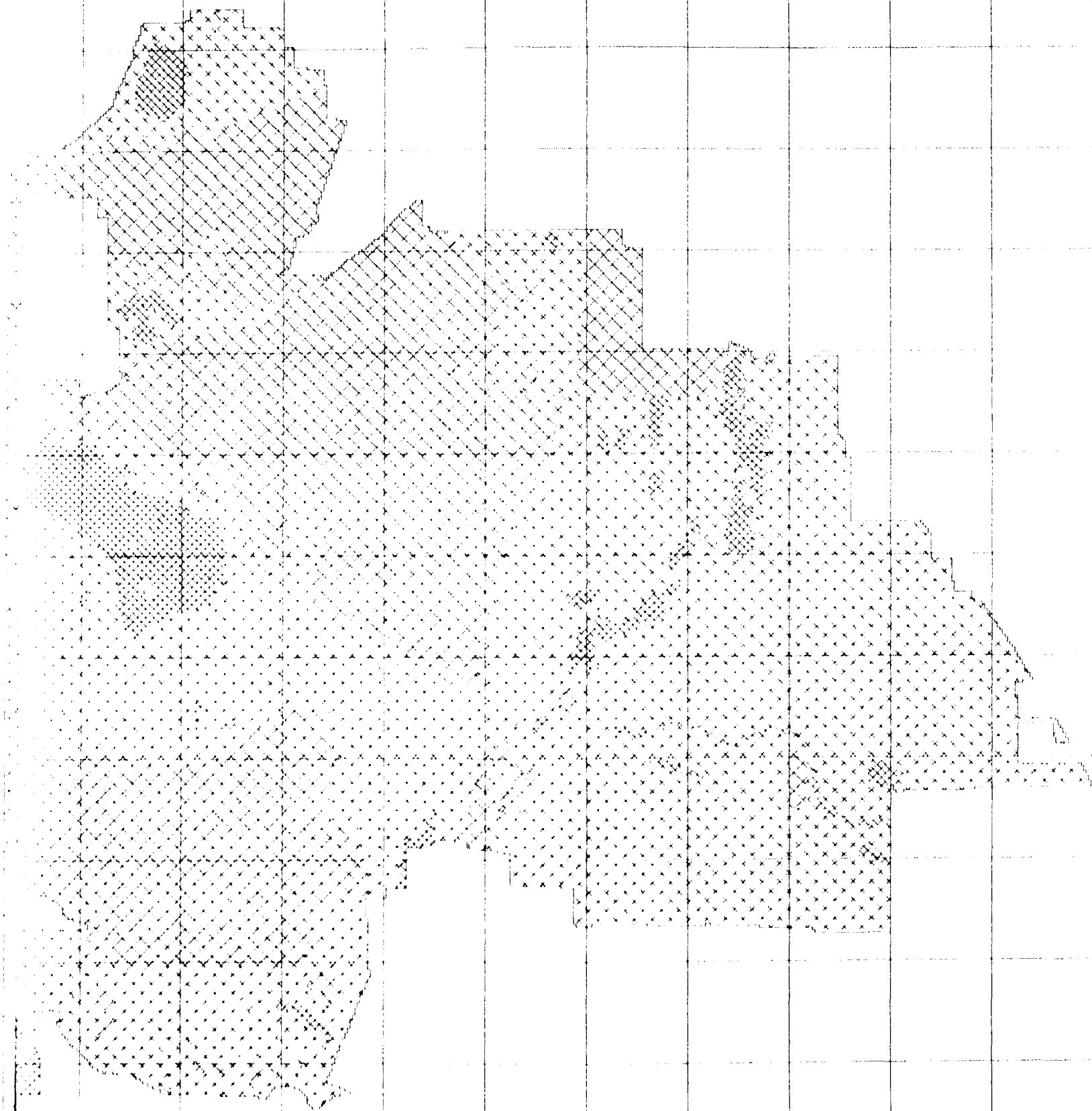
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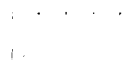


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Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000



URBAN/
OFF LIMITS



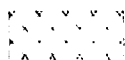
> 5 - 10



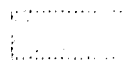
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

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3-3-5 FORCE STRUCTURE
10 PASSES

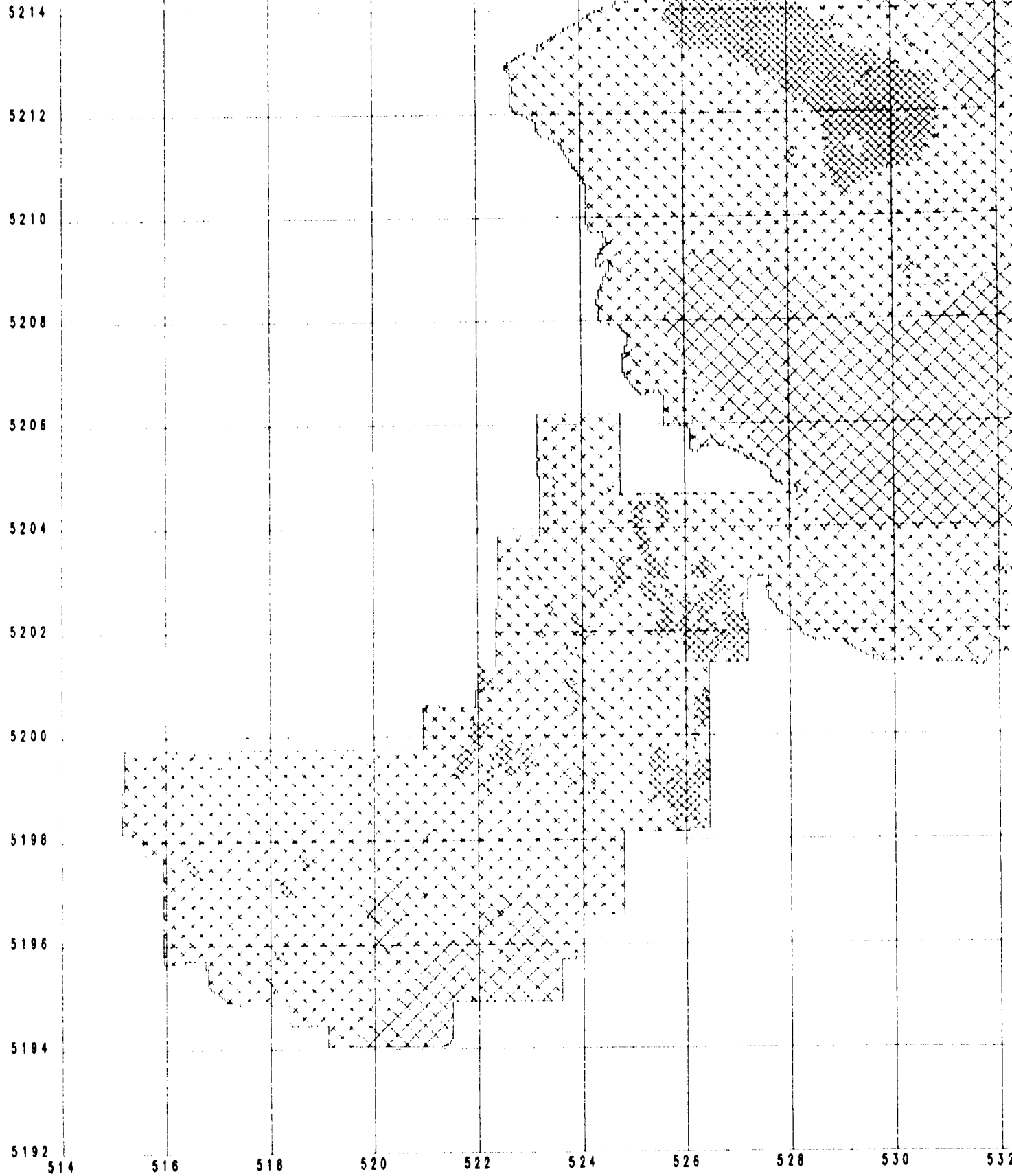


Plate 51. Soil erosion

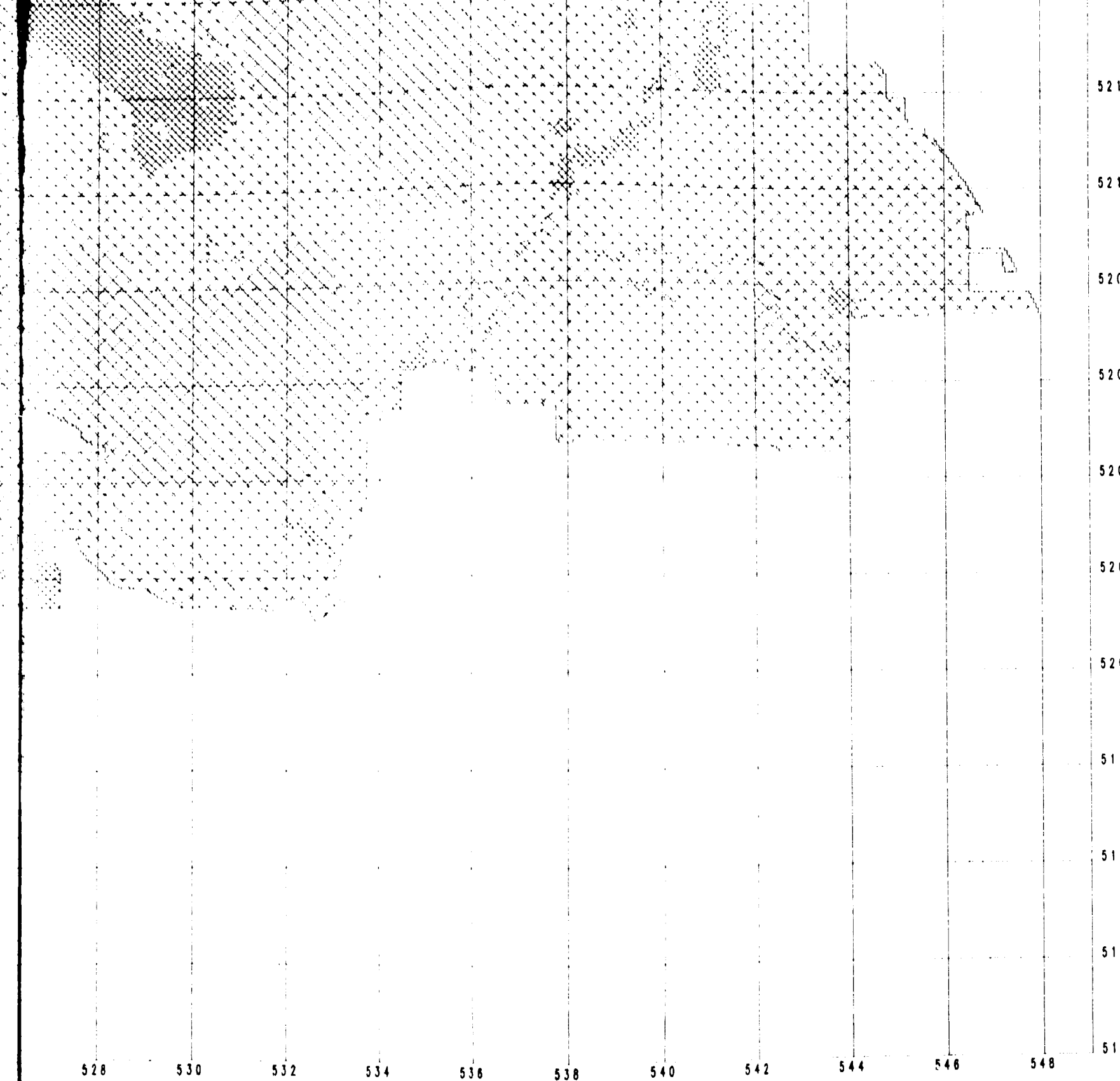
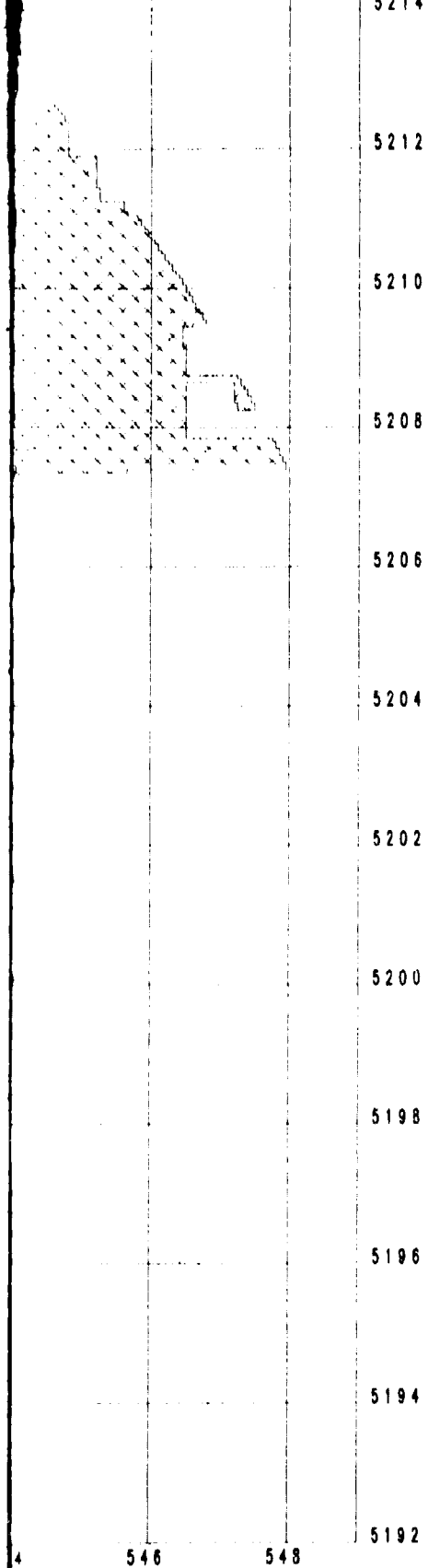
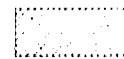


Plate 51. Soil erosion severity for 3-3-5 and 4-3-3 (HMMWV) force structures for ten pass



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40

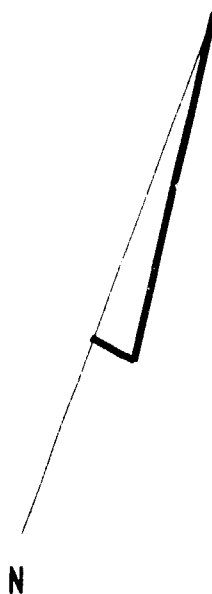


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FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

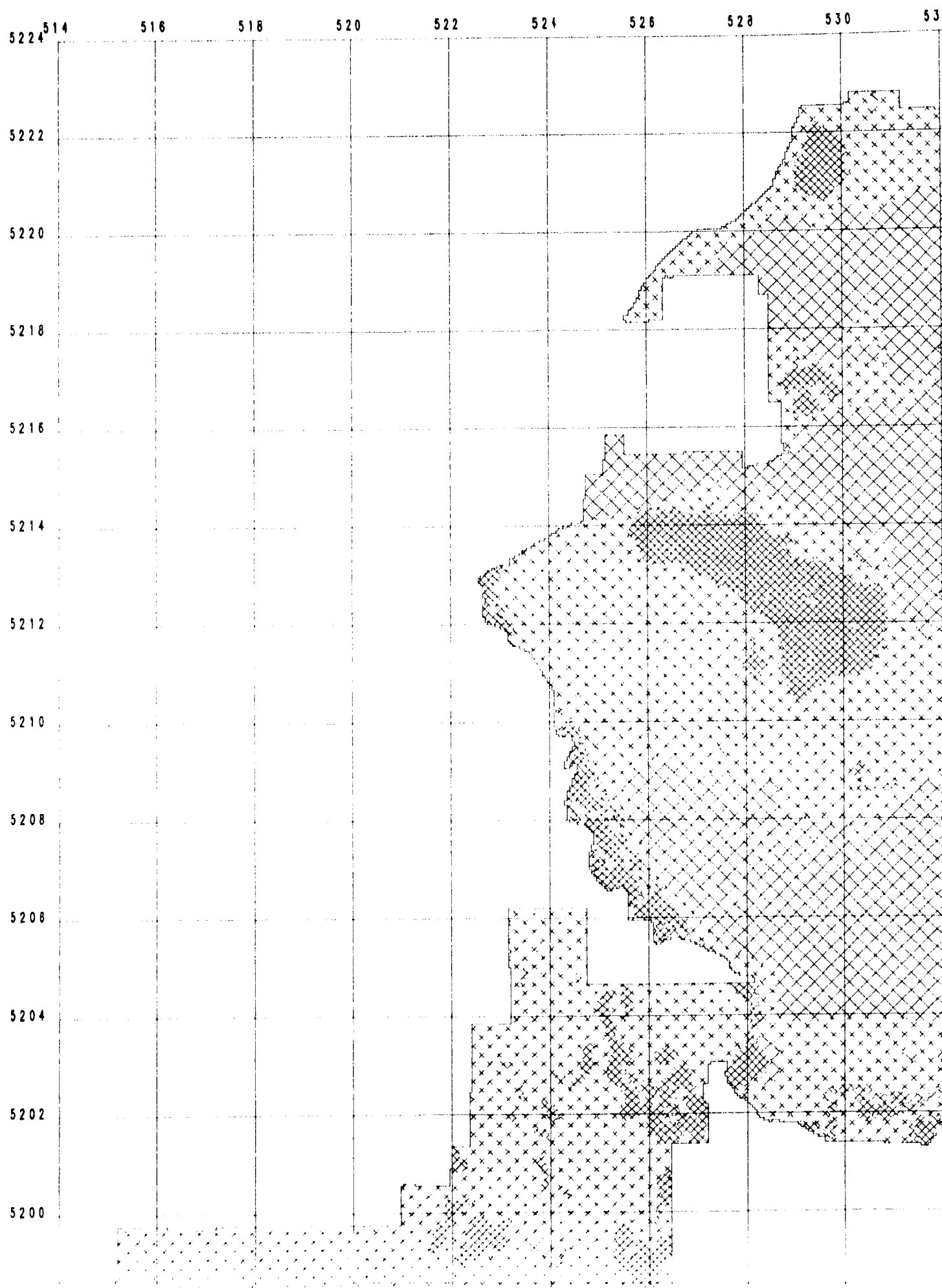
10 PASSES



METERS



structures for ten passes



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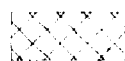
5200

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Waterways
Experiment
Station

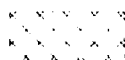
SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000



URBAN/
OFF LIMITS



NO EROSION



> 0 - 1



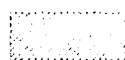
> 1 - 5



> 5 - 10



> 10 - 20



> 20 - 30



> 30 - 40



> 40

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3-3-5 FORCE STRUCTURE
50 PASSES

