SALT LAKE COUNTY FLOOD CONTROL & WATER QUALITY

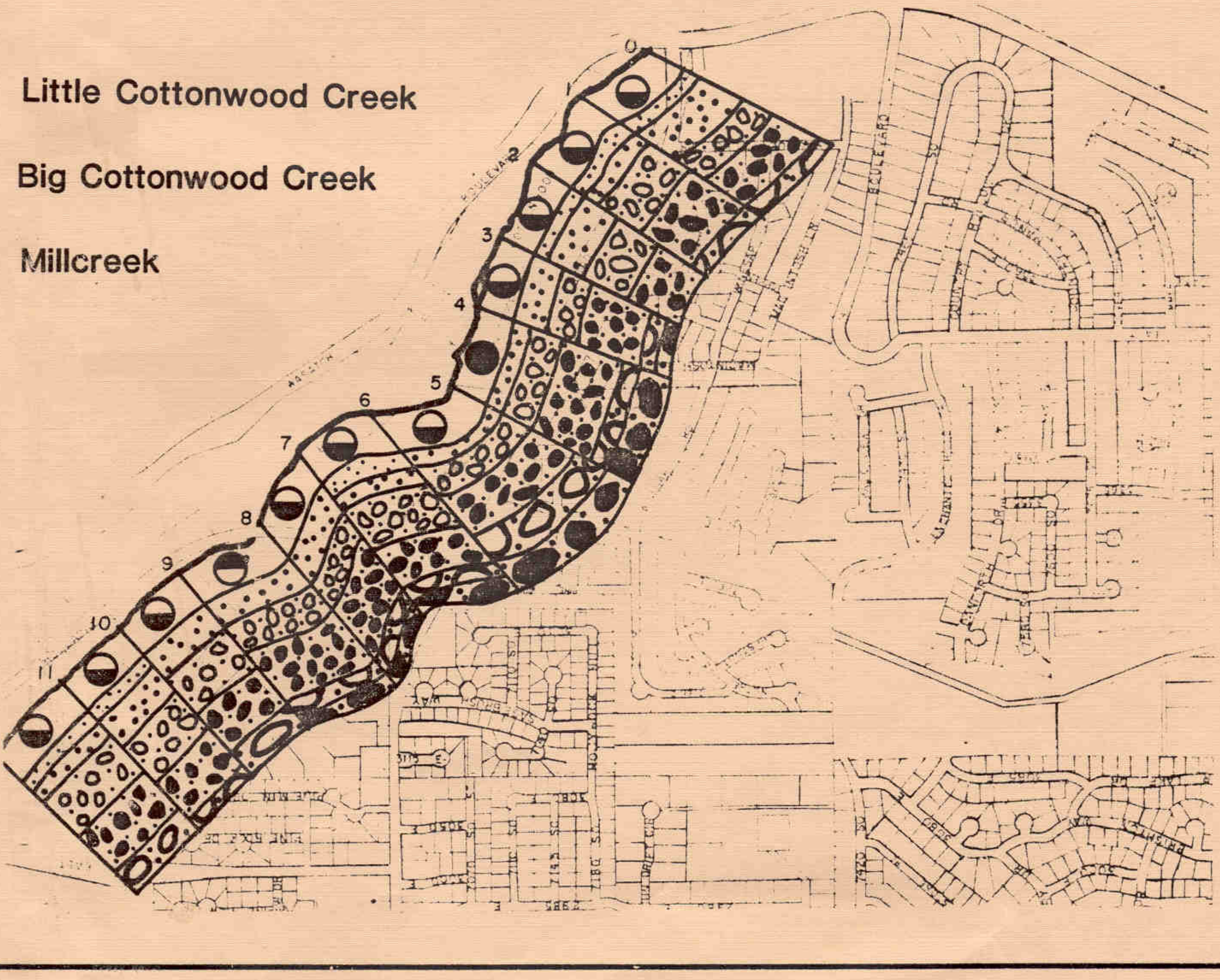
SALT LAKE COUNTY SOIL CONSERVATION DISTRICT

CHANNEL STABILITY EVALUATION & STREAM REACH INVENTORY

Little Cottonwood Creek

Big Cottonwood Creek

Millcreek



REVIEW DRAFT

SALT LAKE COUNTY DEPARTMENT OF PUBLIC WORKS

DIVISION OF FLOOD CONTROL AND WATER QUALITY IN COOPERATION WITH
SALT LAKE COUNTY SOIL CONSERVATION DISTRICT

STREAM BANK STABILIZATION
INVENTORY FOR LITTLE COTTONWOOD, BIG COTTONWOOD, AND MILL CREEK

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SEPTEMBER, 1984

TABLE OF CONTENTS

PAGE #

LIST OF FIGURES AND TABLES

I. OBJECTIVE AND SCOPE OF STUDY: SUMMARY

The purpose of this report is to present data on riparian and stream stability conditions for three Salt Lake valley tributaries: 1) Big Cottonwood Creek; 2) Little Cottonwood Creek; and 3) Mill Creek. Each of these streams head in the alpine reaches of the Wasatch Mountain Range and flow into the Jordan River. In turn, the Jordan River empties into the Great Salt Lake, a closed hydrologic basin. Combined, the creeks run for approximately 28 miles with a significant amount of adjacent riparian and flood plain vegetation. In February and early March 1984, the three creek environmental systems were inventoried. Using a bank stabilization inventory developed by the Forest Service, the inventory procedures differentiated the system into the floodplain, upper creekbank, lower creekbank, and creek bottom.[1] These procedures were developed to systemize measurements and evaluations of the resistive capacity of riparian zones and stream channels to the detachment of bottom and bank materials. Additionally, the capacity of the creeks to adjust and recover from changes in flow and sediment delivery can be correlated with inventory data at a later date. Observations, taken on each creek at 500 foot intervals, allowed the creeks to be represented as segments and/or a continuum.

Although, upper and lower bank vegetative resources were identified, they were examined primarily as they relate to stream sediment loading caused by bank erosion. Available information suggests that much of the sediment loads have a bank source.[2] The streambank stabilization inventory identifies these sources, and surrounding conditions which directly or indirectly accelerate bank erosion rates. These data will help achieve the objective to prioritize stream reaches which may require either structural or non-structural bank stabilization for flood control and water quality purposes.