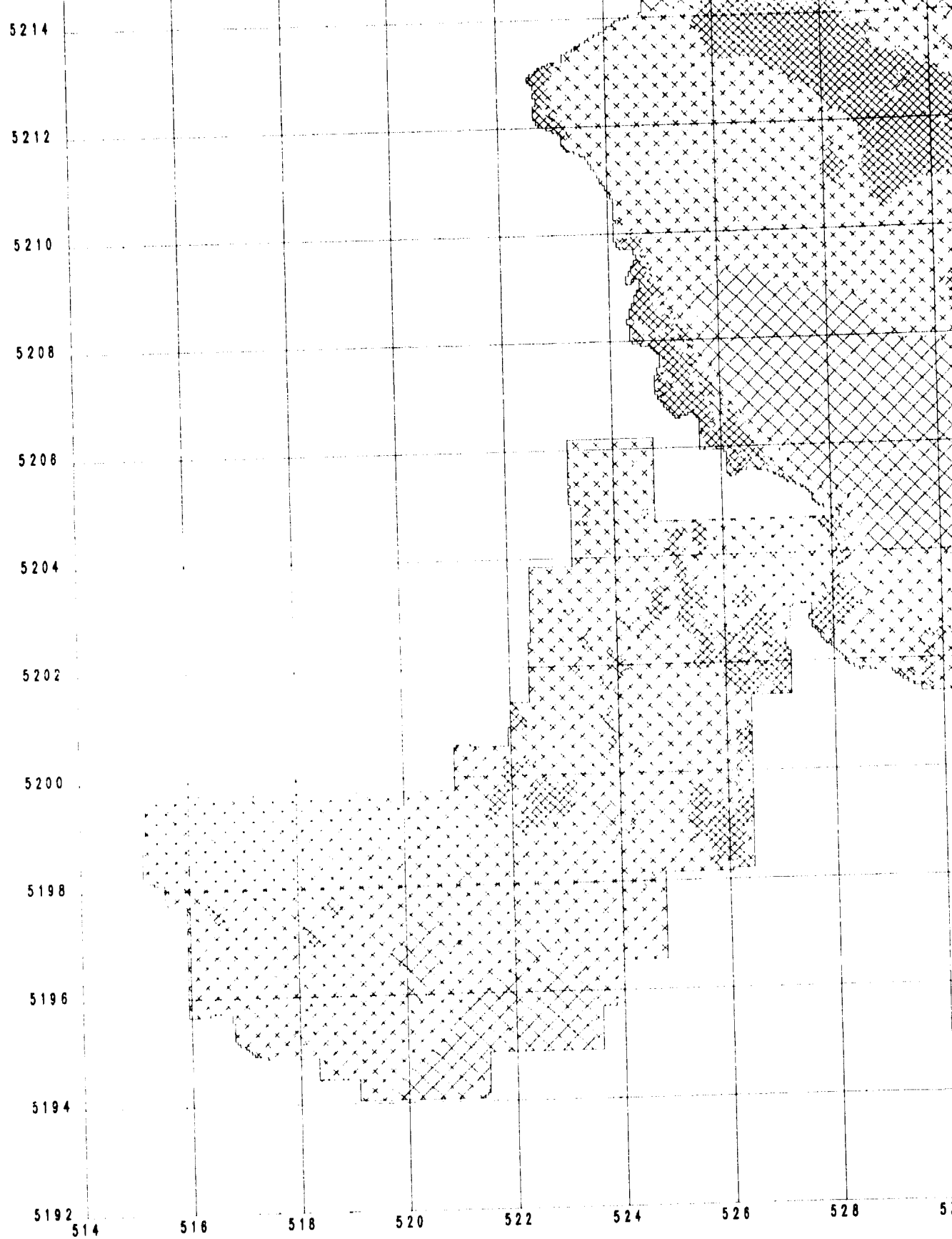


Plate 52. Soi

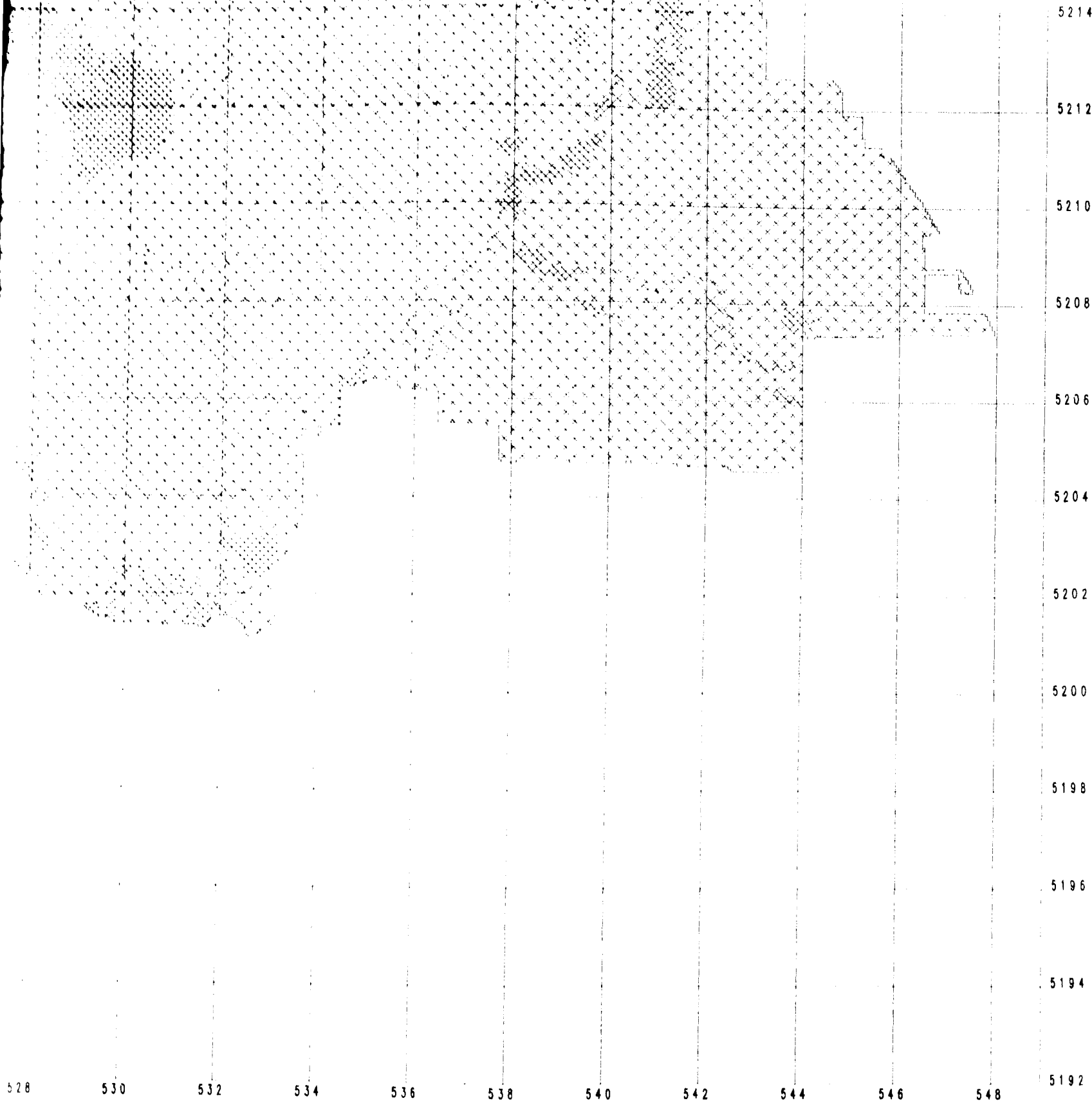
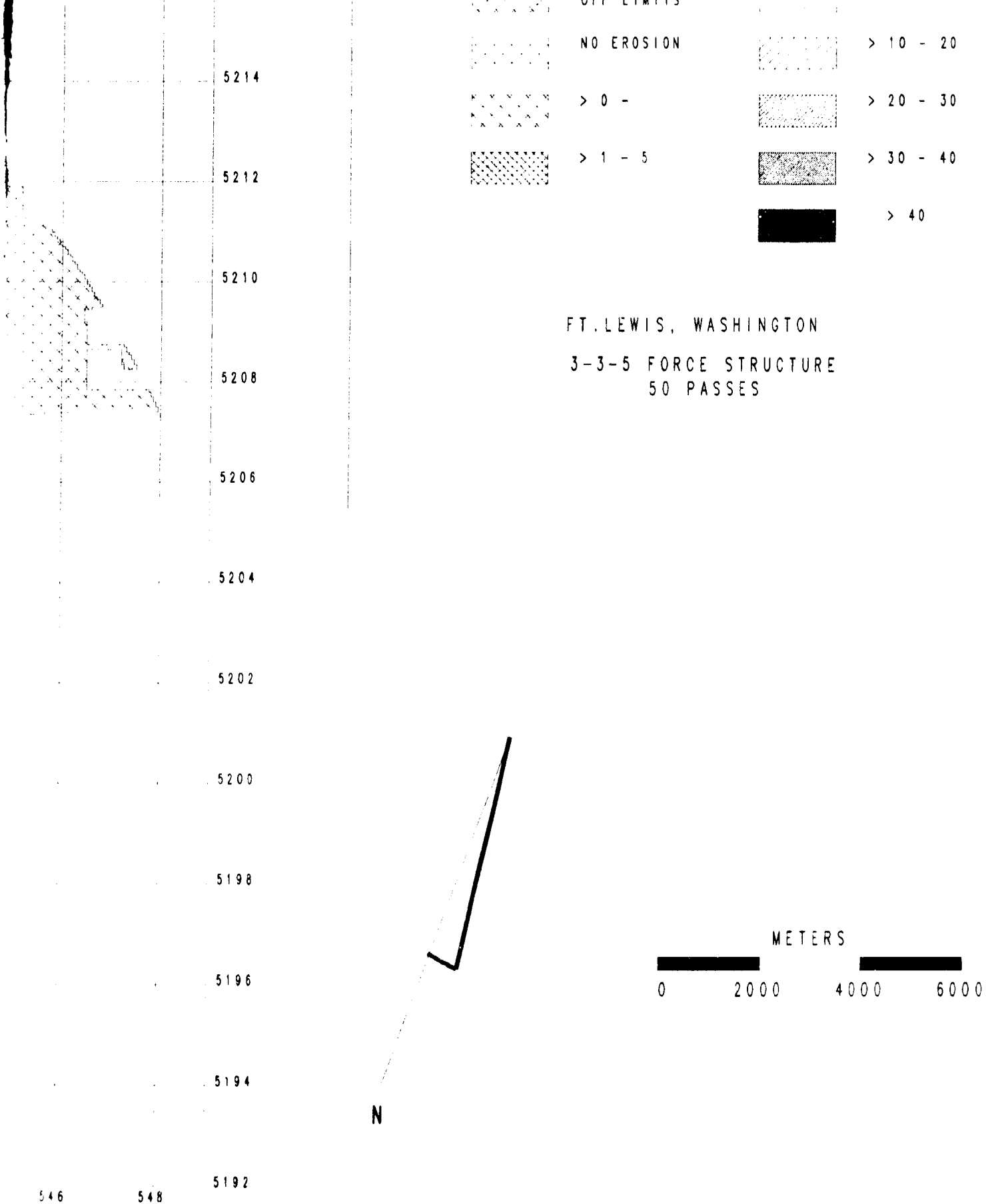


Figure 52. Soil erosion severity for 3-3-5 and 4-3-3 (HMMWV) force structures for fifty passes



res for fifty passes

5224⁵¹⁴ 516 518 520 522 524 526 528 530

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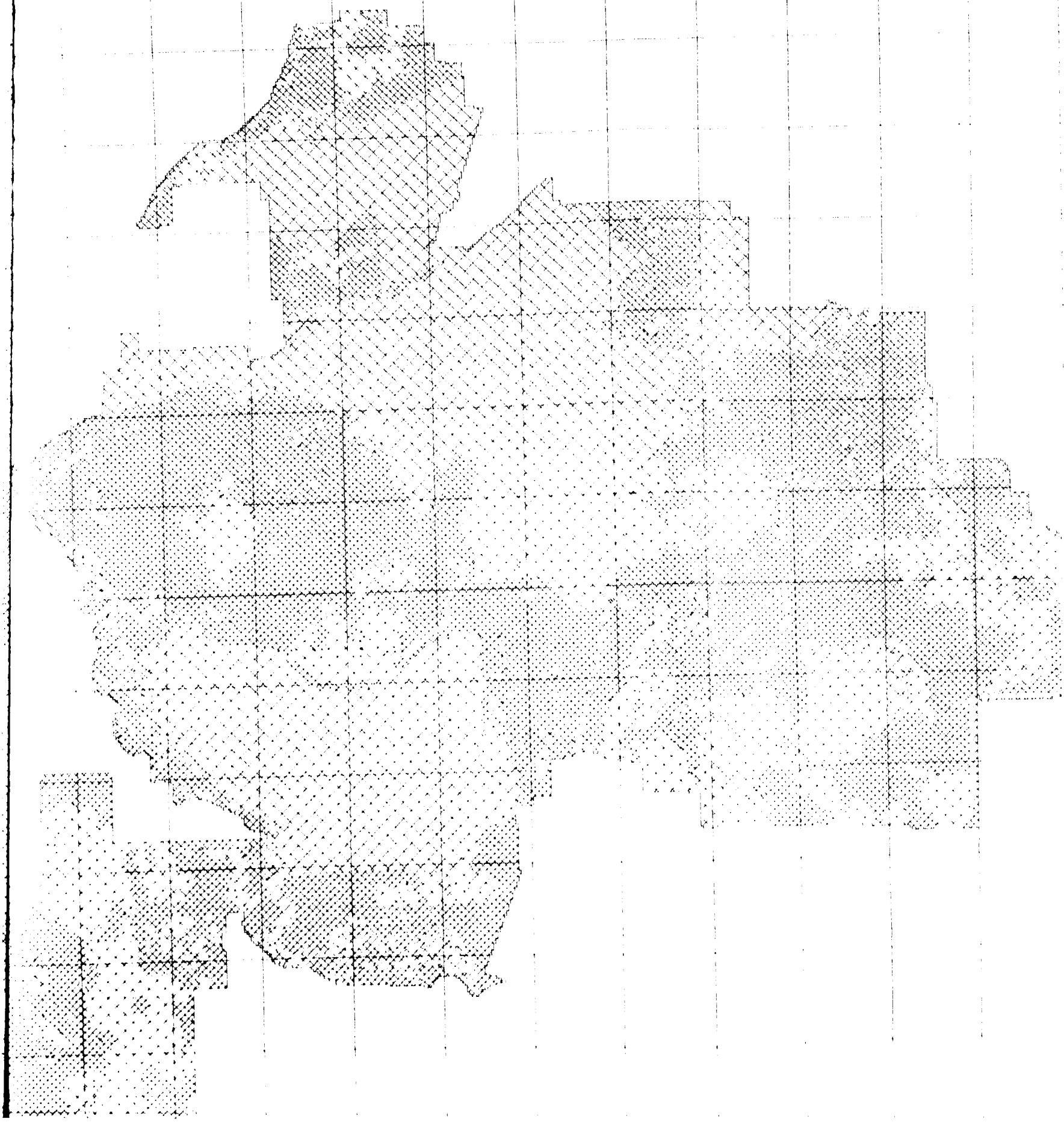
5204

5202

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524 526 528 530 532 534 536 538 540 542 544 546



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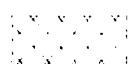
5202

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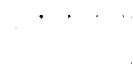


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Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000



URBAN/
OFF LIMITS



> 5 - 10



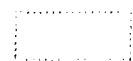
NO EROSION



> 10 - 20



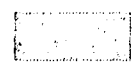
> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

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3-3-5 FORCE STRUCTURE
1000 PASSES

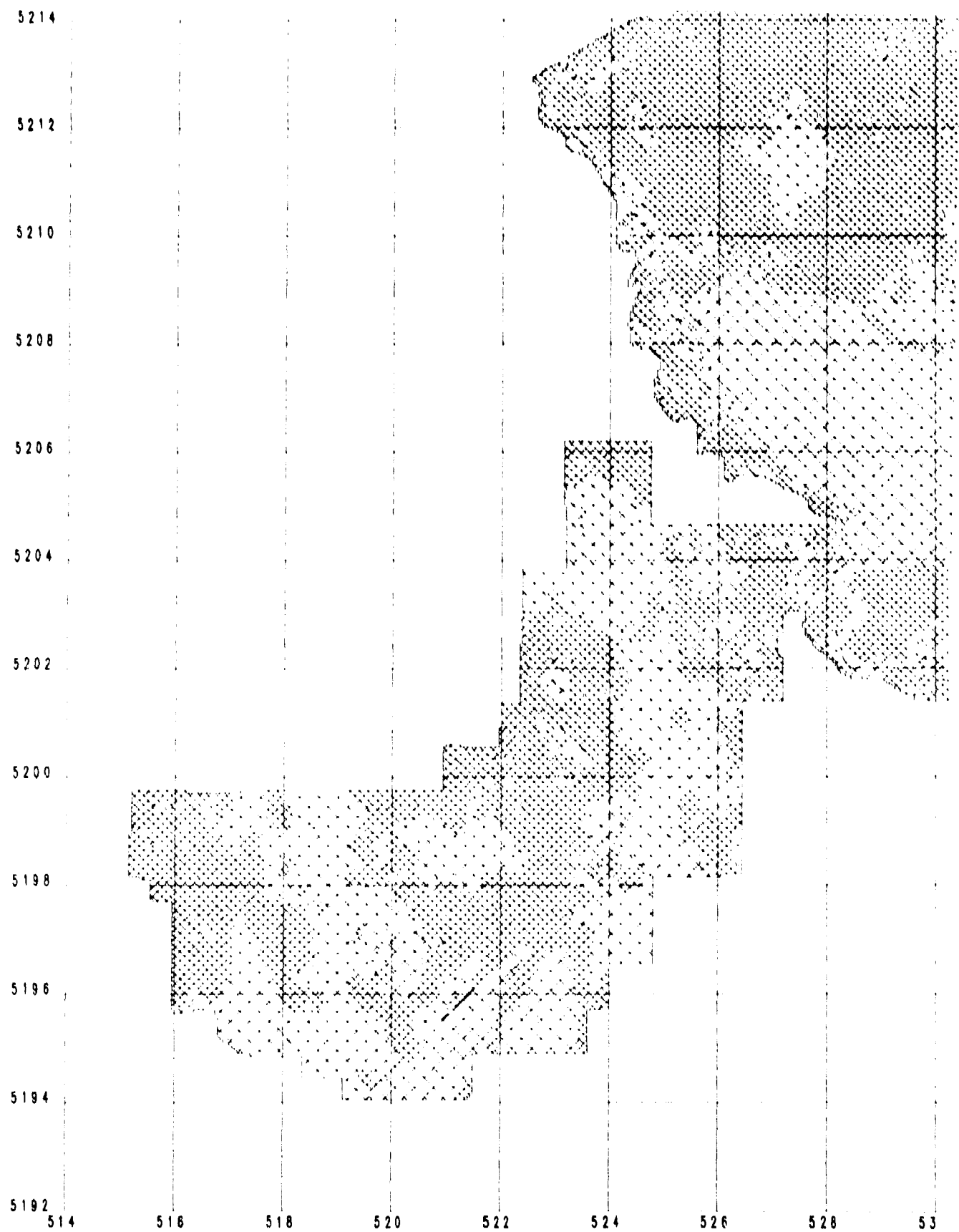


Plate 53. Soil e



Soil erosion severity for 3-3-5 and 4-3-3 (HMMWV) force structures for one thousand passes

5214

> 0 - 1

> 20 - 30

5212

> 1 - 5

> 30 - 40

5210

> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE
1000 PASSES

5208

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METERS

0 2000 4000 6000

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res for one thousand passes

5224⁵¹⁴ 516 518 520 522 524 526 528 530 532

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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000



URBAN/
OFF LIMITS



> 5 - 10



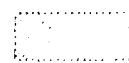
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