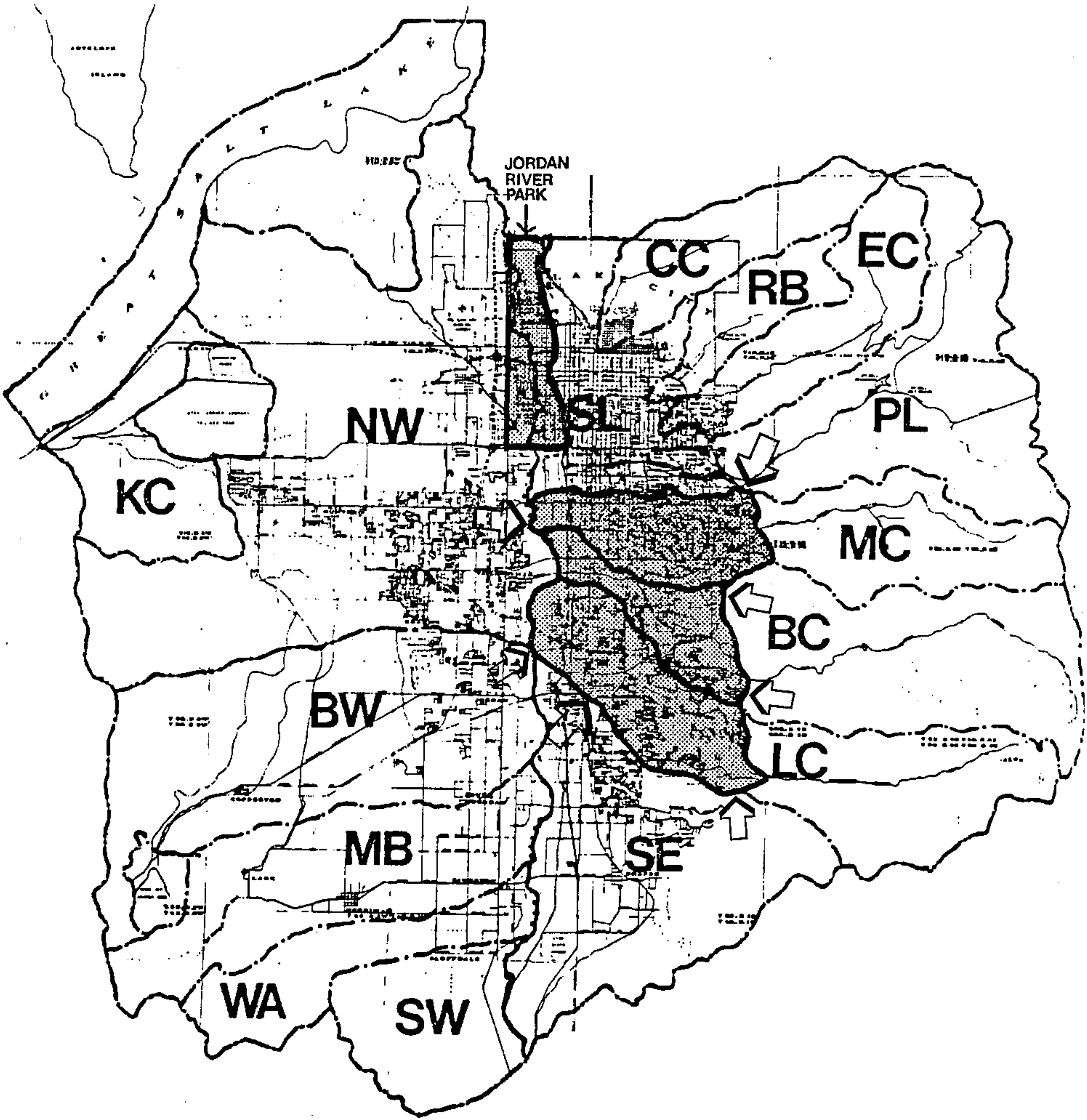


Figure A. Location of Study Area

II. INTRODUCTION

Water is one of Salt Lake County's most important resources serving many and often conflicting consumptive uses. As urban growth continues to accelerate in Salt Lake Valley, the demand for water increases. However, the benefits of water also spill over into indirect and intangible functional relationships. One such relationship is enhanced aesthetic values placed on stream or creek environmental systems. This real or perceived benefit has resulted in land use patterns that focus on the Jordan River (valley) tributaries, limiting flood control effectiveness.

The impact on both man and environment is enhanced during seasonal and cyclic flood events. Stormwater and snowpack runoff and the spring flood of 1983 heightened public awareness of potential flood damage caused to natural creek conditions as well as urban and residential structural development. Data was needed to identify current riparian and creek characteristics, in order to structure multi-resource management components into the flood control program.

This inventory was undertaken to identify creek and adjacent riparian conditions following the 1983 spring flood. Since the character of a creek is molded by the velocity of its current, it was expected that creek conditions have been altered by the flood event. Three natural tributaries of the Jordan River; Big Cottonwood Creek, Little Cottonwood Creek, and Mill Creek were inventoried during minimum flow levels in February and early March of 1984. Combined, the three creeks have approximately 28 stream miles and 53 acres of creek bed within the study area. Observations were recorded at "points" of 500 foot intervals totaling 291 data points. Conditions between points were generalized to be representative of each 500 foot reach.

Historical land use policies, e.g. streamside development, channelization, etc.) adjacent to and within the creek channels have disturbed and modified much of the natural condition resulting in a loose assortment of unstable bottom material. The extent of artificial manipulation of the creek bottoms has been extreme and widespread with very few natural areas remaining. While the merits of these policies may be controversial, and contradictory, with respect to multiple beneficial uses, it is assumed that flood control measures take precedent. It is intended that information from this streambank stabilization inventory be integrated into existing data to provide a framework for policy decision making regarding land and creek use along the Jordan River Valley tributaries. It will also identify conditions of instability which, if appropriately corrected, will reduce expensive dredging needs and expand the use of the creek resources by the public.

III. METHODOLOGY

Inventory procedures were developed and applied to Big Cottonwood Creek, Little Cottonwood Creek and Mill Creek, beginning at the mouths of Big Cottonwood Canyon, Little Cottonwood Canyon and Mill Creek Canyon respectively. Observation points were identified and mapped at 500 foot intervals prior to actual field investigation. The 500 foot intervals were decided upon to correspond existing fishery classification procedures by the Utah Division of Wildlife Resources.

To insure uniformity at each observation point, a standardized inventory format was developed and utilized, based on prior work performed by the United States Forest Service. Inventory sheets, developed by the Forest Service for use on nonurban forest lands, were modified to better fit creek and riparian conditions found on urban lands, Figures 1 and 2. The inventory sheet is divided into two general areas; adjacent land and vegetation characteristics and creek characteristics.

Land and vegetation characteristics Figure 1, ranged from valley shape, width and gradient to general vegetative communities and types of riparian, floodplain, and terrestrial phases of creek systems. Since much urban development has occurred in the floodplain and terrestrial components, it was expected that introduced vegetative species would be found and were discounted. This study concentrates on native vegetation with the exception that all vegetation located in the riparian phase, providing bank stabilization benefits, would be included. Available vegetative material that could possibly contribute to debris and log jams were included and identified. A subjective boundary between terrestrial and stream stata had to be determined.

Creek characteristics included channel gradient, width, average depth,

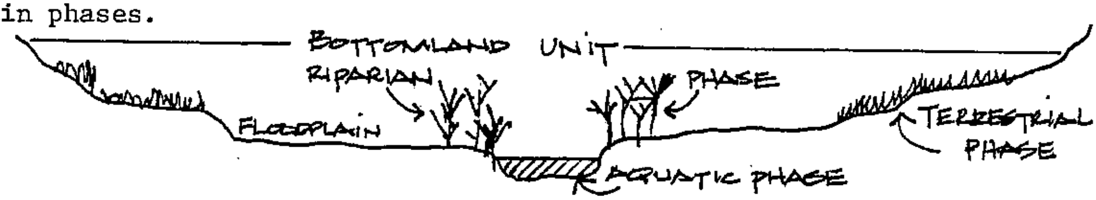
Figure One

Major Drainage__________________ District_______________ Date__________

Observer(s)______________________ Stream Name_____________ Reach Number__________

Elevation________ to ________ feet P.W.I. Watershed #____________

A valley bottomland is that total area of land which includes the stream channel, the adjacent floodplain, benches or terraces, and other gentle terrain, and normally those valley toe slopes which may directly affect or be affected by the stream. Valley bottomlands may be stratified into aquatic, riparian, terrestrial, and floodplain phases.



Directions: Circle the appropriate response or fill in the blank as required.

Valley Shape:

Valley Width: narrow (100") moderately wide (100'-325') wide (325')

Side slope Gradient: low (30') moderately steep (30-60%) steep (60%)

Valley Gradient: low(4%) moderately stee (4-8%) steep (8%)

Channel Gradient: very low (2%) low (2-3%) moderately steep (3-6% steep (6%)

Channel Size: width______ft. Average depth______ ft. Flow pattern__________

Geologic materials in bottom: ____

Landform/Type ____

	RIPARIAN PHASE	FLOODPLAIN	TERRESTRIAL PHASE
vegetative type:			
vegetative cover density:			
type of debris:			
sediment buffer potential:			

Number of debris jams &/or fish blocks/mile___. Upstream watershed impacts (Type)____.

Size Composition of
Bottom Material
(Total to 100%)

1. Exposed bedrock__________%
2. Large boulders, 3' + Dia.____%
3. Small boulders, 1-3'________%
4. Large rubble, 6"-12"________%
5. Small rubble, 3"-6"________%
6. Coarse gravel, 1"-3"________%
7. Fine gravel, 0.1"-1"________%
8. Sand, silt, clay, muck____%

Figure Two

R-1 STREAM REACH INVENTORY and CHANNEL STABILITY EVALUATION

REACH LOCATION: Survey Date 8-12-75 Time 1430 Obs. D.R. - L.S. - D.P.

Forest Brightwater Rgr. Dist. Purity

P.W.I.

Stream Fern Creek W/S No. 16-02-00-04-23-05-01-01

Reach Description & Other Identification Road crossing Sec 3 to 1/4 mi. upstream Aerial Photo # 274-191

	Key #	Stability Indicators by Classes (Fair and Poor on reverse side) EXCELLENT		GOOD	
Upper Banks	1	Bank slope gradient <30%.	(2)	Bank slope gradient 30-40%.	(4)
	2	No evidence of past or any potential for future mass wasting into channel.	[✓ 3]	Infrequent and/or very small. Mostly healed over. Low future potential.	(6)
	3	Essentially absent from immediate channel area.	(2)	Present but mostly small twigs and limbs.	[✓ 4]
	4	90%+ plant density. Vigor and variety suggests a deep, dense, soil binding, root mass.	[✓ 3]	70-90% density. Fewer plant species or lower vigor suggests a less dense or deep root mass.	(6)
Lower Banks	5	Ample for present plus some increases. Peak flows contained. W/D ratio <7.	(1)	Adequate. Overbank flows rare. Width to Depth (W/D) ratio 8 to 15.	[✓ 2]
	6	65%+ with large, angular boulders 12"+ numerous.	(2)	40 to 65%, mostly small boulders to cobbles 6-12".	[✓ 4]
	7	Rocks and old logs firmly embedded. Flow pattern without cutting or deposition. Pools and riffles stable.	[✓ 2]	Some present, causing erosive cross currents and minor pool filling. Obstructions and deflectors newer and less firm.	(4)
	8	Little or none evident. Infrequent raw banks less than 6" high generally.	(4)	Some, intermittently at outcurves and constrictions. Raw banks may be up to 12".	~~(8)~~ [✓ 6]
	9	Little or no enlargement of channel or point bars.	[✓ 4]	Some new increase in bar formation, mostly from coarse gravels.	(8)
Bottom	10	Sharp edges and corners, plane surfaces roughened.	(1)	Rounded corners and edges, surfaces smooth and flat.	[✓ 2]
	11	Surfaces dull, darkened, or stained. Gen. not "bright".	(1)	Mostly dull, but may have up to 35% bright surfaces.	[✓ 2]
	12	Assorted sizes tightly packed and/or overlapping.	[✓ 2]	Moderately packed with some overlapping.	(4)
	13	No change in sizes evident. Stable materials 80-100%.	[✓ 4]	Distribution shift slight. Stable materials 50-80%.	(8)
	14	Less than 5% of the bottom affected by scouring and deposition.	[✓ 6]	5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	(12)
	15	Abundant. Growth largely moss-like, dark green, perennial. In swift water too.	(1)	Common. Algal forms in low velocity & pool areas. Moss here too and swifter waters.	[✓ 2]
		EXCELLENT COLUMN TOTAL →	24	GOOD COLUMN TOTAL →	22