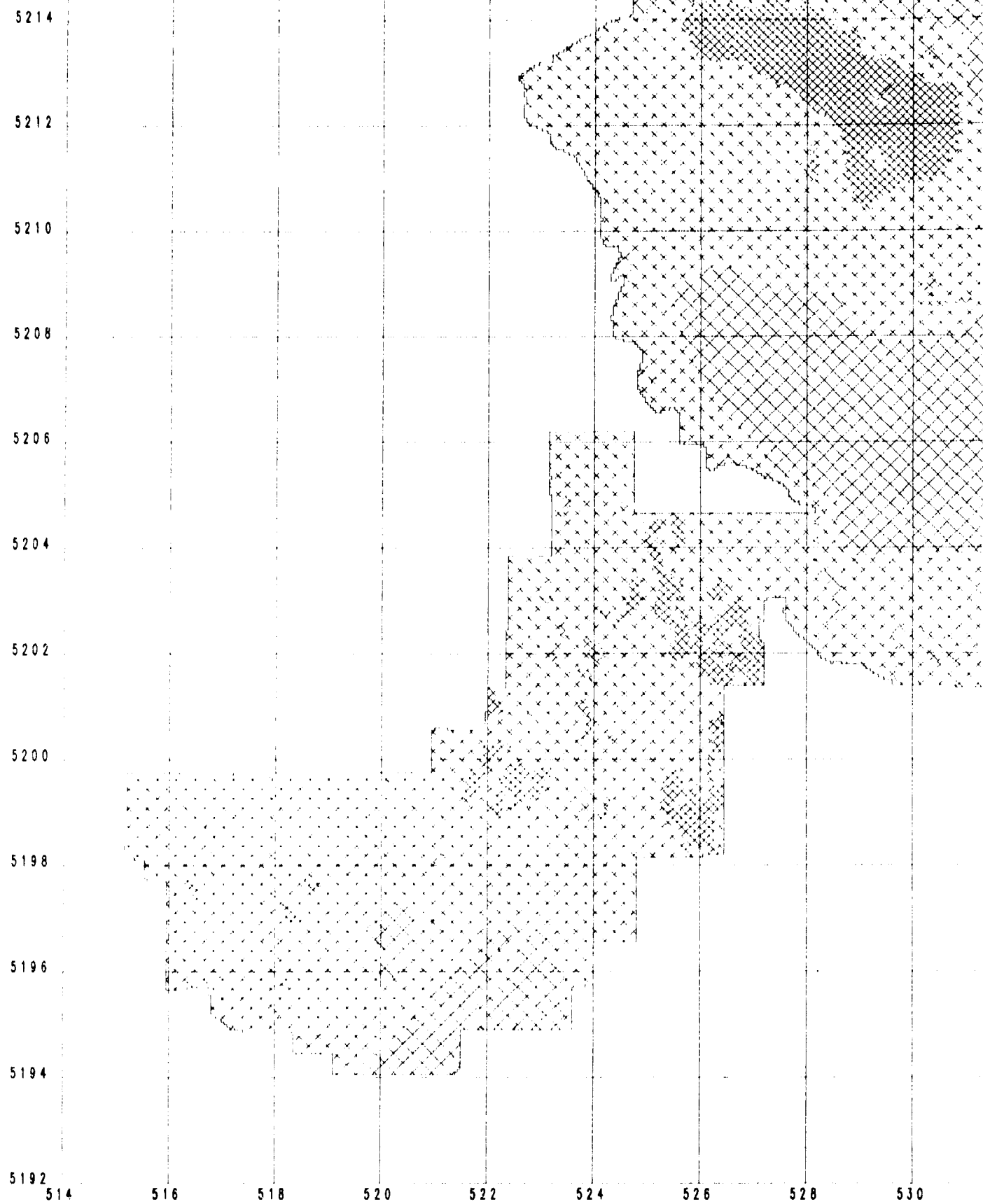
> 30 - 40

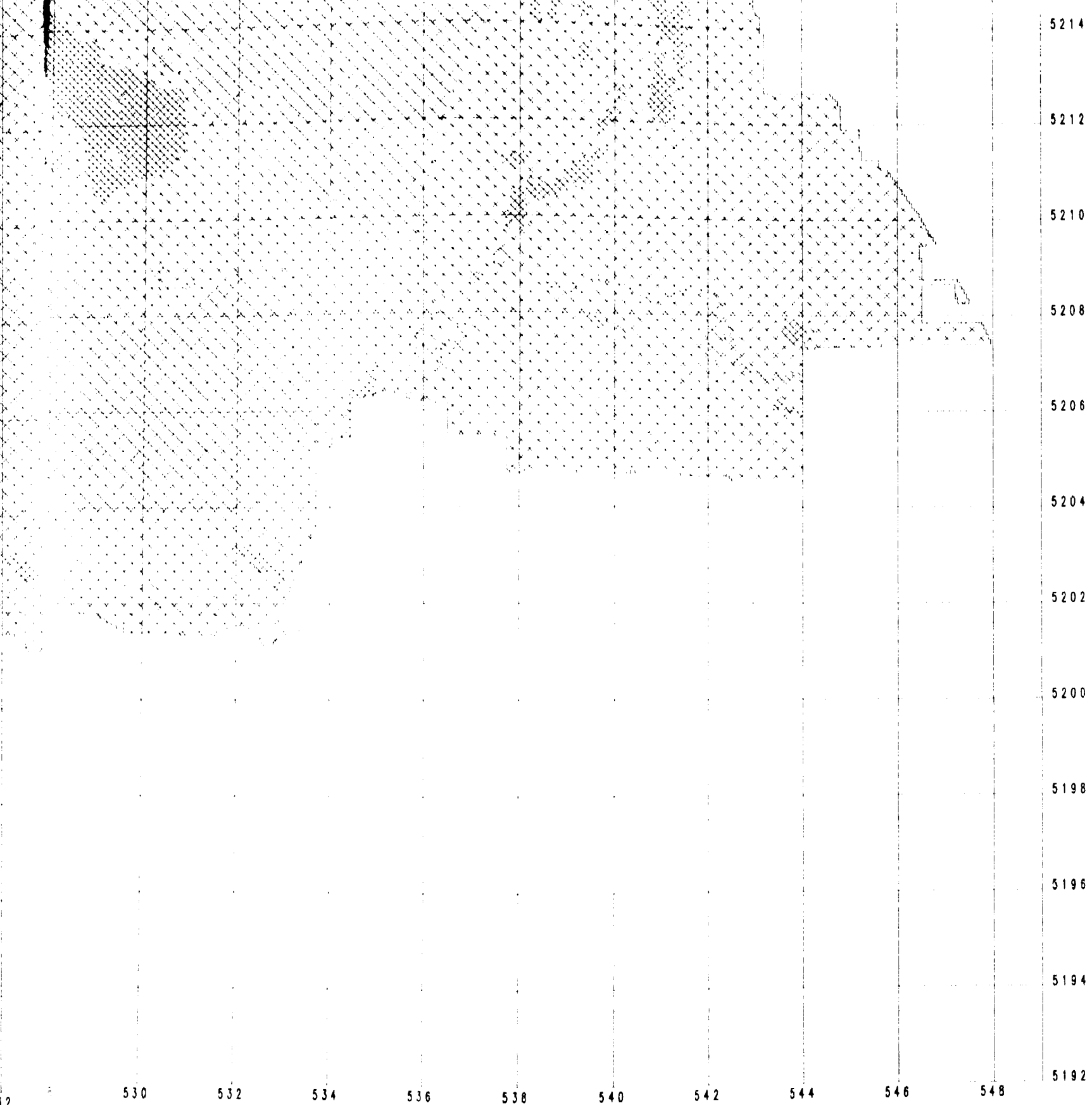


> 40

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4-3-3 FORCE STRUCTURE
10 PASSES

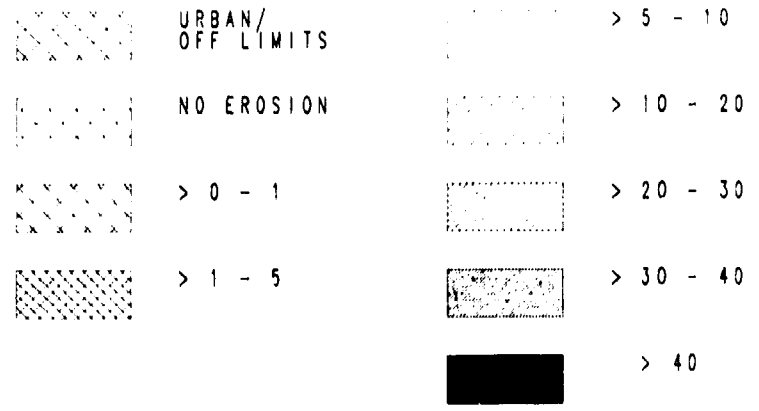




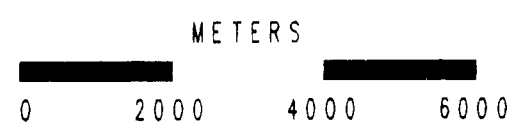
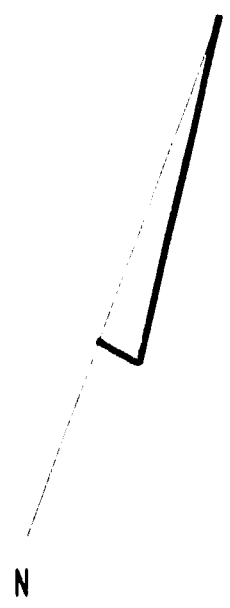
er. Plate 54. Soil erosion severity for 4-3-3 (8X8) force structure for ten passes

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5208
5206
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5202
5200
5198
5196
5194
5192

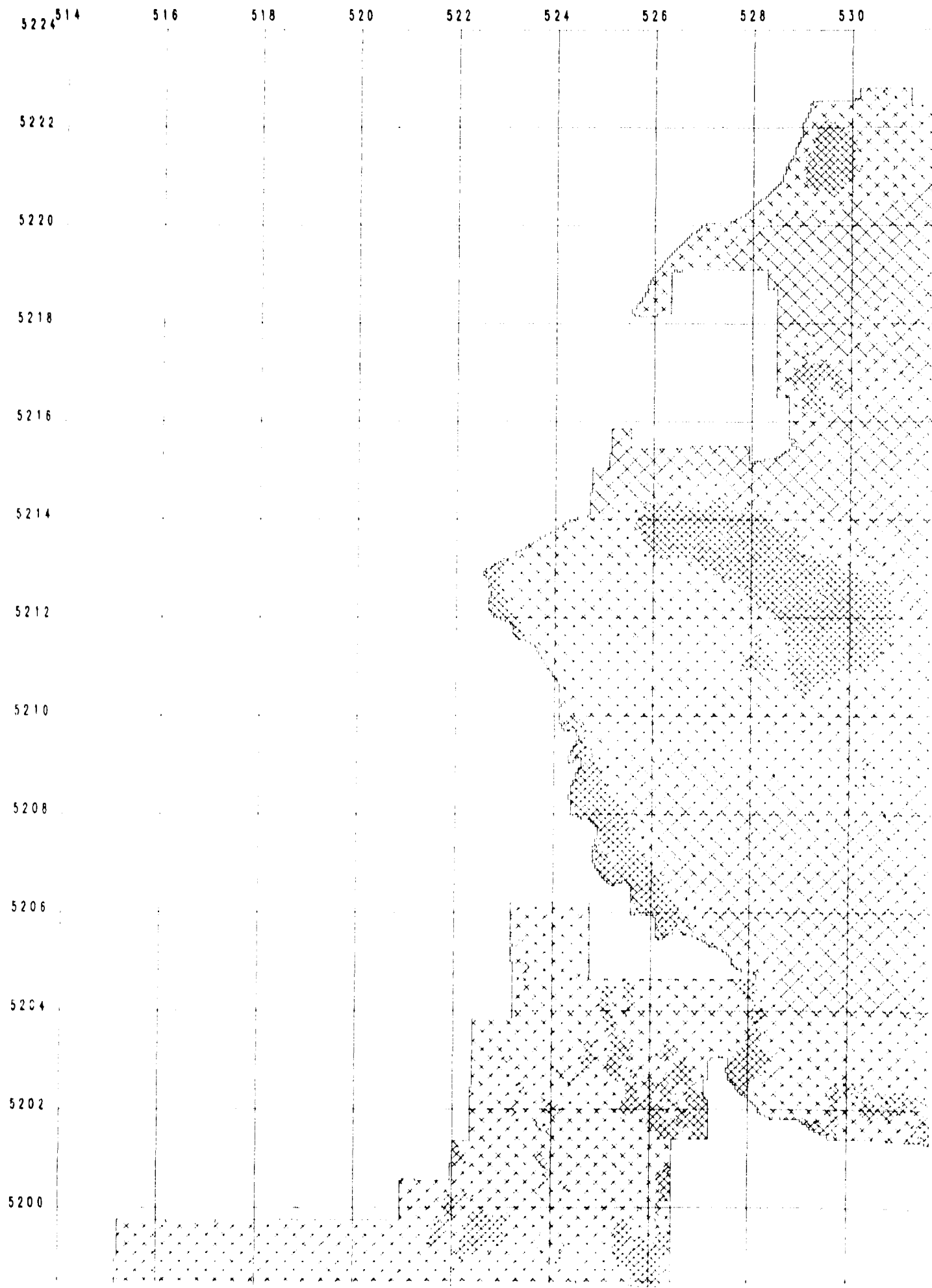
546 548



FT. LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE
10 PASSES



or ten passes



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5202

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5202

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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000



URBAN/
OFF LIMITS

> 5 - 10



NO EROSION

> 10 - 20



> 0 - 1

> 20 - 30



> 1 - 5

> 30 - 40



> 40

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4-3-3 FORCE STRUCTURE
50 PASSES

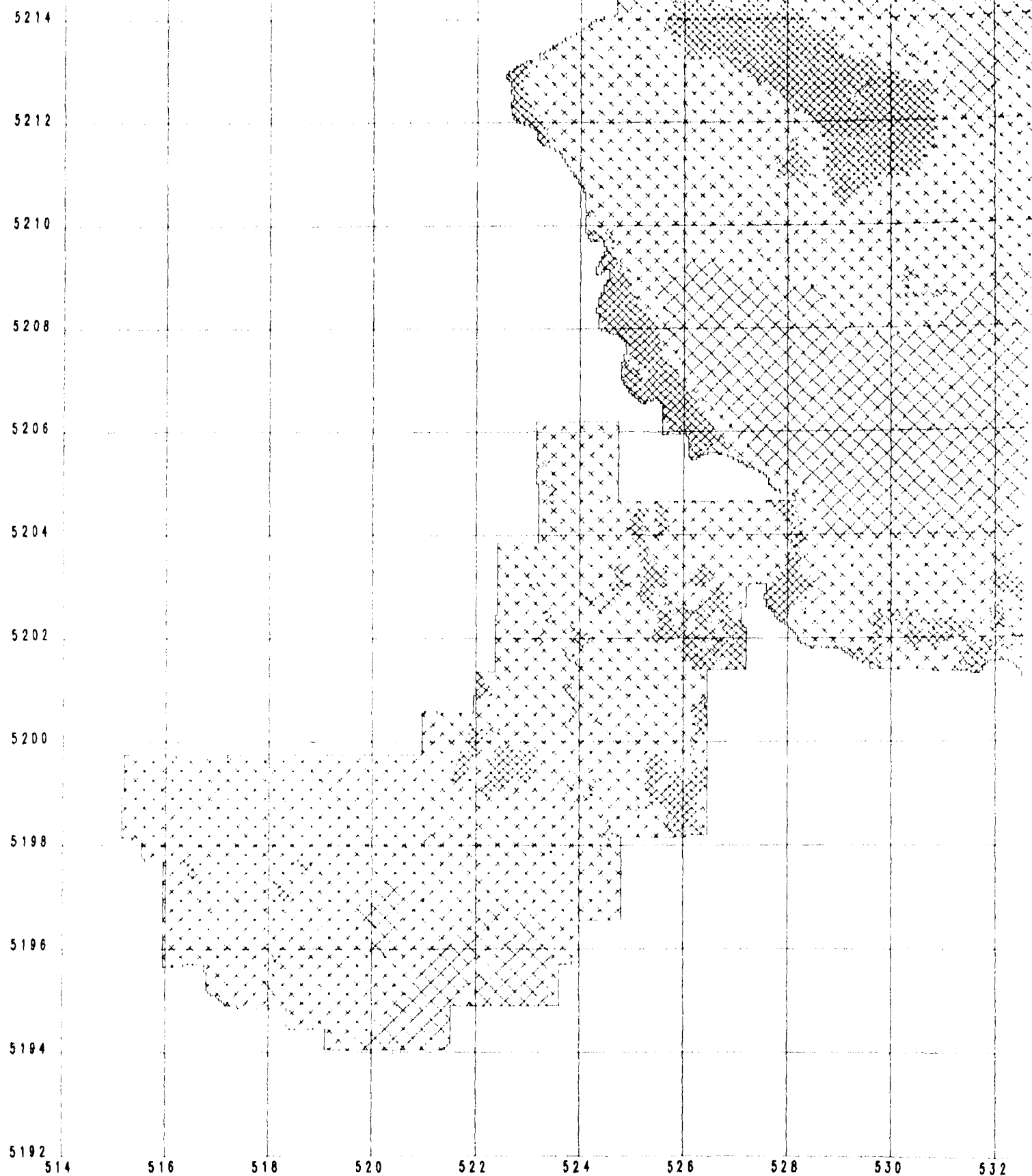


Plate 55. Soil

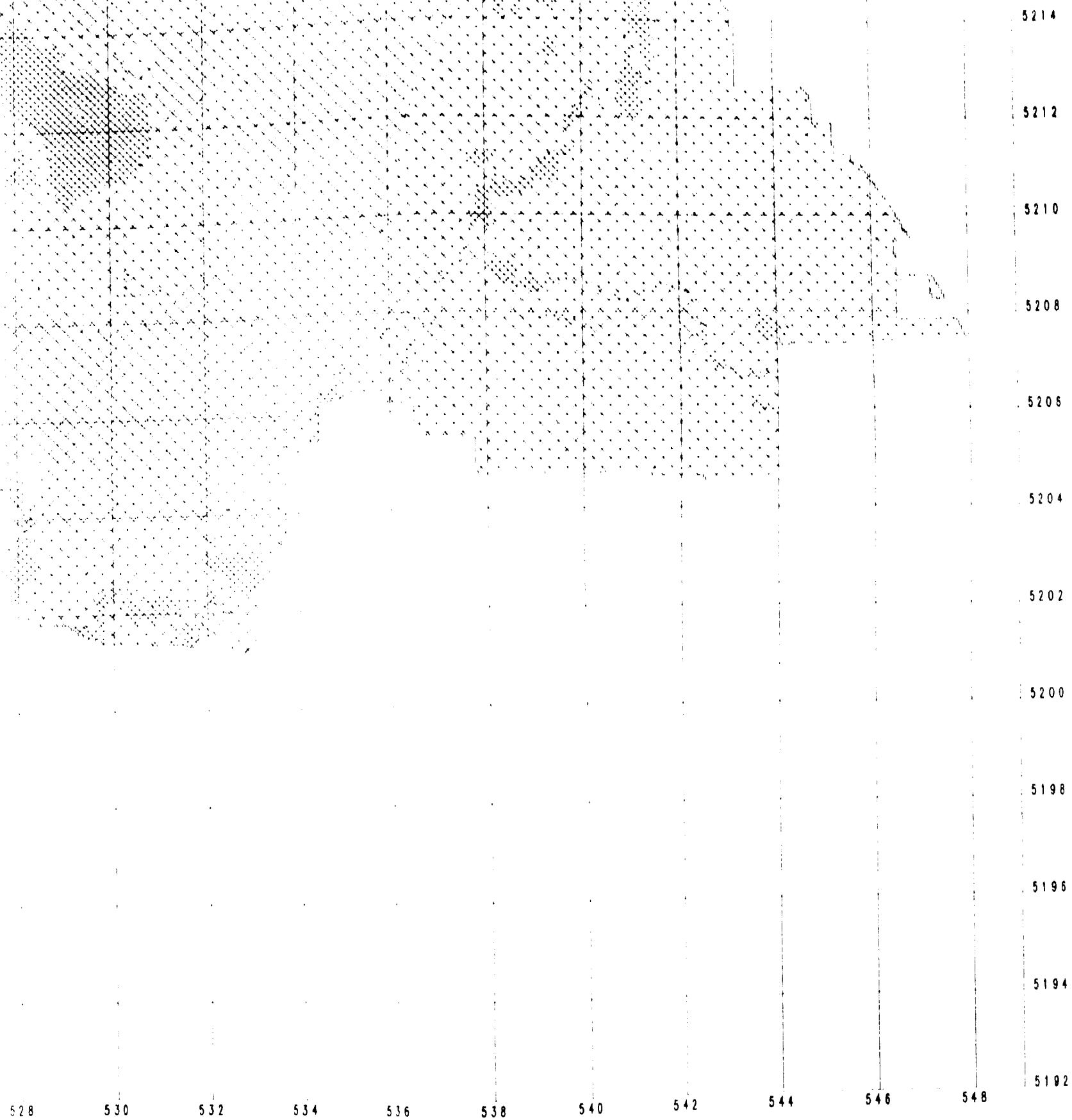
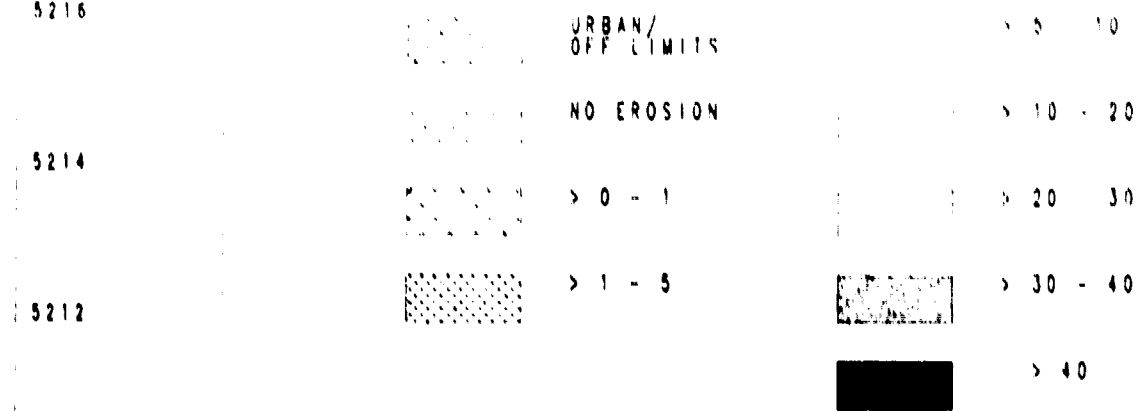
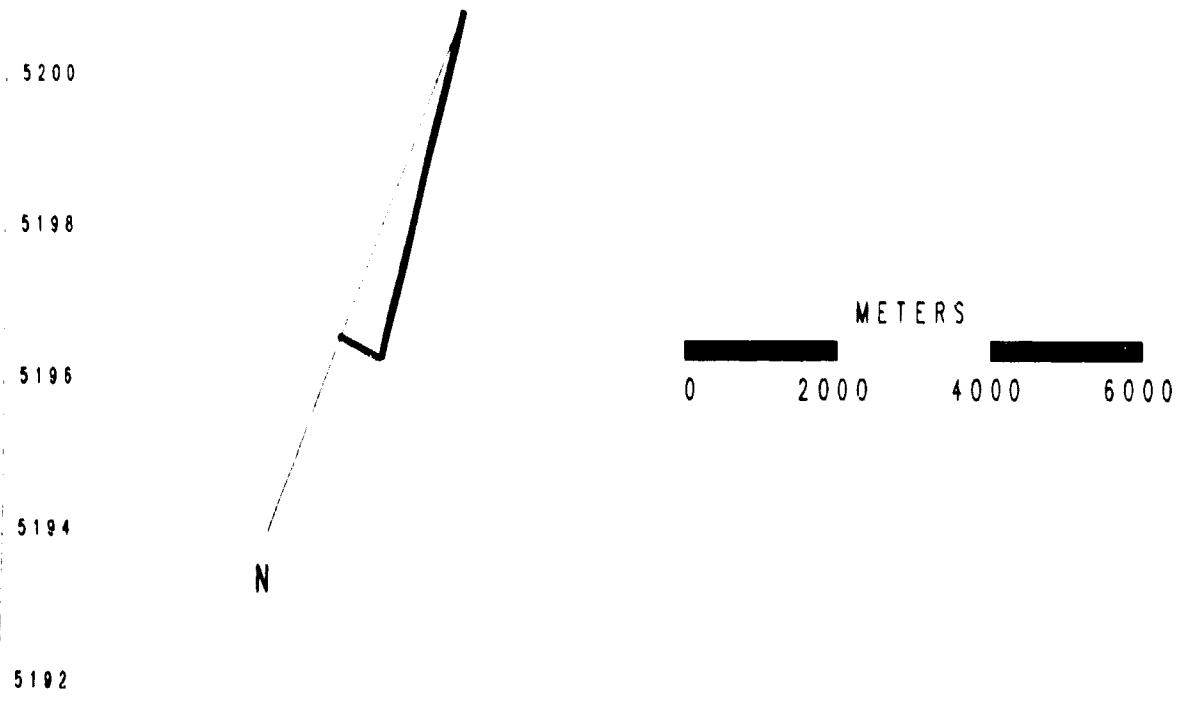