Add values in each column and record in spaces below. Add column scores.

E. 24 + G. 22 + F. 6 + P. 0 = 52 Total Reach Score.

Adjective ratings: <38=Excellent, [✓ 39-76=Good] 77-114=Fair, 115+=Poor*

*(Scores above may be locally adjusted by Forest Hydrologist)

Stream Width 6 ft. X Ave. Depth 0.5 ft. X Ave. Velocity [✓ 1.2] /s= 3.6 Flow cfs

Reach Gradient 4 %, Stream Order 3, Turbidity Level Low, Stream Stage Low (2.3) Sinuosity Ratio [✓ 1.2].

Temperature °F or °C of: Air 86 Water 52, Others pH 7.2, Conductance 45 µMhos

Water Quality Sample Bottle # 34

	Key #	Stability Indicators by Classes FAIR		POOR	
Upper Banks	1	Bank slope gradient 40-60%.	[✓ 6]	Bank slope gradient 60%+.	(8)
	2	Moderate frequency & size, with some raw spots eroded by water during high flows.	(9)	Frequent or large, causing sediment nearly yearlong OR imminent danger of same.	(12)
	3	Present, volume and size are both increasing.	(6)	Moderate to heavy amounts, predominantly larger sizes.	(8)
	4	50-70% density. Lower vigor and still fewer species form a somewhat shallow and discontinuous root mass.	(9)	<50% density plus fewer species & less vigor indicate poor, discontinuous, and shallow root mass.	(12)
Lower Banks	5	Barely contains present peaks. Occassional overbank floods. W/D ratio 15 to 25.	(3)	Inadequate. Overbank flows common. W/D ratio > 25.	(4)
	6	20 to 40%, with most in the 3-6" diameter class.	(6)	< 20% rock fragments of gravel sizes, 1-3" or less.	(8)
	7	Moderately frequent, moderately unstable obstructions & deflectors move with high water causing bank cutting and filling of pools.	(6)	Frequent obstructions and deflectors cause bank erosion yearlong. Sediment traps full, channel migration occurring.	(8)
	8	Significant. Cuts 12"-24" high. Root mat overhangs and sloughing evident.	(12)	Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	(16)
	9	Moderate deposition of new gravel & coarse sand on old and some new bars.	(12)	Extensive deposits of predominantly fine particles. Accelerated bar development.	(16)
Bottom	10	Corners & edges well rounded in two dimensions.	(3)	Well rounded in all dimensions, surfaces smooth.	(4)
	11	Mixture, 50-50% dull and bright, ± 15% ie. 35-65%.	(3)	Predominantely bright, 65%+, exposed or scoured surfaces.	(4)
	12	Mostly a loose assortment with no apparent overlap.	(6)	No packing evident. Loose assortment, easily moved.	(8)
	13	Moderate change in sizes. Stable materials 20-50%.	(12)	Marked distribution change. Stable materials 0-20%.	(16)
	14	30-50% affected. Deposits & scour at obstructions, constrictions, and bends. Some filling of pools.	(18)	More than 50% of the bottom in a state of flux or change nearly yearlong.	(24)
	15	Present but spotty, mostly in backwater areas. Seasonal blooms make rocks slick.	(3)	Perennial types scarce or absent. Yellow-green, short term bloom may be present.	(4)
		FAIR COLUMN TOTAL →	6	POOR COLUMN TOTAL →	0

Size Composition of Bottom Materials (Total to 100%)

1. Exposed bedrock.......... 0 %	5. Small rubble, 3"-6"..... 30 %
2. Large boulders, 3'+ Dia.... 5 %	6. Coarse gravel, 1"-3".... 25 %
3. Small boulders, 1-3'....... 10 %	7. Fine gravel, 0.1-1"..... 20 %
4. Large rubble, 6"-12"...... 10 %	8. Sand, silt, clay, muck.. T %

flow pattern and size composition of bottom materials. More specifically, the creek channel was divided into the following strata:

Upper Bank: That portion of the topographic cross-section from the break in the general slope of the surrounding land to the normal high water line. Upper bank characteristics that were inventoried included landform slope, existing or potential mass wasting, debris jam potential and bank protection;

Lower Bank: The intermittently submerged portion of the channel cross-section from the normal high water line to the water's edge during minimum flows. Characteristics that were inventoried include channel capacity, bank rock content, cutting, deposition and flow deflectors.

Channel Bottom: The submerged portion of the channel cross-section which supports an aquatic environment. Characteristics inventoried under this strata included degrees of rock angularity, rock brightness, particle packing, bottom size distribution and percent stable material, scouring and deposition and clinging aquatic vegetation.

Individual creek characteristics were measured in predefined degrees of condition and placed in columns of excellent, good, fair and poor condition, Figures 2. Each condition was assigned a weighted numeric value, ranging one to twenty-four, with the higher numbers indicating poorer condition. Table 1 respectively shows weighted numeric values.

Information from the inventory data sheets were combined into a matrix format and mapped to provide graphic documentation (See Appendices 1-3).

Graphic and matrix documentation allows better visualization of specific creek lengths and/or points. Specific problem areas and non-problem areas were then identified and discussed.

TABLE ONE

WEIGHTED VALUES FOR SPECIFIC CREEK CHARACTERISTICS

Creek Characteristic	Condition			
	Excellent	Good	Fair	Poor
A. Upper Bank				
Landform Slope	2	4	6	8
Mass Wasting	3	6	9	12
Debris Jam Potential	2	4	6	8
Bank Vegetation	3	6	9	12
B. Lower Bank				
Channel Capacity	1	2	3	4
Rock Content	2	4	6	8
Flow Deflectors	2	4	6	8
Cutting	4	8	12	16
Deposition	4	8	12	16
C. Channel Bottom				
Rock Angularity	1	2	3	4
Brightness	1	2	3	4
Particle Packing	2	4	6	8
Size Distribution	4	8	12	16
Scouring/Deposition	6	12	18	24
Aquatic Vegetation	1	2	3	4

The actual conditions of a/point were identified and summed to give a point score and expanded to make certain assumptions concerning the stream segment or reach. Individual points were catagorized based on Table Two.

TABLE TWO

POINT OR REACH SCORES

	Excellent	Good	Fair	Poor
Total Score	< 38	39-76	77-114	> 114

IV. INVENTORY RESULTS/DISCUSSION

Inventory results show many similarities as well as differences. Generally, the artificial manipulations of the creek systems, and more specifically the creek channels, have minimized natural interactions between conditions. Dynamic biotic and abiotic relationships allow characters to maintain balanced and sustainable systems. Where one component fails, others will expand to recreate and achieve the balance. Conversely, sustained artificial manipulation maintains an unbalanced creek system susceptible to increased disasters. Ongoing manmade manipulation create the need for further manmade manipulation. However, certain creek condition parameters indicate high degrees of correlation, while others seem individual. For example, the extent of upper bank mass wasting seems to be a function of quantity of riparian vegetation.

For the purposes of this report, each creek is discussed individually. The inventory of current conditions is divided into four sections: 1) General Geologic and Reach Characteristics; 2) Upper Banks; 3) Lower Banks; and 4) Channel Bottom. Specific characteristics are discussed within each section.

A. BIG COTTONWOOD CREEK

The inventory area of Big Cottonwood Creek extends from the mouth of Big Cottonwood Canyon, where Wasatch Boulevard crosses the creek, approximately nine miles to the confluence of the creek and Jordan River. 102 observation points are located within the study area. The elevational change is approximately 800 feet.

Parent geologic material, the source being Big Cottonwood Canyon, consists primarily of sedimentary shale, sandstone and carbonic limestones (3). Lesser amounts of granite were found in the creek bottom. Since artificial man-caused movement has occurred routinely over the years, only preliminary identification was established. Rather, bottom size composition was more critical to this study.