plate 55. Soil erosion severity for 4-3-3 (8X8) force structure for fifty passes



FT. LEWIS, WASHINGTON
 4-3-3 FORCE STRUCTURE
 50 PASSES



r fifty passes

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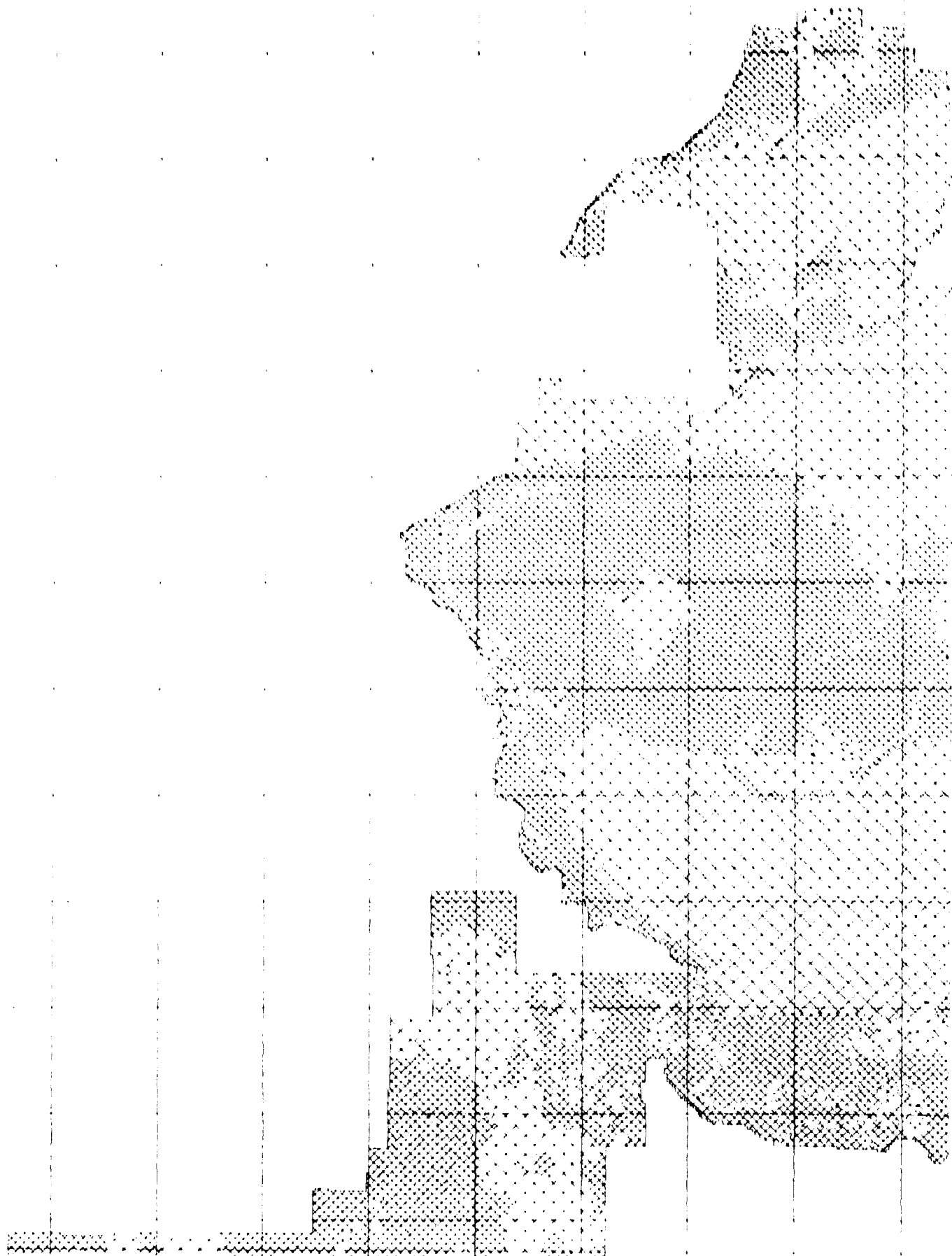
5208

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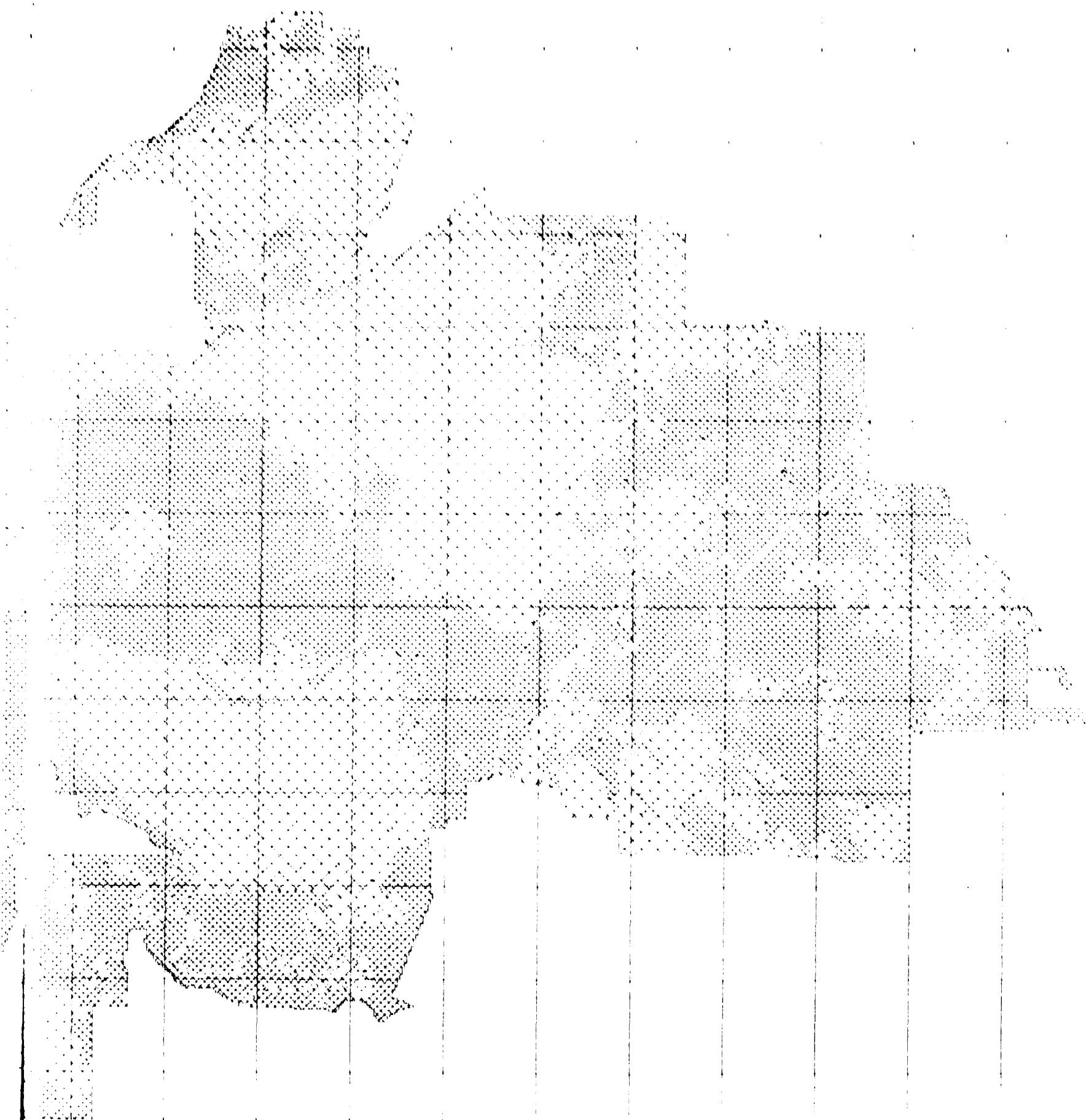
5204

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528 528 530 532 534 536 538 540 542 544 546



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U. S. Army Corps of Engineers
Waterways
Experiment
Station

5218

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000

5216

URBAN/
OFF LIMITS

> 5 - 10

5214

NO EROSION

> 10 - 20

5212

> 0 - 1

> 20 - 30

> 1 - 5

> 30 - 40

> 40

5210

FT. LEWIS, WASHINGTON

5208

4-3-3 FORCE STRUCTURE
1000 PASSES

5206

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5202

5200

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5212

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5208

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5204

5202

5200

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5194

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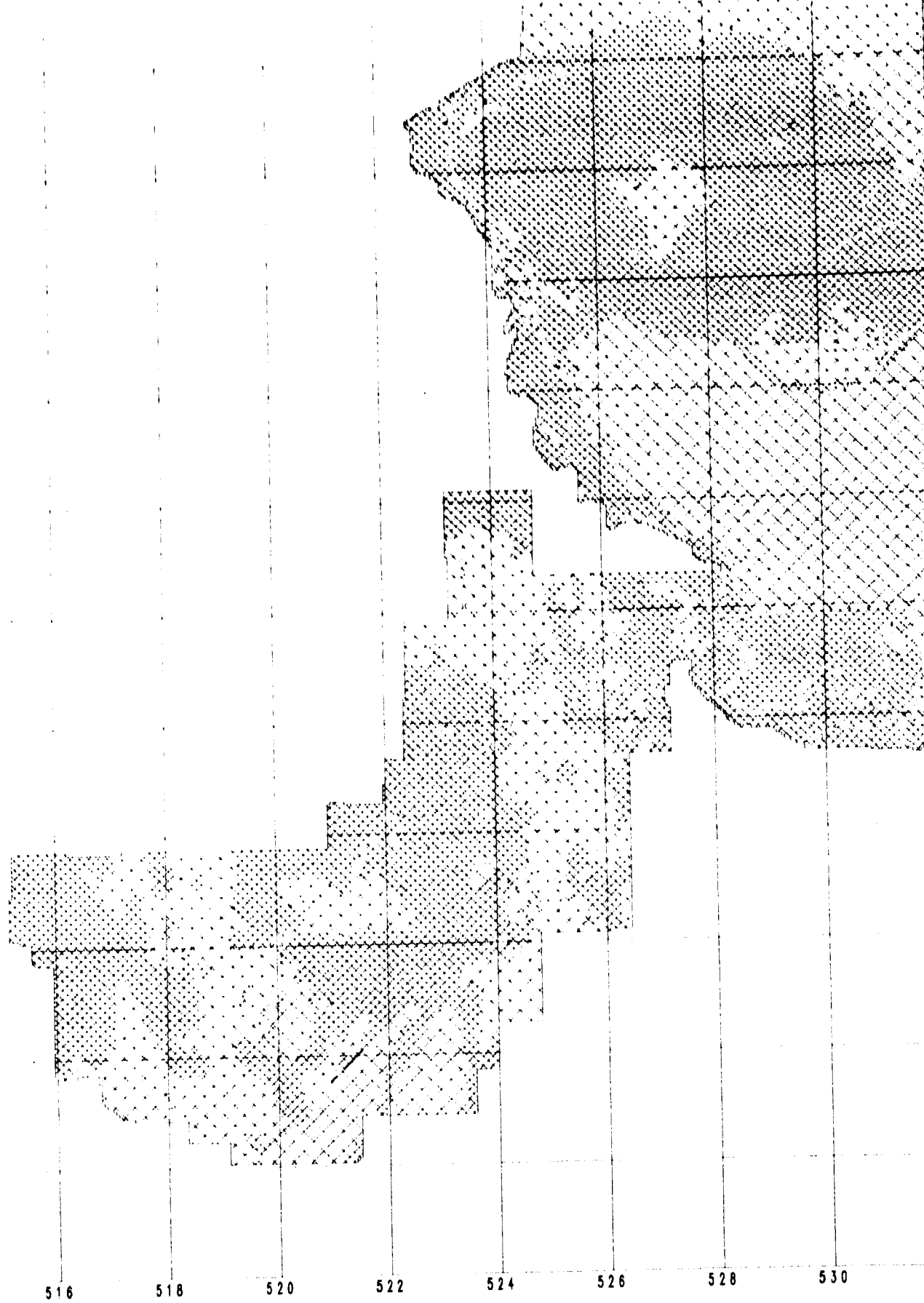
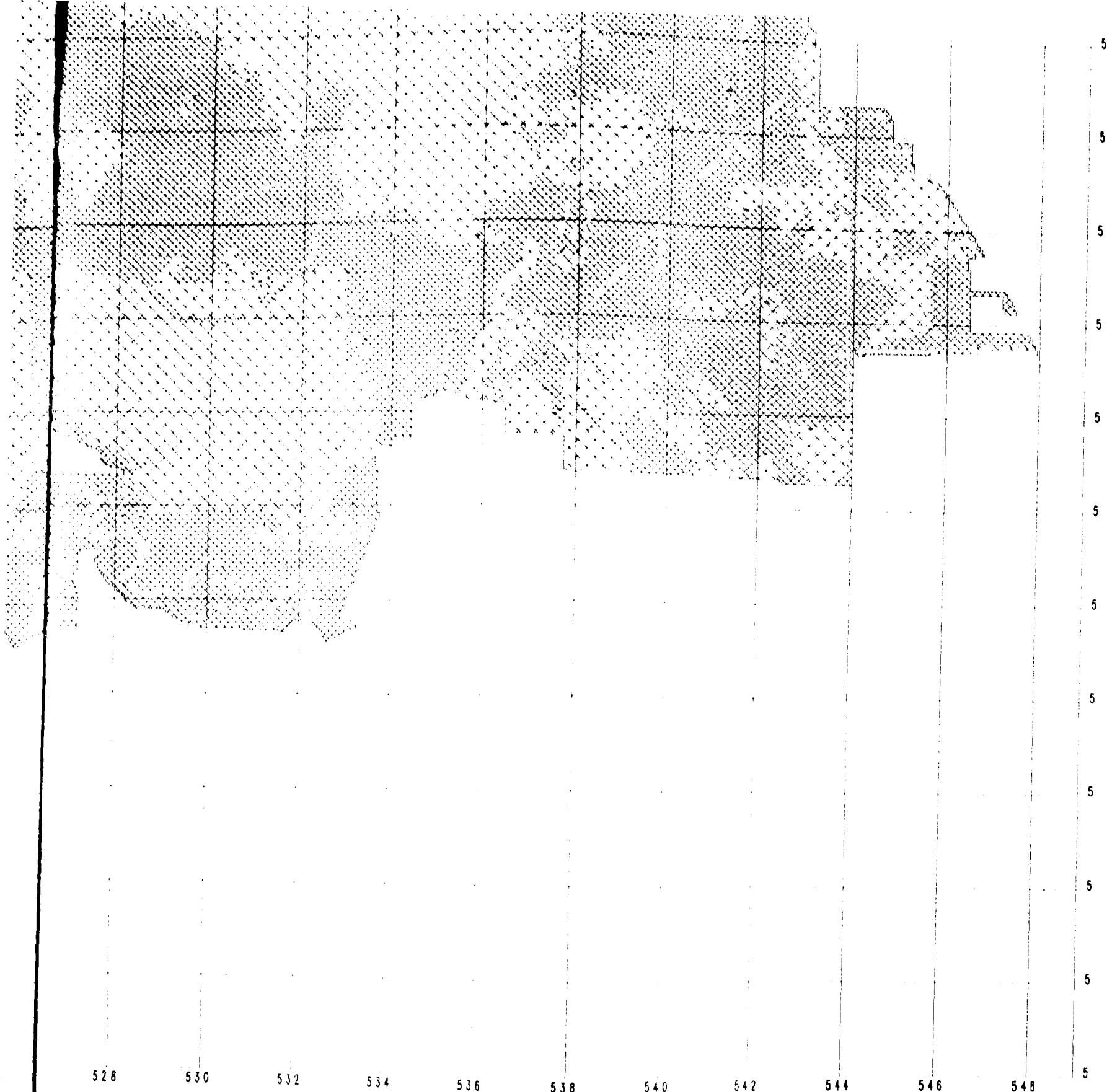


Plate 56. Soil e



sio Plate 56. Soil erosion severity for 4-3-3 (8X8) force structure for one thousand pass

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5204

5202

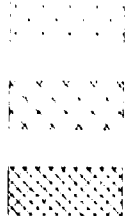
5200

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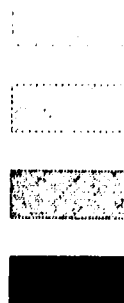
5194