Identification of the size composition of bottom materials is normally a function of local channel gradient and stream velocity. Figure 3 shows the composition and size distribution of bottom material. Point differences may be due to micro creek gradients or man-caused movement. Generally, larger boulders were present but decreased slowly downstream and were virtually gone by point 17 (above Knudsens Corner Area). Extensive gabion construction below point 20 can account for the rapid disappearance of larger bottom material. Local available larger bottom material is utilized to fill gabion baskets. Additionally, channelization techniques push bottom material against the bank and subsequent bank erosion allows smaller materials to return to the creekbed prior to larger material. Rubble material (3-12 inches), too small to be utilized extensively as gabion fill material, predominates bottom material below Point 11, only to be placed by fine gravel and muck at Point 79 where the creek velocity slows considerably and dredging activities have taken place. Slower velocities allow smaller particles to settle out. Riffle-pool conditions, bridge and other road and development activities have affected size composition of localized creek segments.

Overall, the reach character scored 75 percent in fair condition, 9 percent in poor condition and 5 percent in good condition. Observations for 11 percent of the creek were omitted due to construction activities. The majority of poor conditions are found on the lower segments closer to the confluence of the Jordan River. Specific creek channel characteristics are found in Appendix A.

Creek conditions were identified and plotted to visually show relationships Figure 3 against channel strata.