5192



> 0 - 1

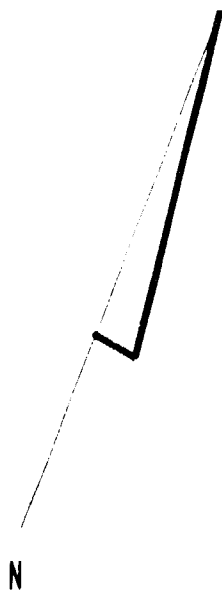
> 1 - 5



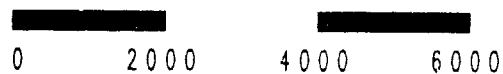
> 10 - 20
> 20 - 30
> 30 - 40
> 40

FT. LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE
1000 PASSES



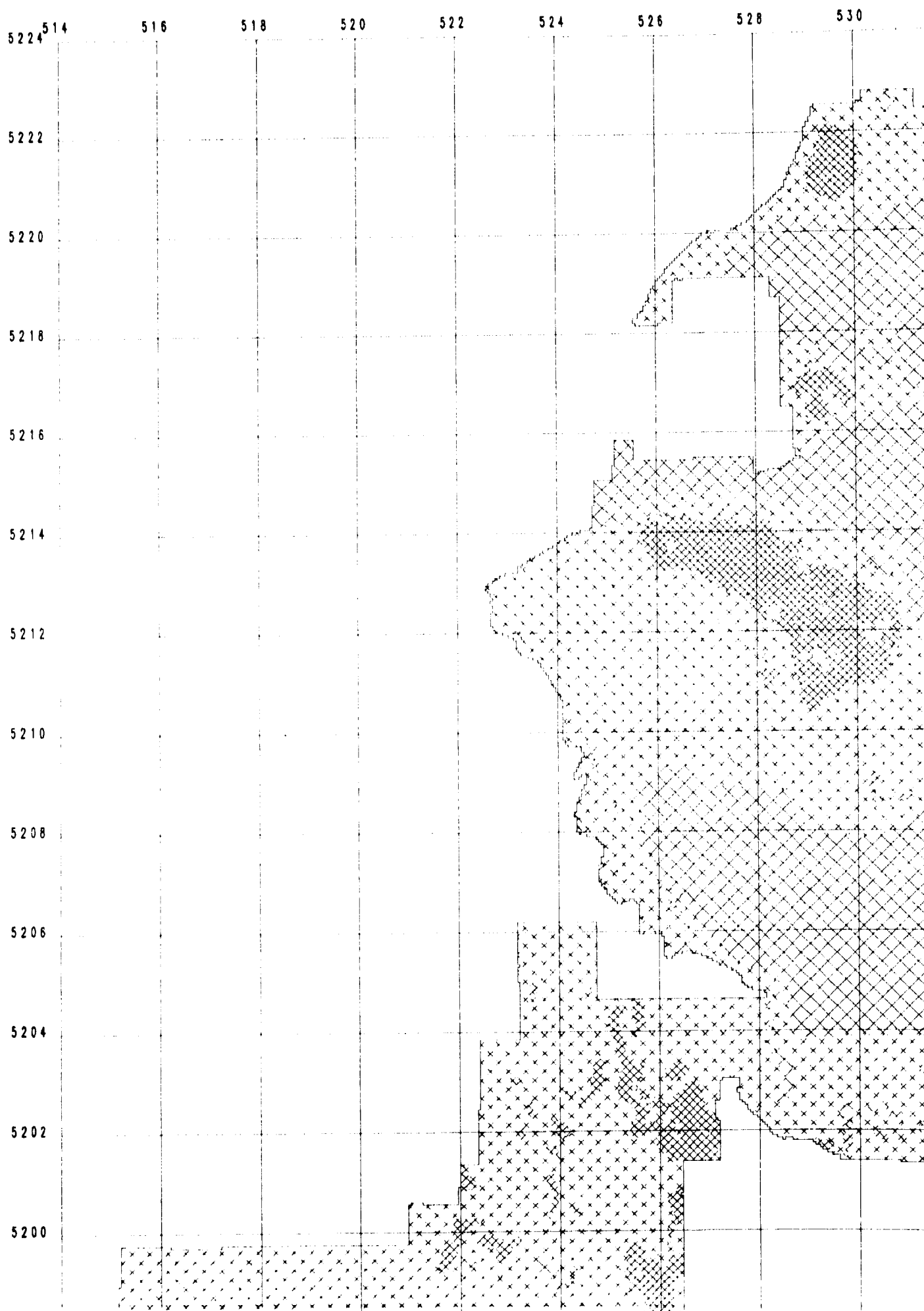
METERS

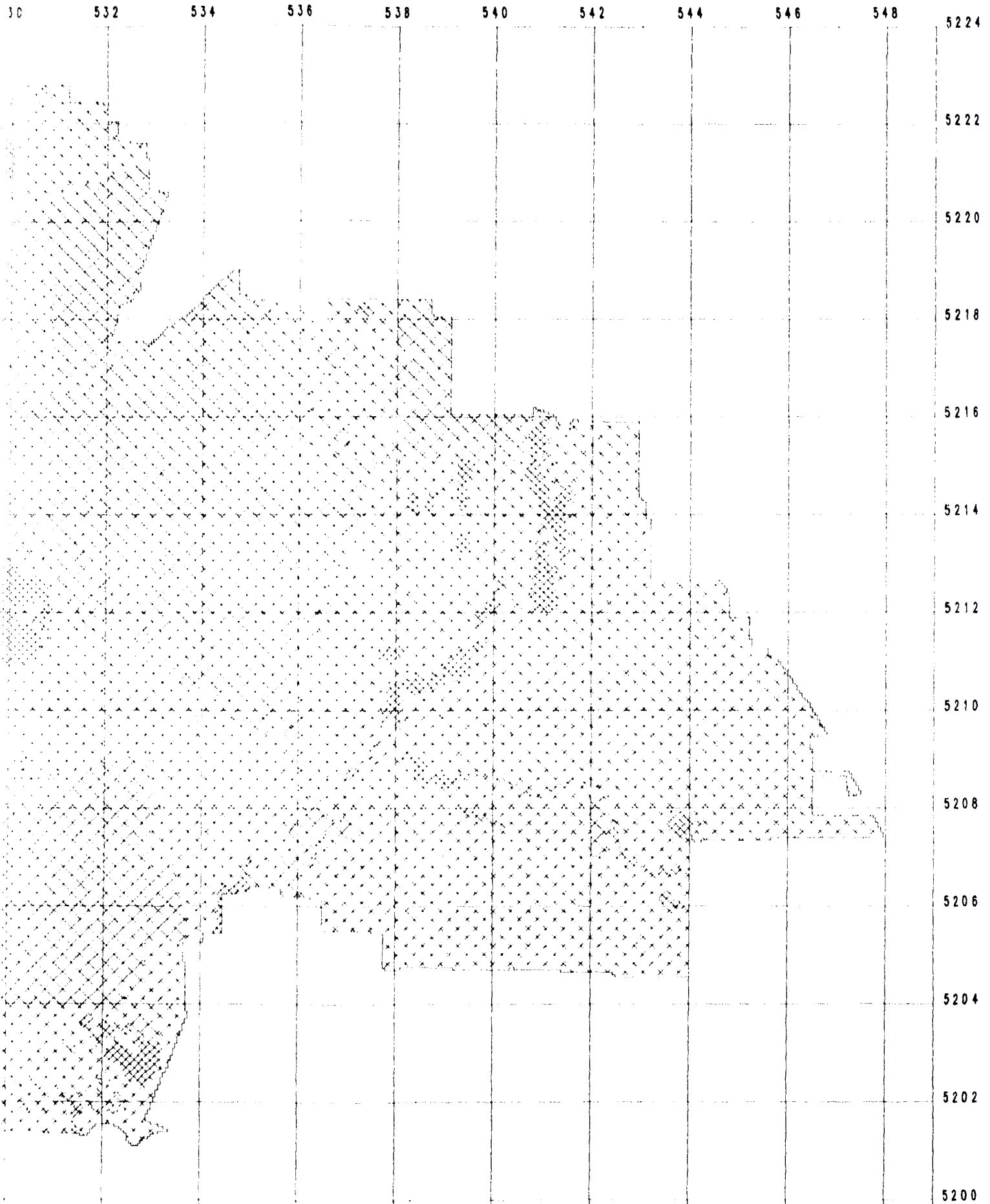


546

548

e thousand passes





548

548

5224



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Station

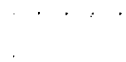
5222

5220

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000

5218

5216

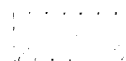
URBAN/
OFF LIMITS

> 5 - 10

5214



NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30

5212



> 1 - 5



> 30 - 40



> 40

5210

FT. LEWIS, WASHINGTON

5208

5-5-0 FORCE STRUCTURE
10 PASSES

5206

5204

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5214

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Plate

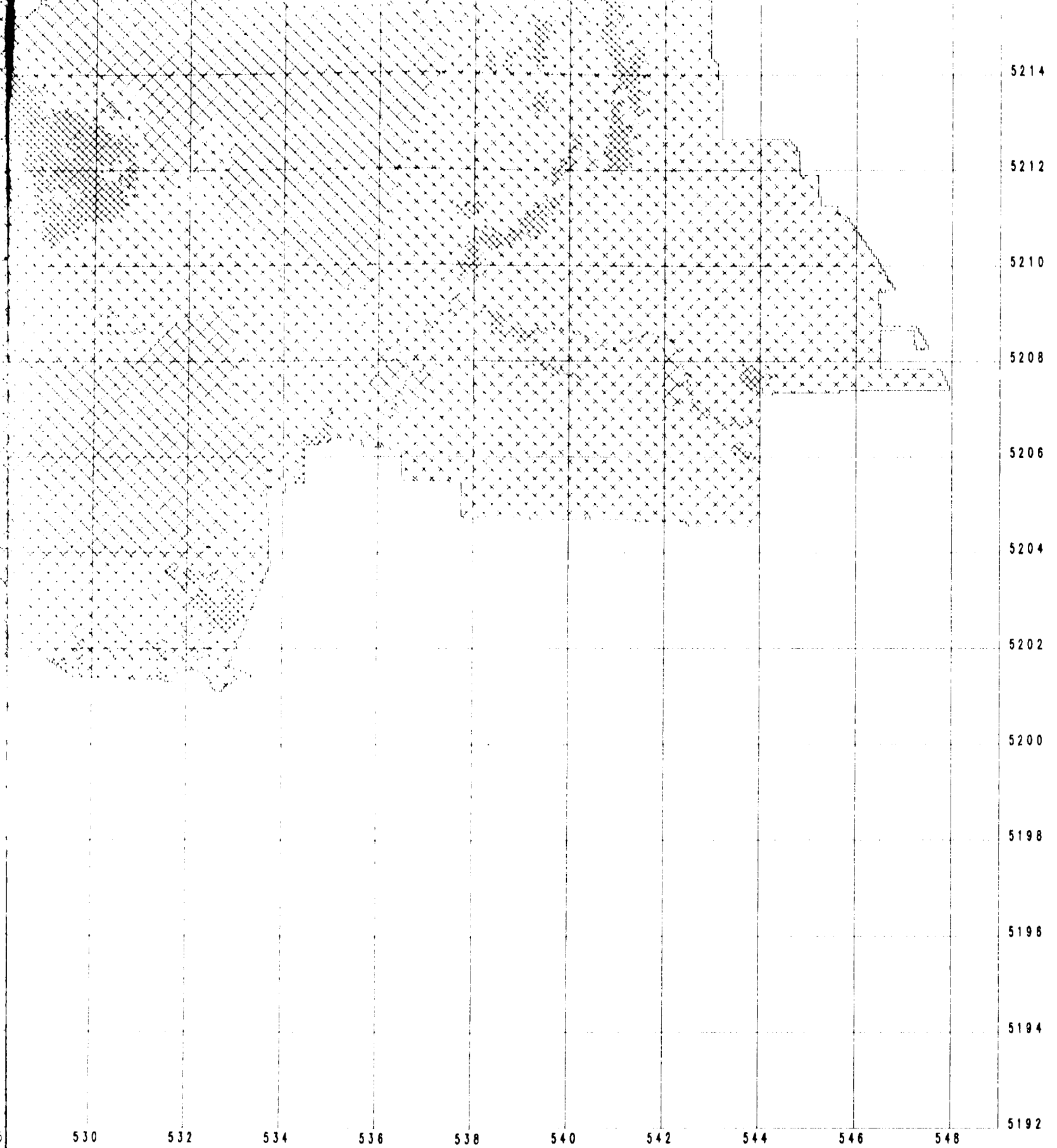


Plate 57. Soil erosion severity for 5-5-0 force structure for ten passes

5214

5212

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5192

NO EROSION

> 0 - 1

> 1 - 5

> 10 - 20

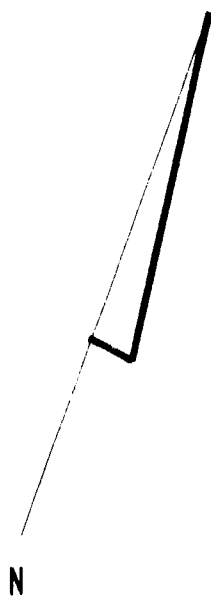
> 20 - 30

> 30 - 40

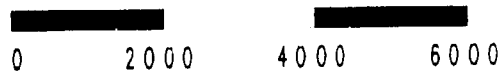
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FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE
10 PASSES



METERS



ten passes

5224⁵¹⁴

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5214

5212

5210

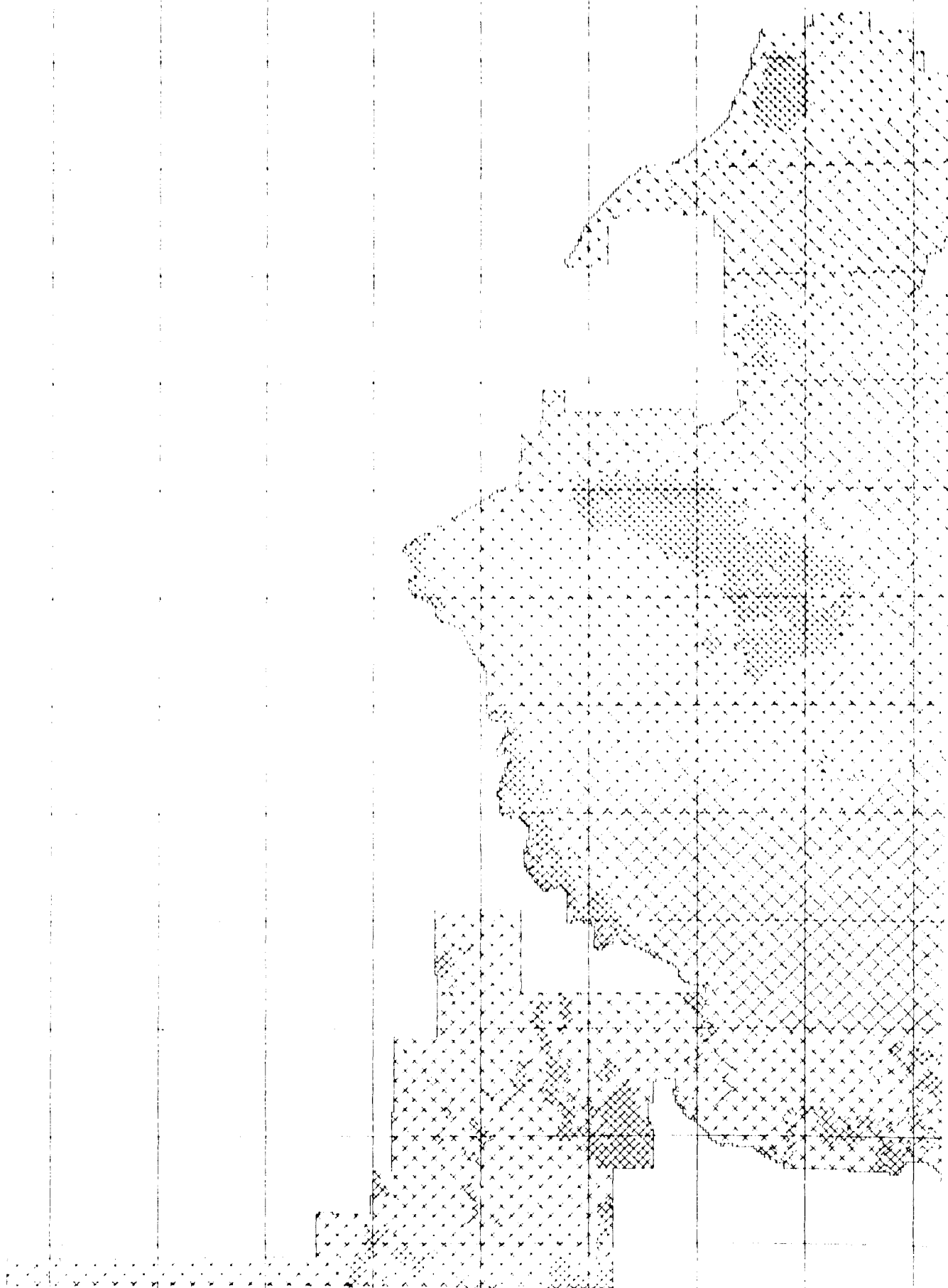
5208

5206

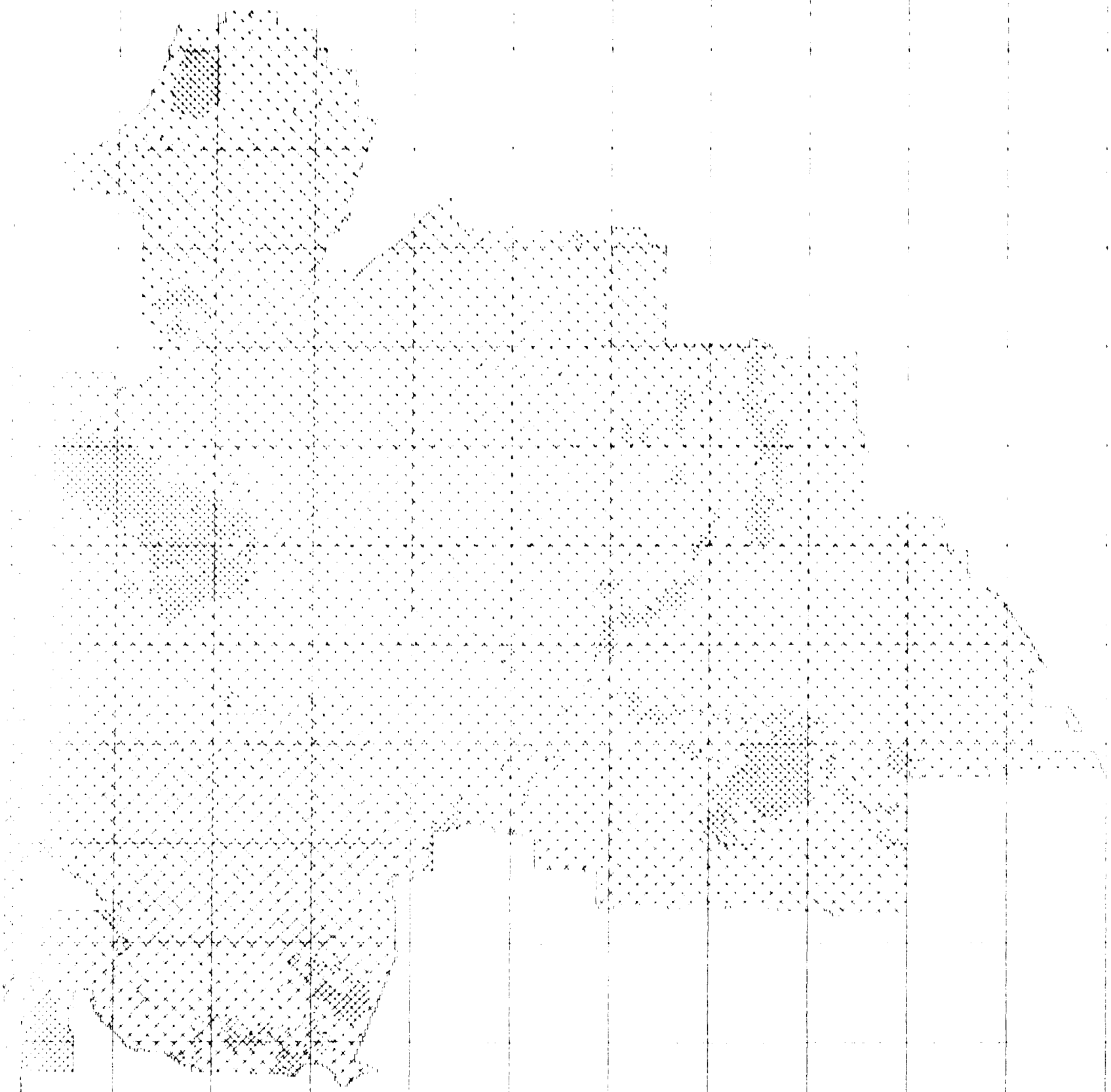
5204

5202

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520 530 532 534 536 538 540 542 544 546 548



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5222

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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



URBAN/
OFF LIMITS

> 5 - 10



NO EROSION

> 10 - 20

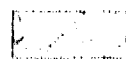


> 0 - 1

> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE
50 PASSES

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5212

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Plate 58.

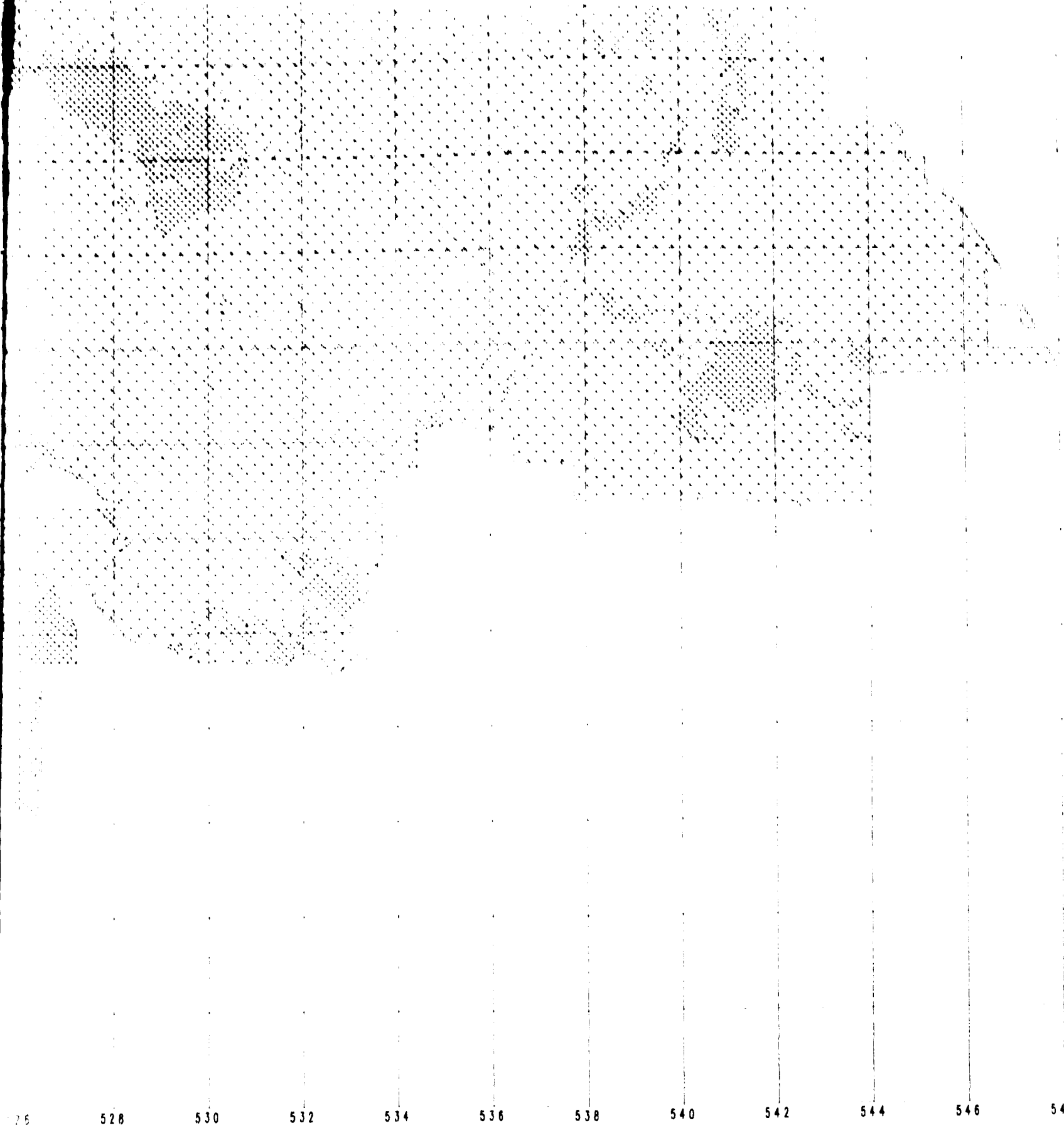


Plate 58. Soil erosion severity for 5-5-0 force structure for fifty passes

NO EROSION

5214
5212
5210
5208
5206
5204
5202
5200
5198
5196
5194
5192
548



> 0 - 1



> 1 - 5



> 20 - 30



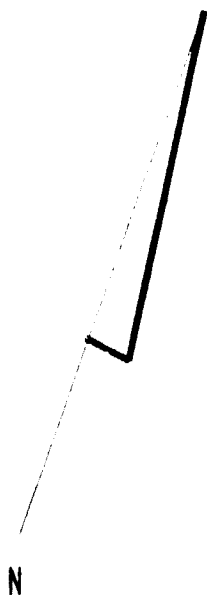
> 30 - 40



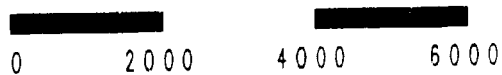
> 40

FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE
50 PASSES



METERS



ty passes

5224⁵¹⁴

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U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000



URBAN/
OFF LIMITS



NO EROSION



> 0 - 1



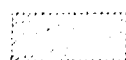
> 1 - 5



> 5 - 10



> 10 - 20



> 20 - 30



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE
1000 PASSES

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5208
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Plate 5

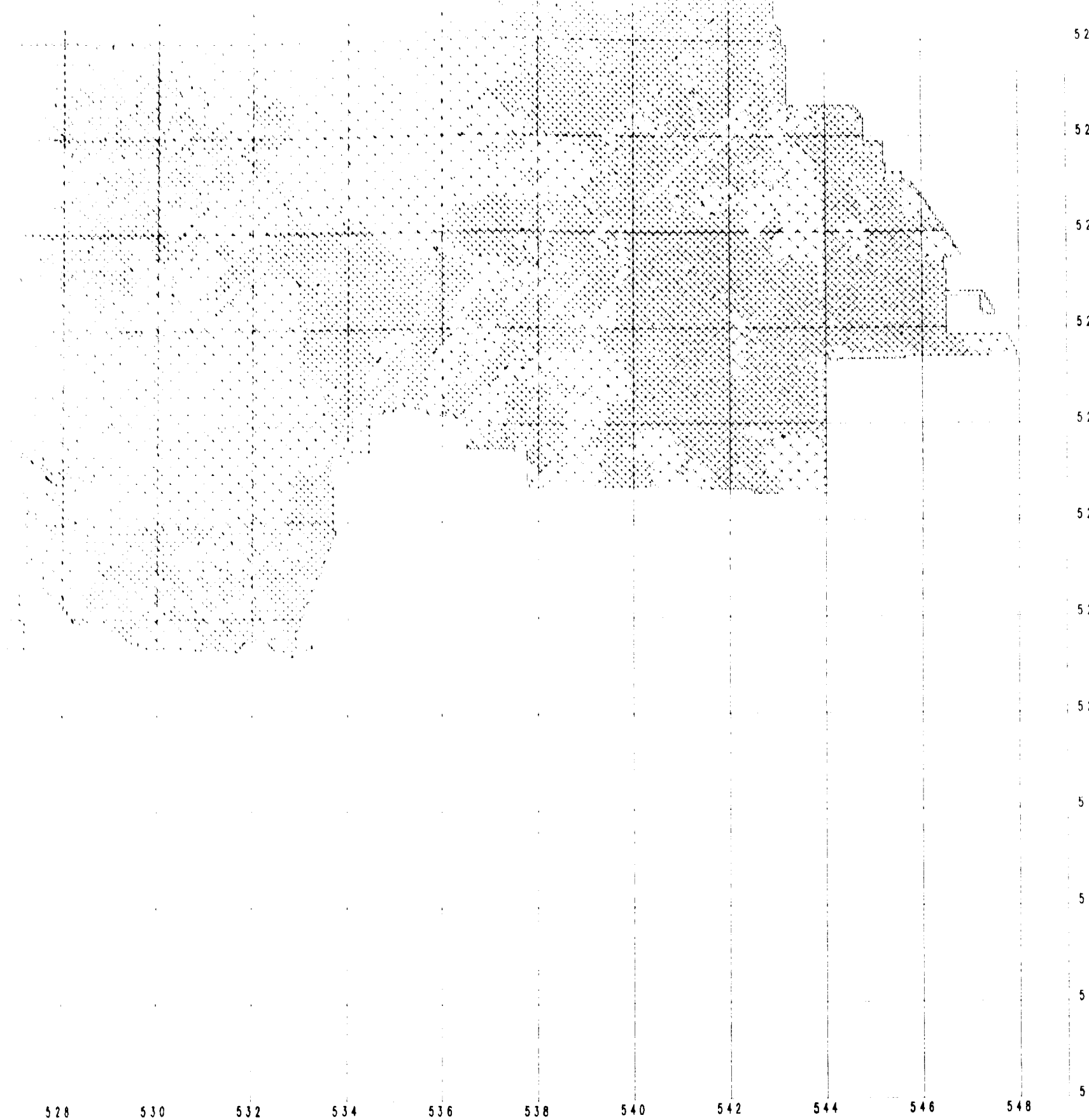


Plate 59. Soil erosion severity for 5-5-0 force structure for one thousand passes

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5196

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NO EROSION

> 0 - 1

> 1 - 5

> 10 - 20

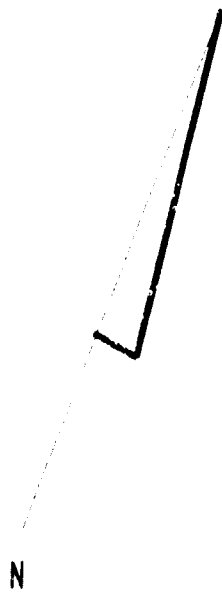
> 20 - 30

> 30 - 40

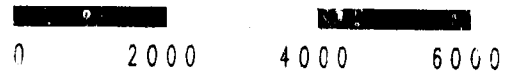
> 40

FT. LEWIS, WASHINGTON

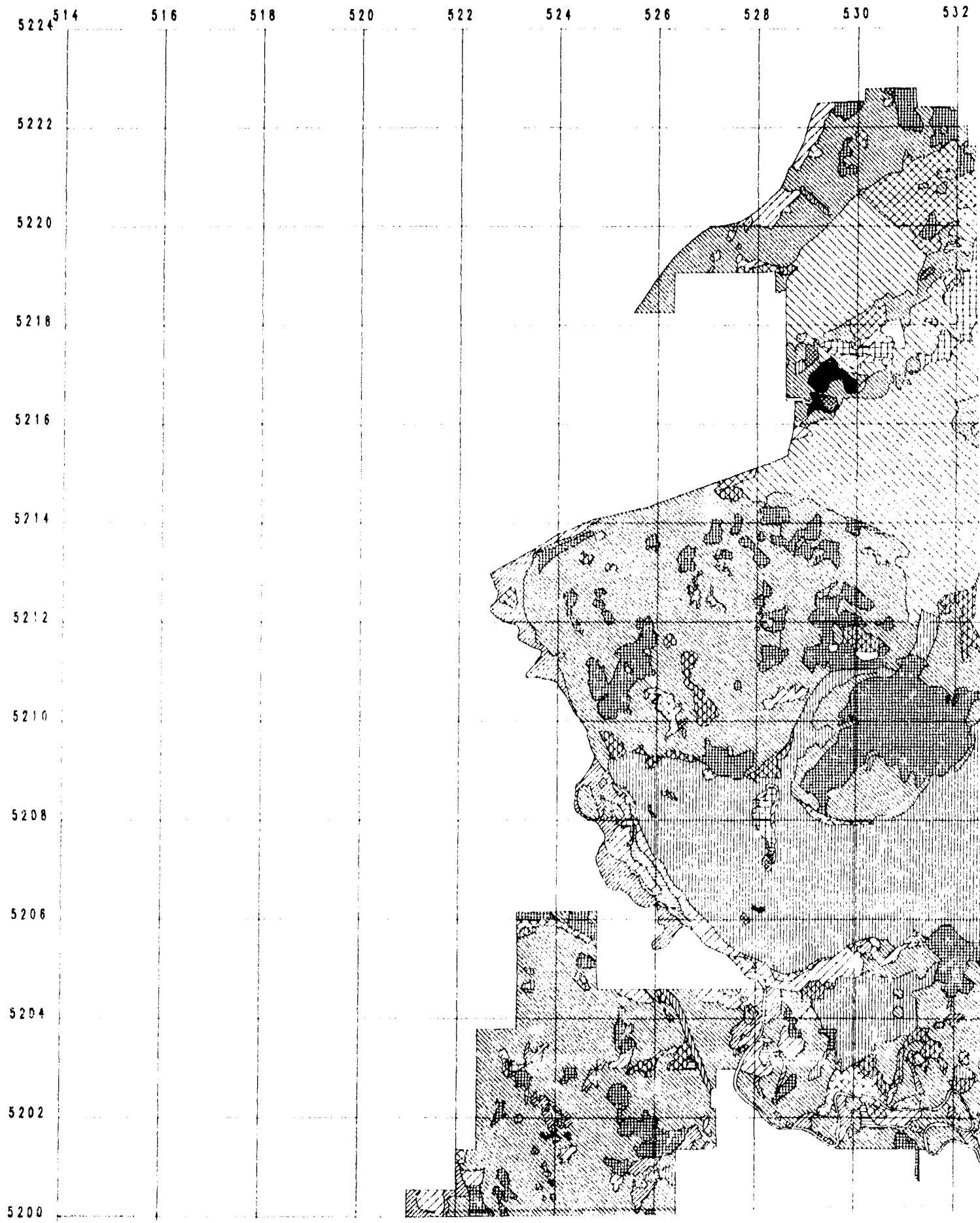
5-5-0 FORCE STRUCTURE
1000 PASSES



METERS

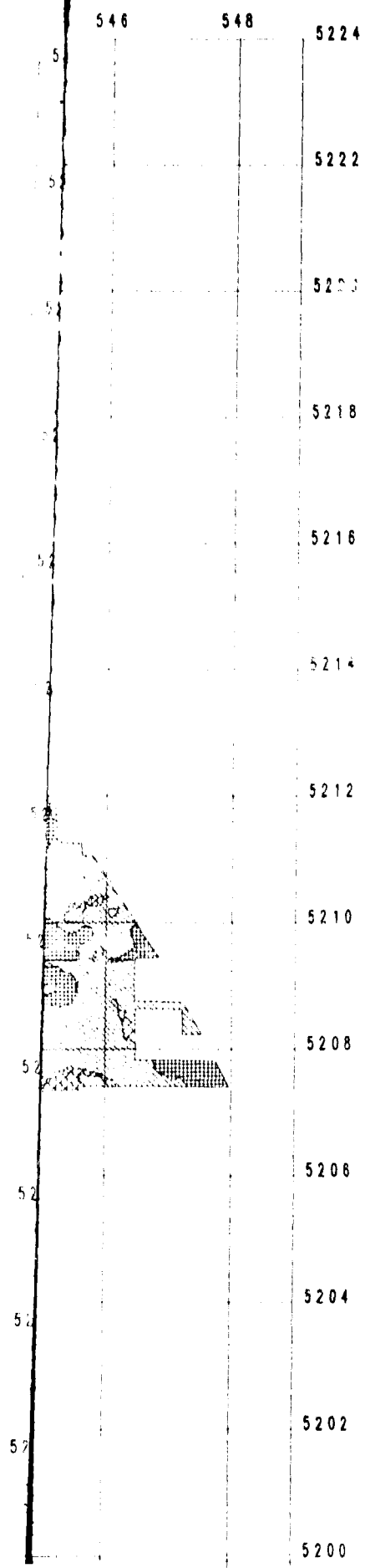


and passes



526 528 530 532 534 536 538 540 542 544 546 548





U. S. Army Corps of Engineers Waterways Experiment Station

MAJOR VEGETATION CATEGORIES

SCALE 1:100000

	B - BARE GROUND		G - GRASSLAND
	Em - EMERGENT MARSH		Gc - CLEARED GRASSLAND
	Fc - CONIFEROUS FOREST		Gm - MIXED GRASSLAND
	Fd - DECIDUOUS FOREST		OW - OPEN WATER
	Fm - MIXED CONIFEROUS/ DECIDUOUS FOREST		S - SHRUBLAND
	Fs - FORESTED SWAMP		SS - SCRUB/SHRUB SWAMP
	Fy - YOUNG FOREST		U - URBAN

FT LEWIS, WASHINGTON

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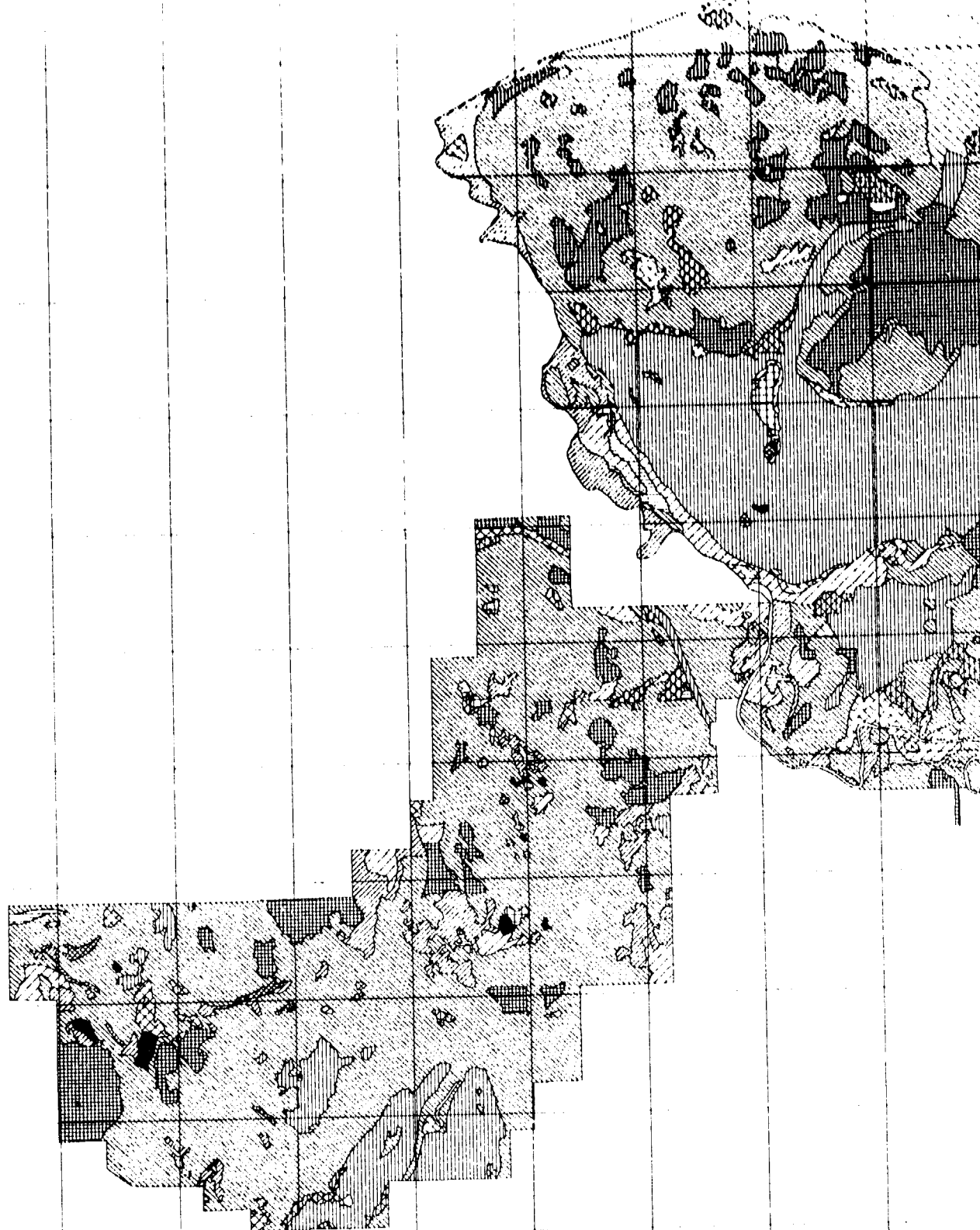
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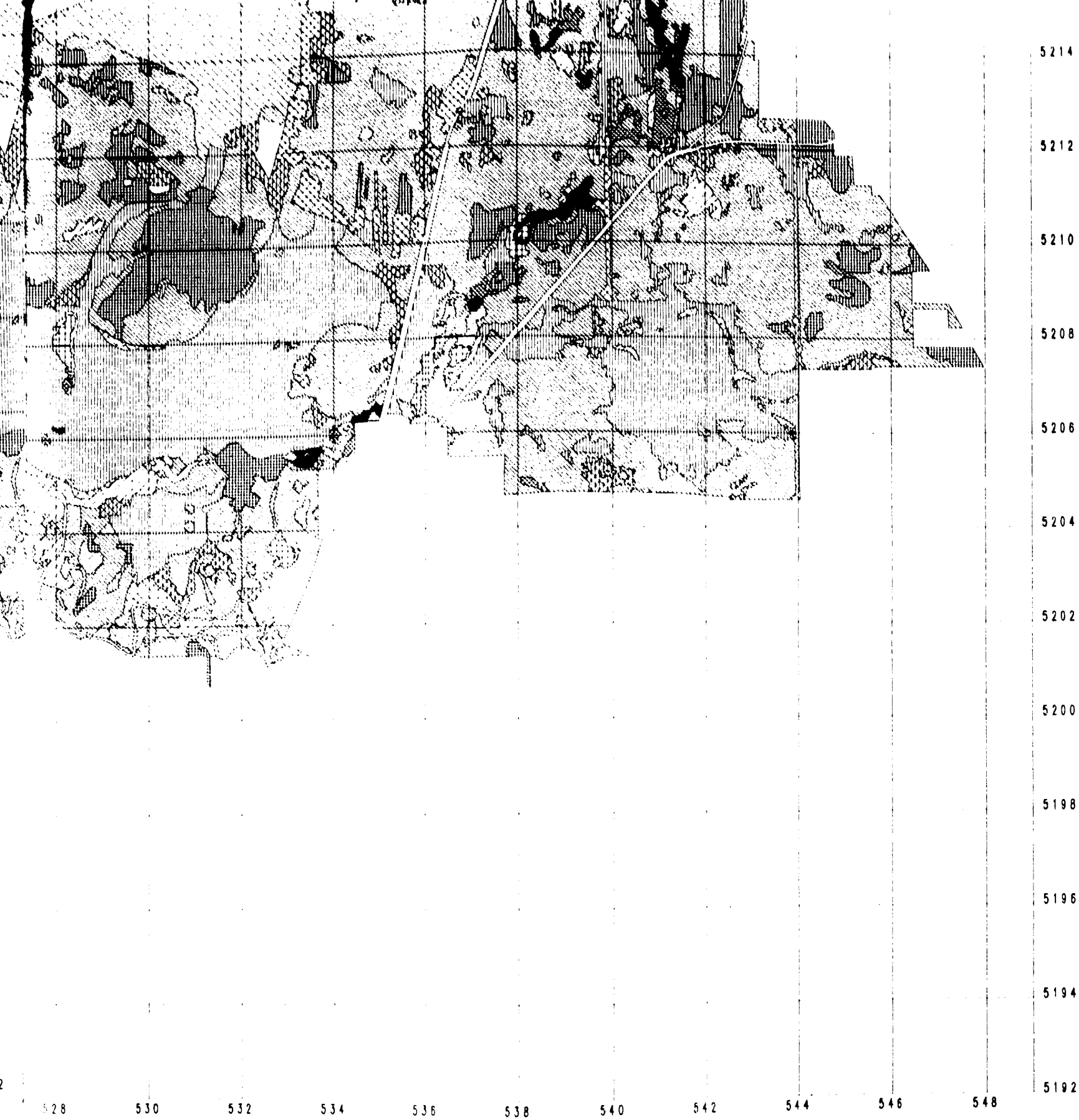


Plate 60. Major vegetation associations

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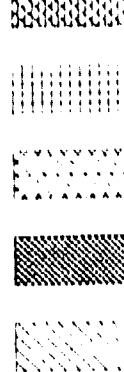


Fd - DECIDUOUS FOREST

Fm - MIXED CONIFEROUS/
DECIDUOUS FOREST

Fo - FORESTED SWAMP

Fy - YOUNG FOREST



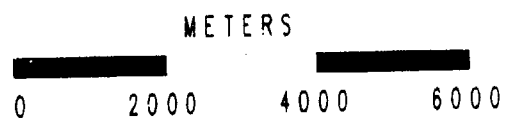
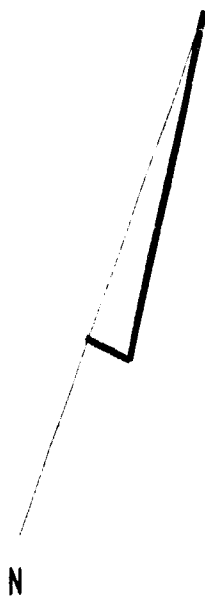
Qw - OPEN WATER

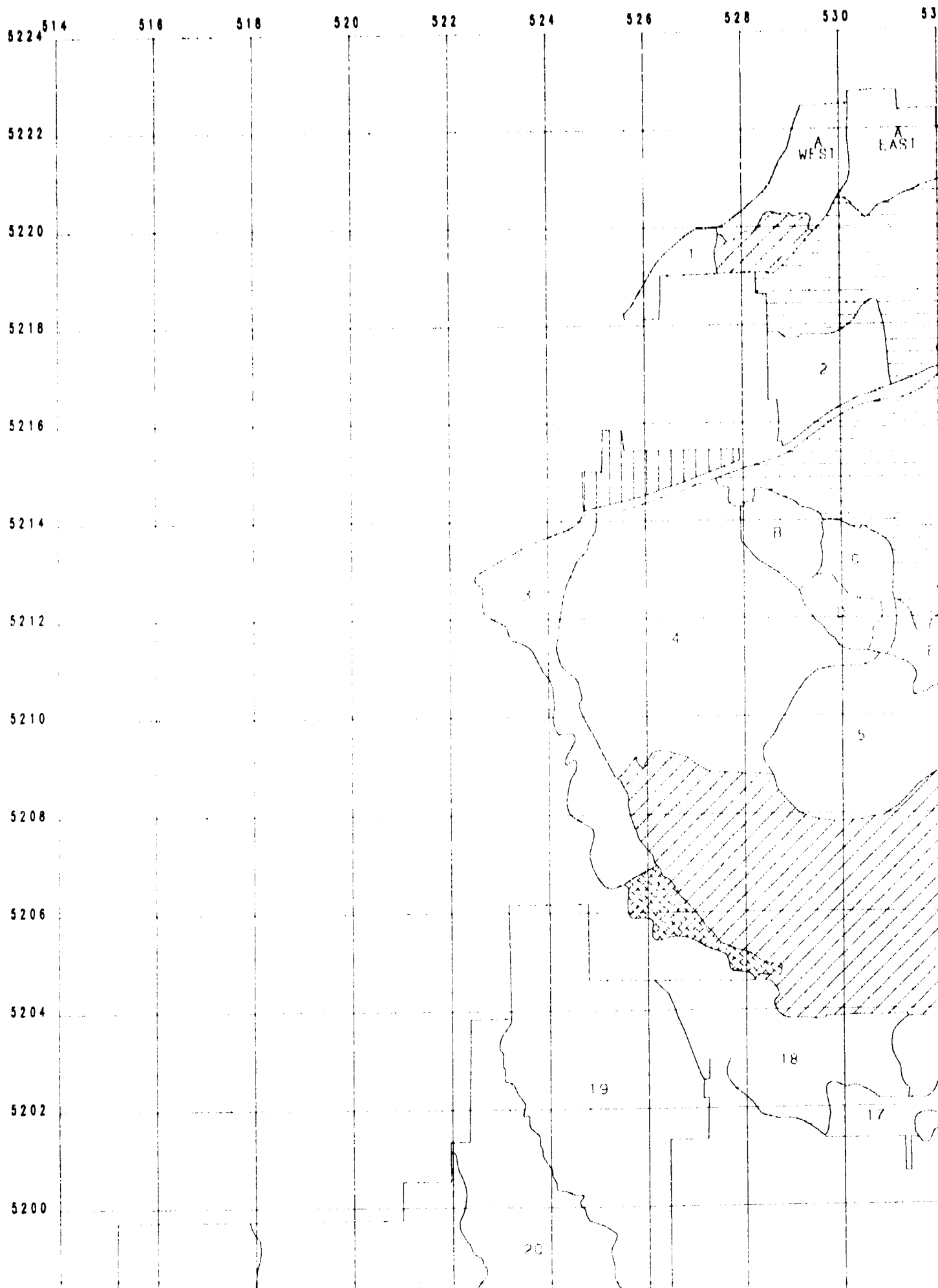
S - SHRUBLAND

SS - SCRUB/SHRUB SWAMP

U - URBAN

FT LEWIS, WASHINGTON





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WEST

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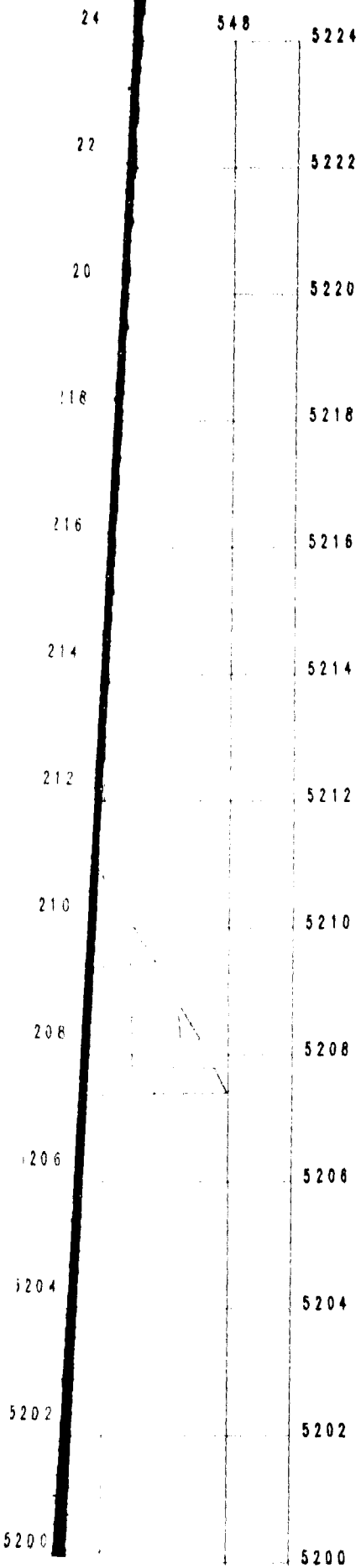
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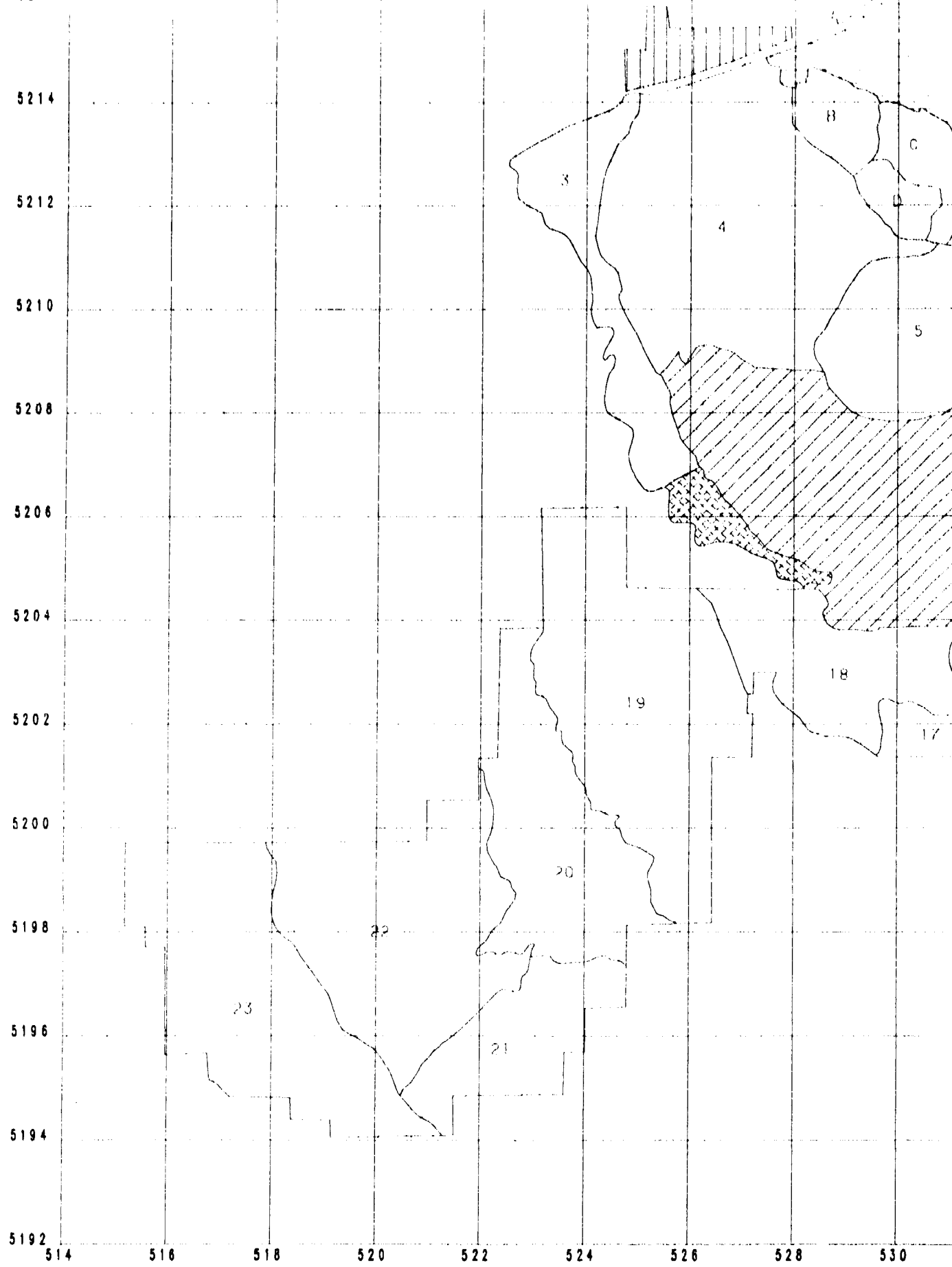
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Waterways
Experiment
Station

TRAINING AREA/IMPACT AREA

SCALE 1:100000

	IMPACT AREAS
	CANTONMENT
	AMMO STORAGE
	GOLF COURSE
	BUFFER ZONE
	TRAINING AREA

FT LEWIS, WASHINGTON



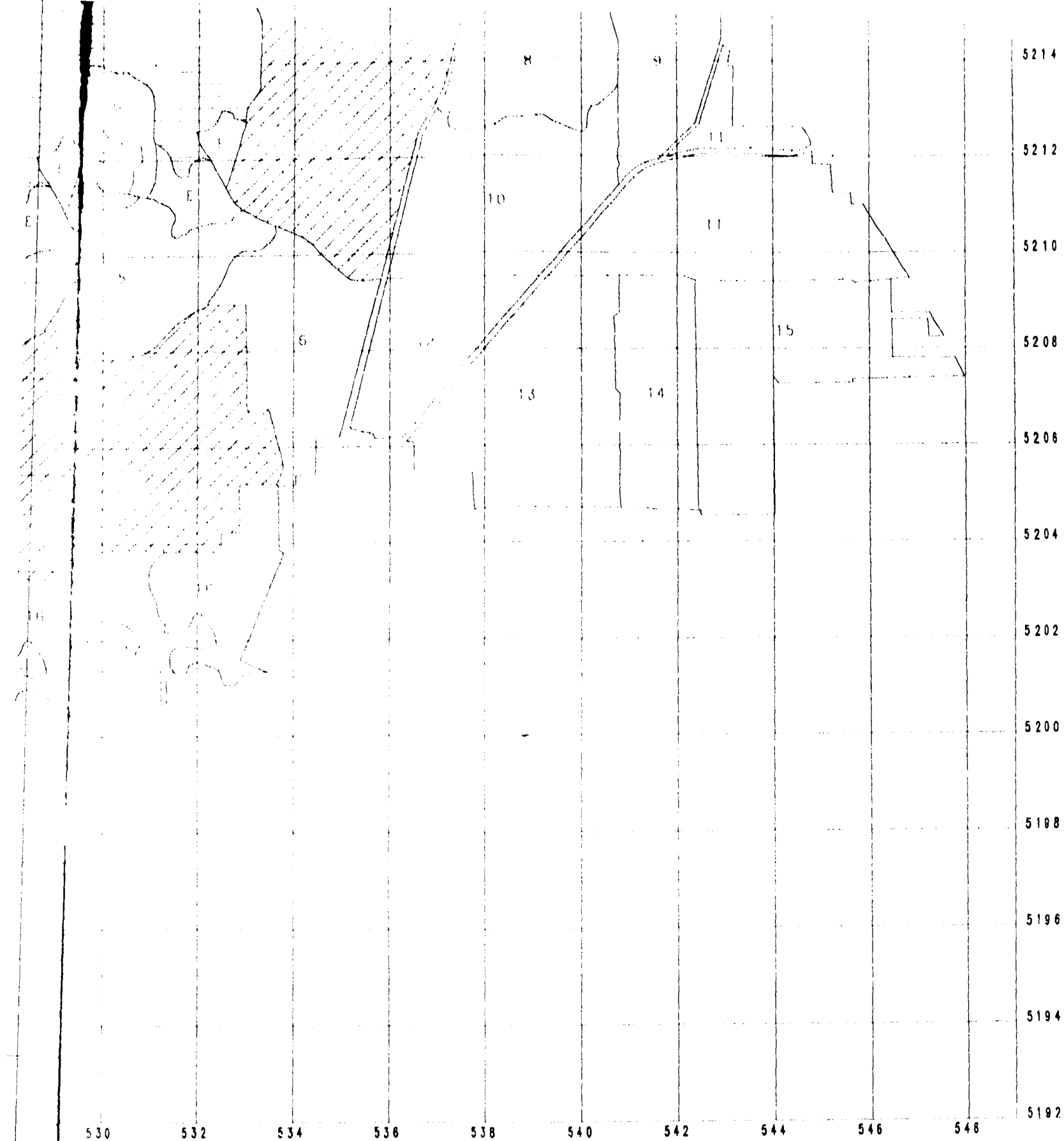


Plate 61. Training areas and other administrative boundaries

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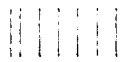
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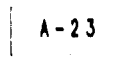
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GOLF COURSE

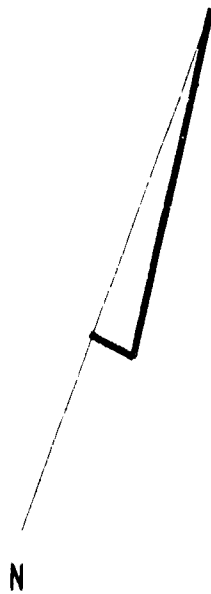


BUFFER ZONE

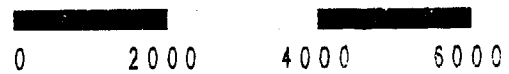


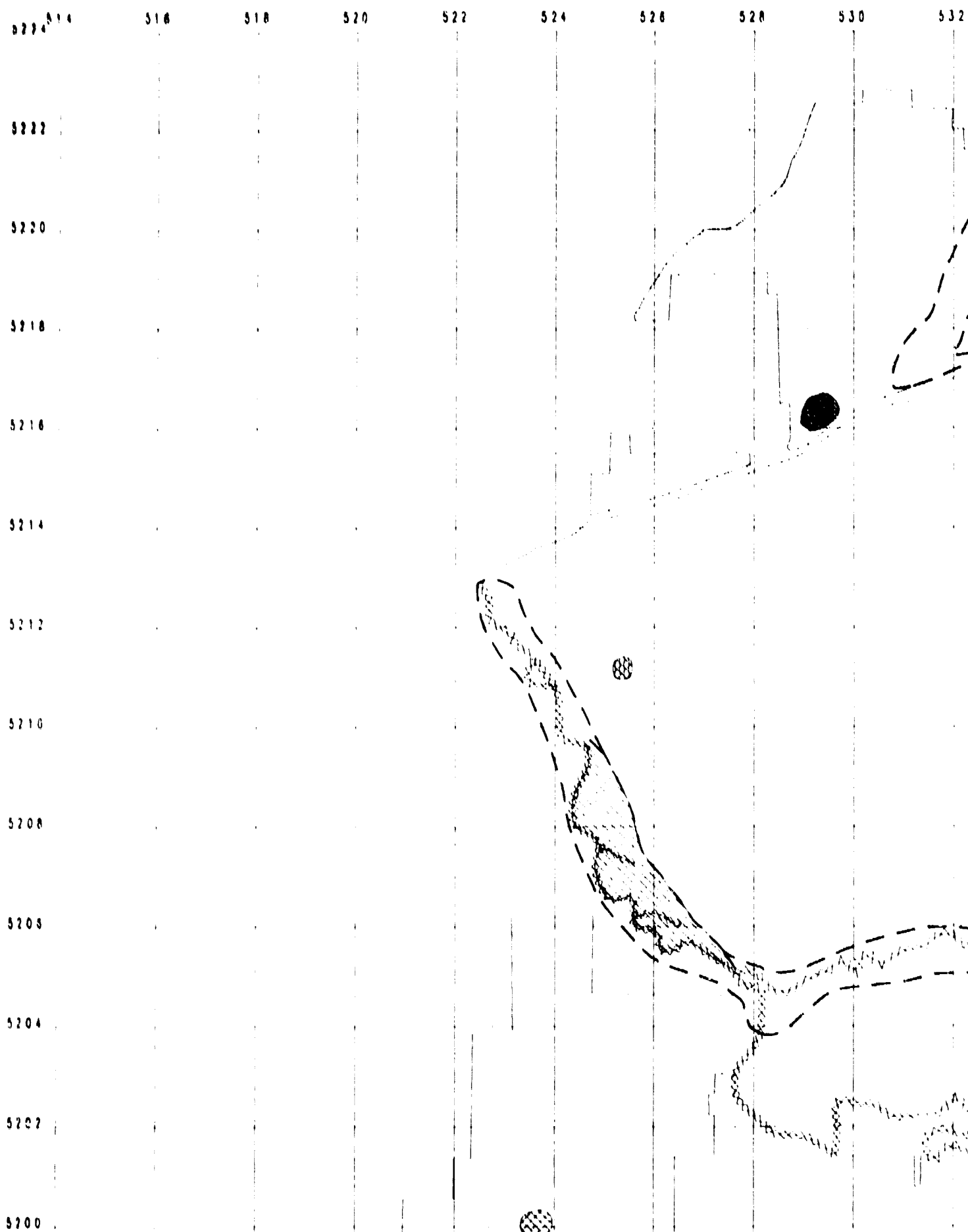
TRAINING AREA

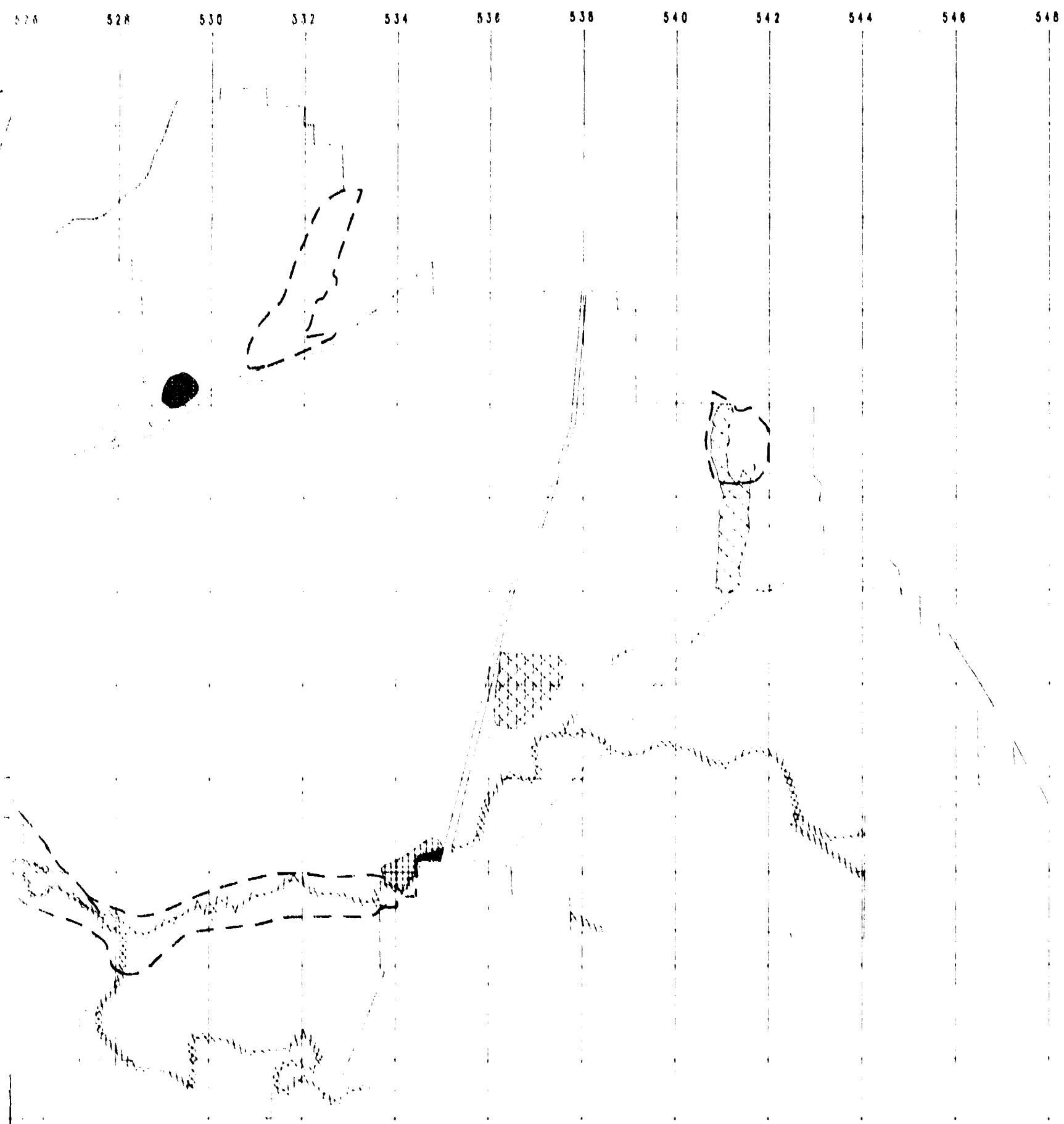
FT LEWIS, WASHINGTON



METERS







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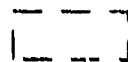


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NATURAL RESOURCE - AREAS OF CONCERN

SCALE 1:100000

ANIMALS



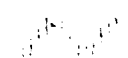
NESTING/WINTERING AREAS
(BALD EAGLE)



HERON ROOKERY

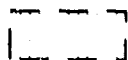


OSPREY NESTING AREA

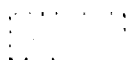


ANADROMOUS FISH SPAWNING AREAS

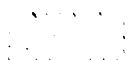
PLANTS



WEIR PRAIRIE AREA



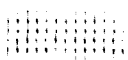
SPURGEON CREEK AREA



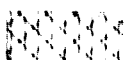
CARTER WOODS AREA



MONETTE HILL AREA



HALVERSON/BRANDENBURG
MARSH AREA



BOWER WOODS AREA



SPANAWAY MARSH AREA

FT LEWIS, WASHINGTON

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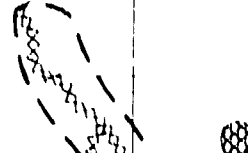
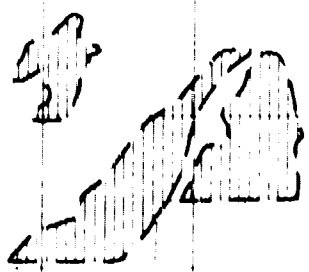
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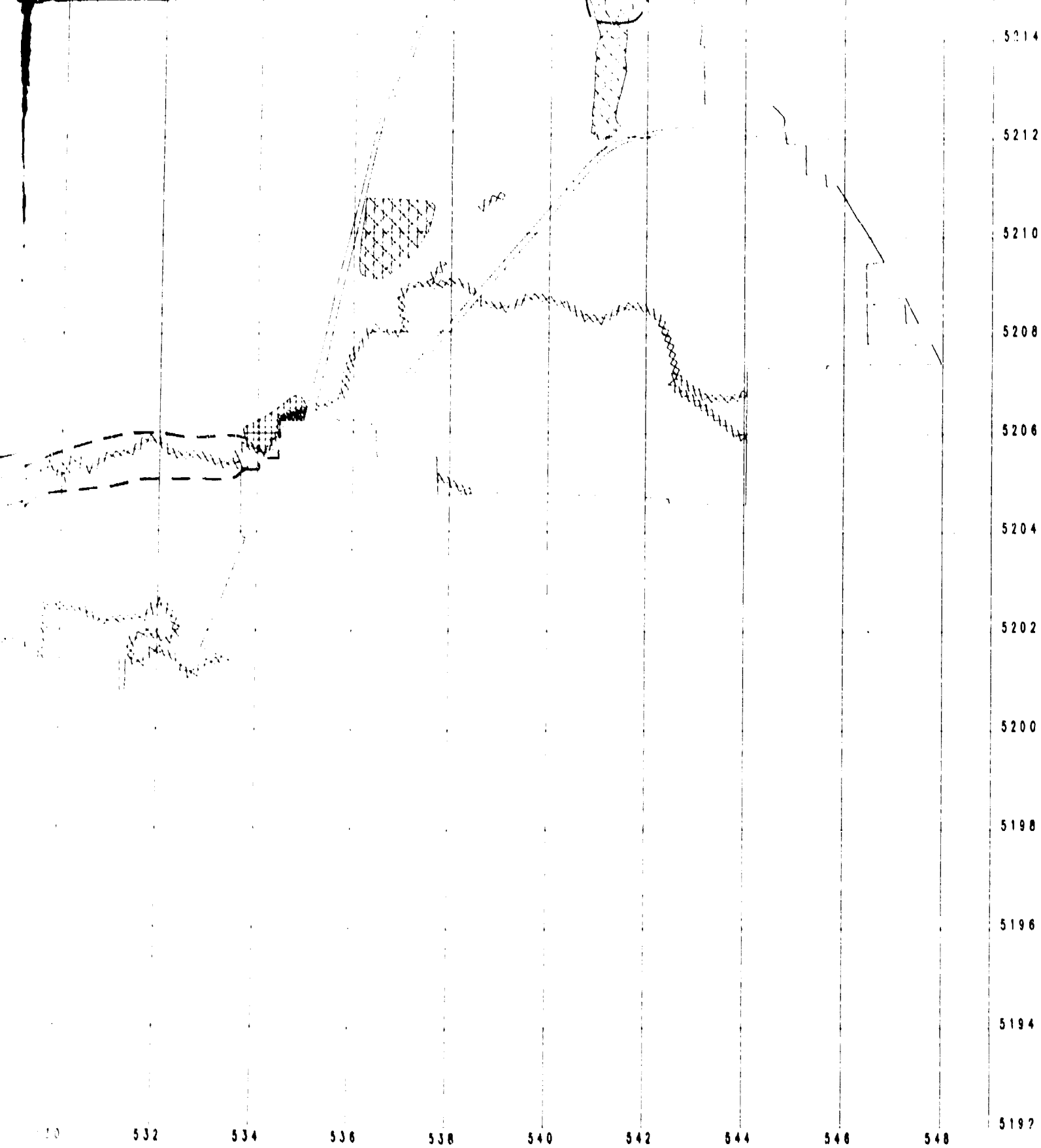


Plate 62. Special features

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ANADROMOUS FISH SPAWNING AREAS

PLANTS



WEIR PRAIRIE AREA



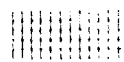
SPURGEON CREEK AREA



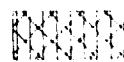
CARTER WOODS AREA



MONETTE HILL AREA



HALVERSON/BRANDENBURG
MARSH AREA



BOWER WOODS AREA



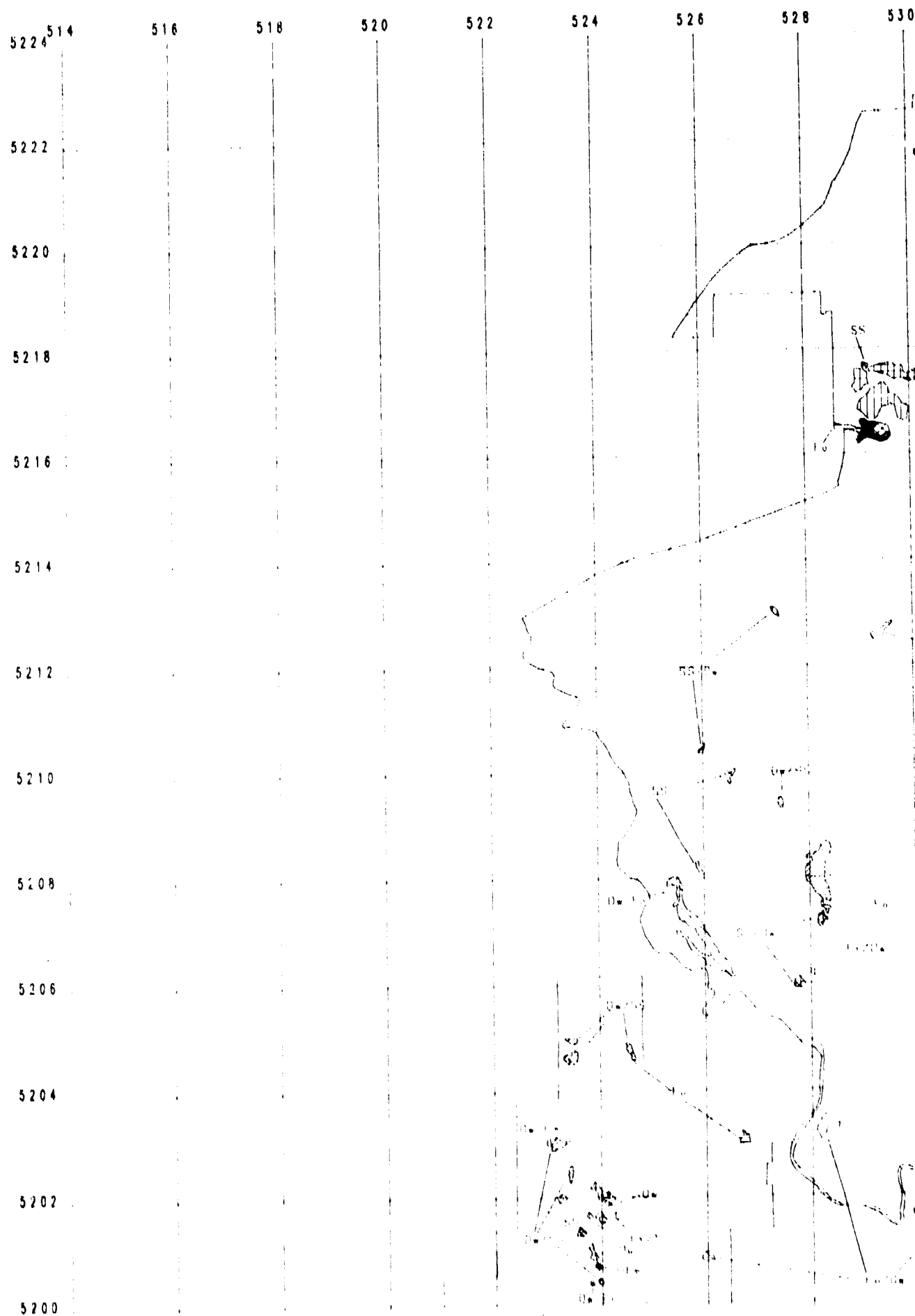
SPANAWAY MARSH AREA

FT LEWIS, WASHINGTON

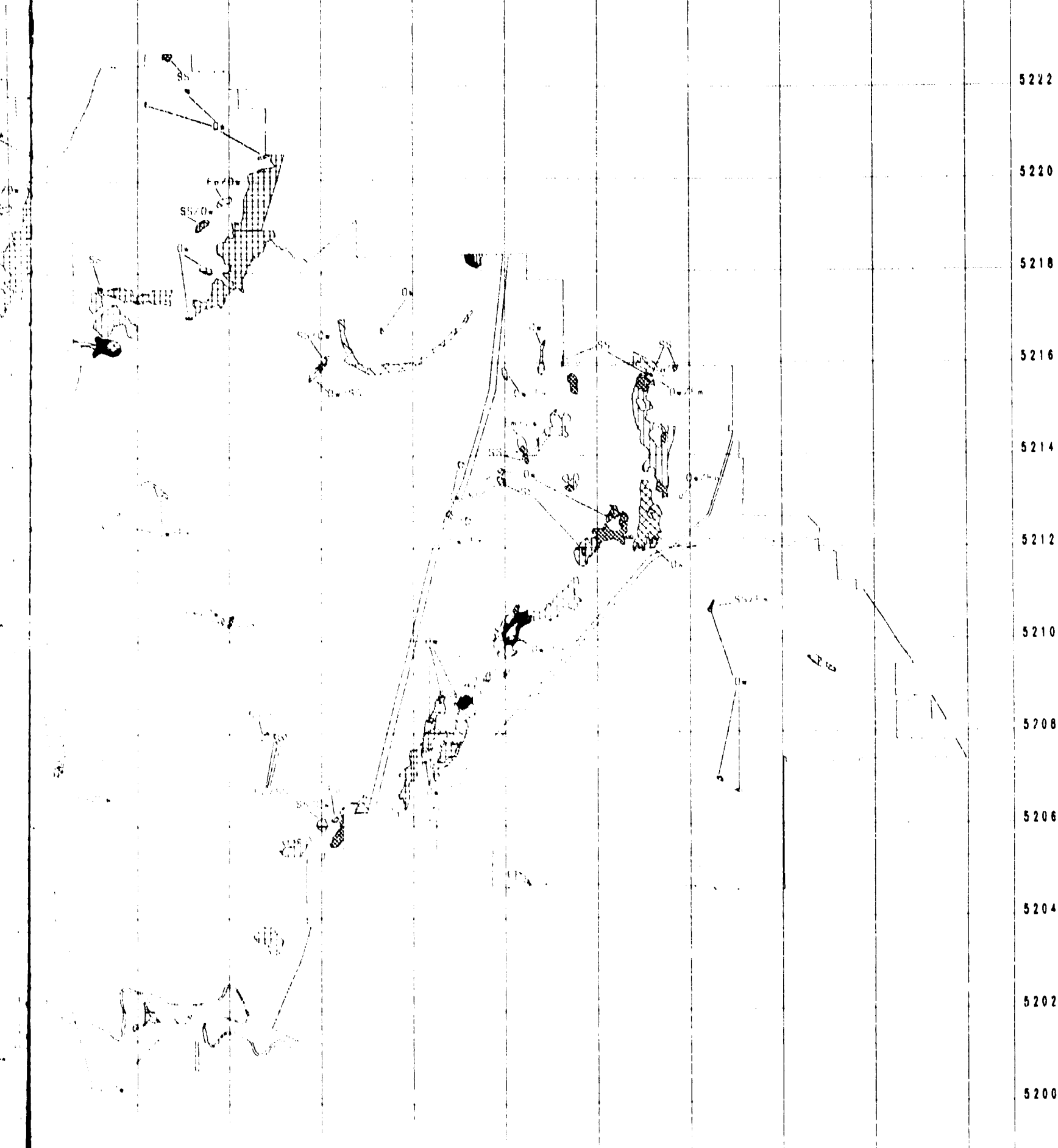
N

METERS





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U. S. Army Corps of Engineers Waterways Experiment Station

WETLANDS

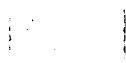
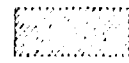
SCALE 1:100000



Em - EMERGENT MARSH



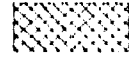
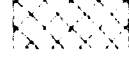
Ow - OPEN WATER

Em/Fc - EMERGENT MARSH/
CONIFEROUS FORESTOw/Em - OPEN WATER/
EMERGENT MARSHEm/Fo - EMERGENT MARSH/
FORESTED SWAMPOw/Fo - OPEN WATER/
FORESTED SWAMPEm/Ow - EMERGENT MARSH/
OPEN WATEROw/SS - OPEN WATER/
SCRUB/SHRUB SWAMPEm/SS - EMERGENT MARSH/
SCRUB/SHRUB SWAMP

SS - SCRUB/SHRUB SWAMP



Fo - FORESTED SWAMP

SS/Em - SCRUB/SHRUB SWAMP
EMERGENT MARSHFo/Fd - FORESTED SWAMP/
DECIDUOUS FORESTSS/Fd - SCRUB/SHRUB SWAMP
DECIDUOUS FORESTFo/Ow - FORESTED SWAMP/
OPEN WATERSS/Fm - SCRUB/SHRUB SWAMP
CONIF/DECID FOREFo/SS - FORESTED SWAMP/
SCRUB/SHRUB SWAMPSS/Fo - SCRUB/SHRUB SWAMP
FORESTED SWAMPSS/Ow - SCRUB/SHRUB SWAMP
OPEN WATER

FT LEWIS, WASHINGTON

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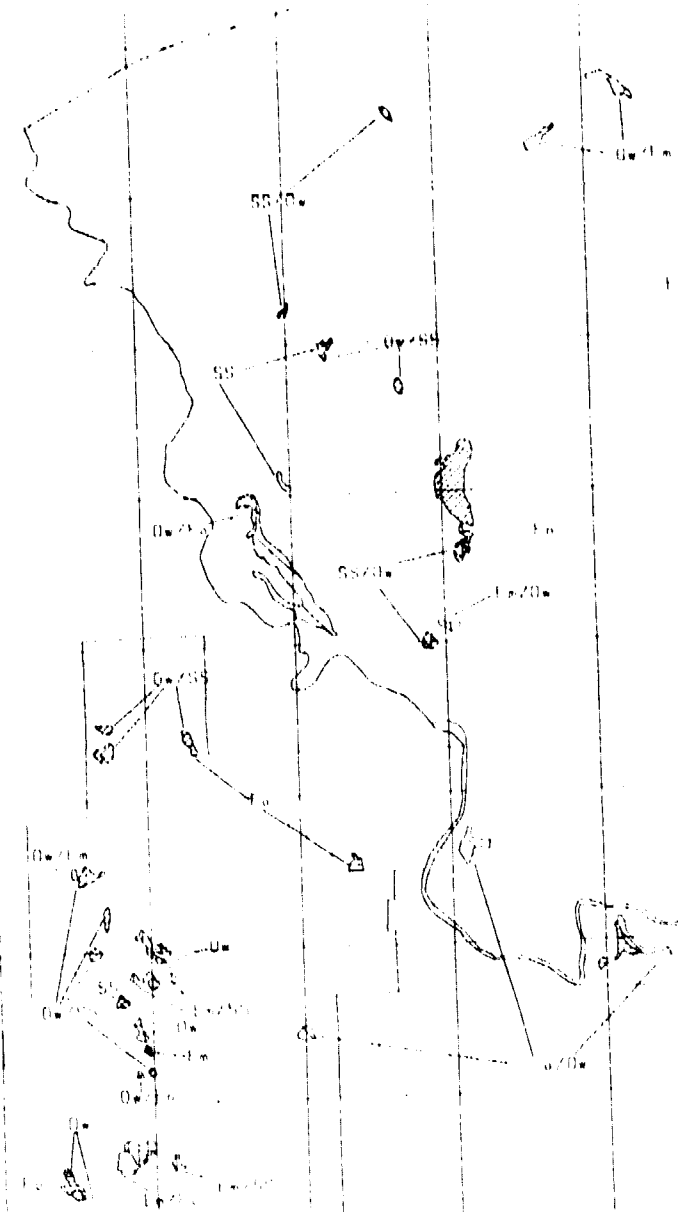
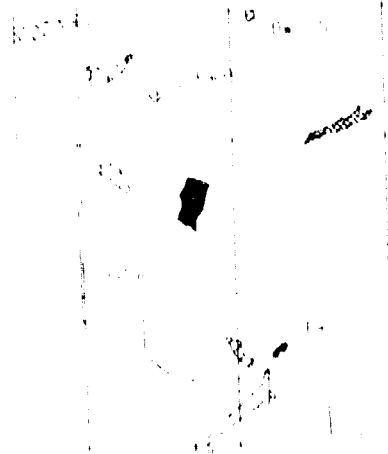
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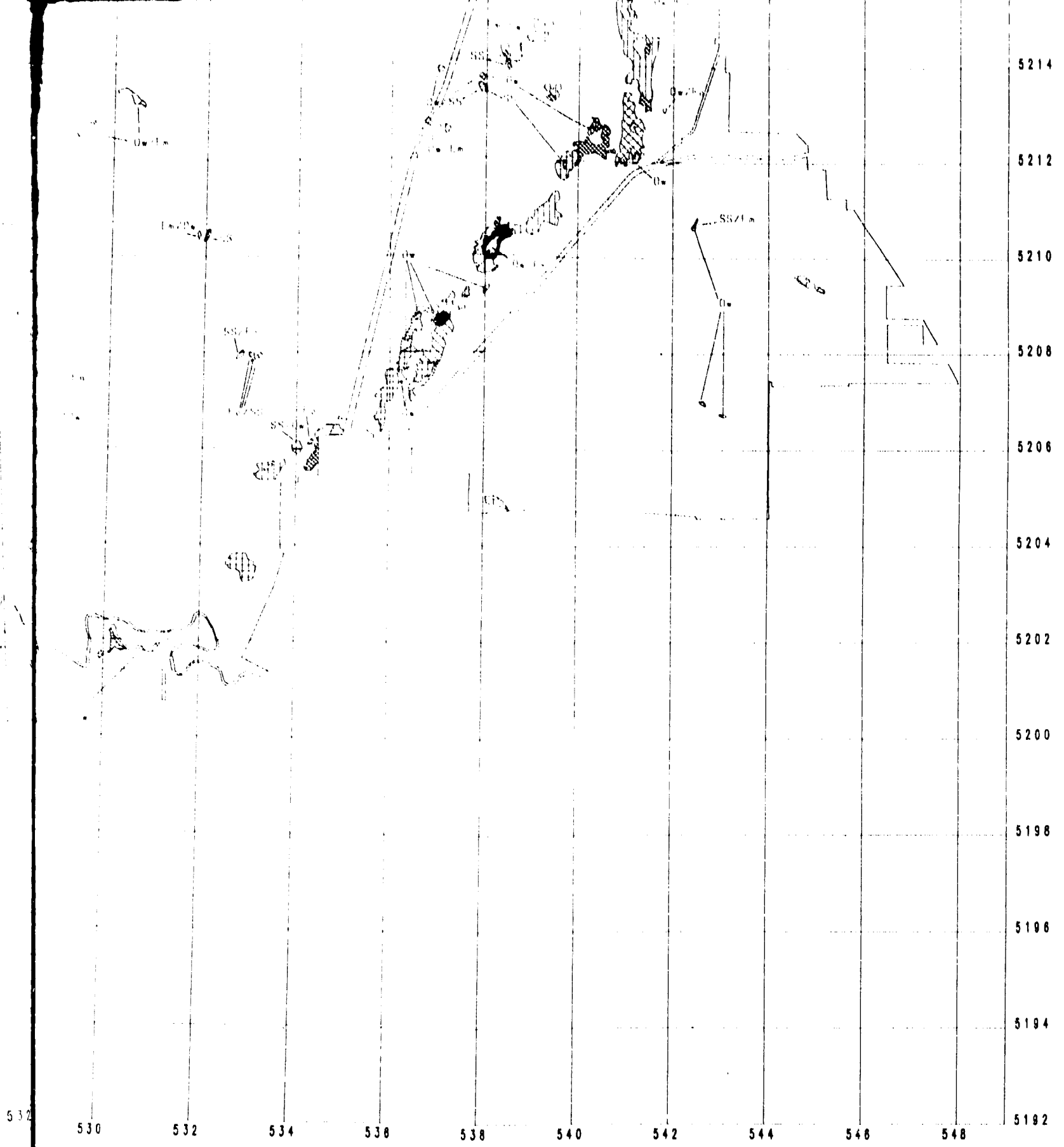
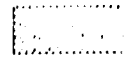


Plate 63. Detailed wetland associations

5214

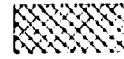
Em/Ow - EMERGENT MARSH/
OPEN WATEROw/SS - OPEN WATER/
SCRUB/SHRUB SWAMPEm/SS - EMERGENT MARSH/
SCRUB/SHRUB SWAMP

SS - SCRUB/SHRUB SWAMP

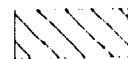
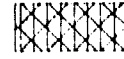
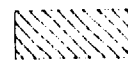
5212



Fo - FORESTED SWAMP

SS/Em - SCRUB/SHRUB SWAMP/
EMERGENT MARSHFo/Fd - FORESTED SWAMP/
DECIDUOUS FORESTSS/Fd - SCRUB/SHRUB SWAMP/
DECIDUOUS FOREST

5210

Fo/Ow - FORESTED SWAMP/
OPEN WATERSS/Fm - SCRUB/SHRUB SWAMP/MIX
CONIF/DECID FORESTFo/SS - FORESTED SWAMP/
SCRUB/SHRUB SWAMPSS/Fo - SCRUB/SHRUB SWAMP/
FORESTED SWAMP

5208

SS/Ow - SCRUB/SHRUB SWAMP/
OPEN WATER

5206

FT LEWIS, WASHINGTON

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METERS