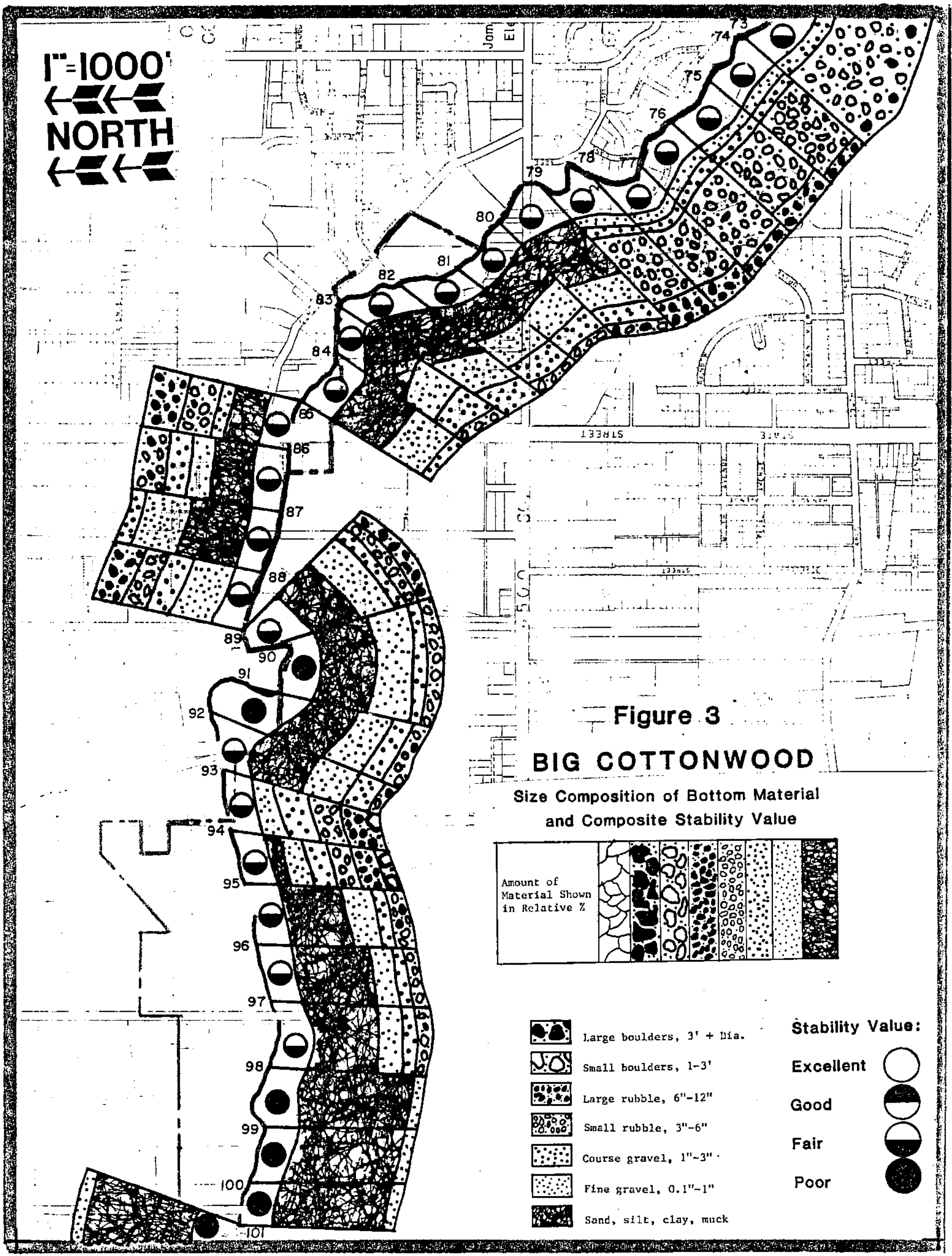
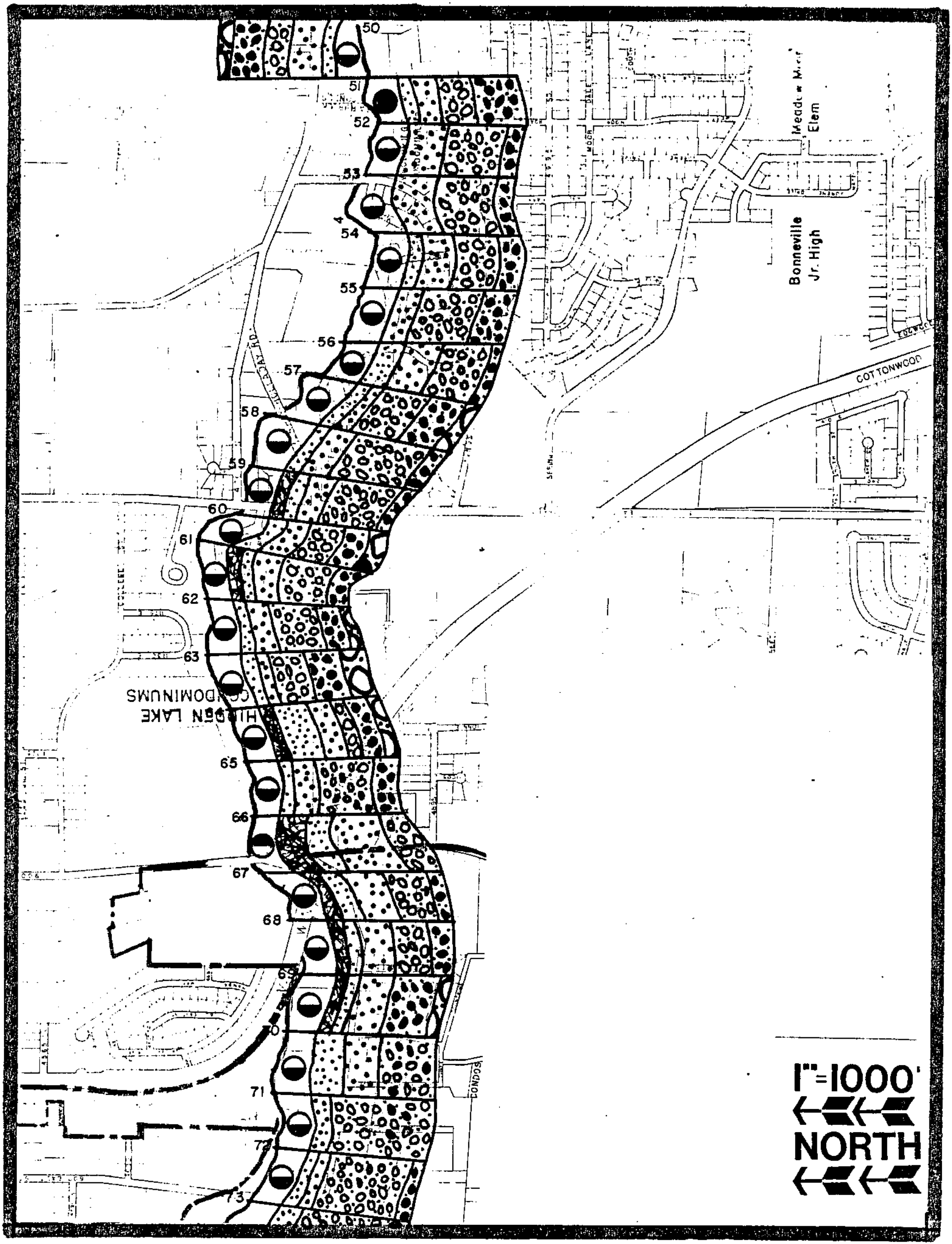


Figure 3

BIG COTTONWOOD

Size Composition of Bottom Material and Composite Stability Value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Bonneville Jr. High
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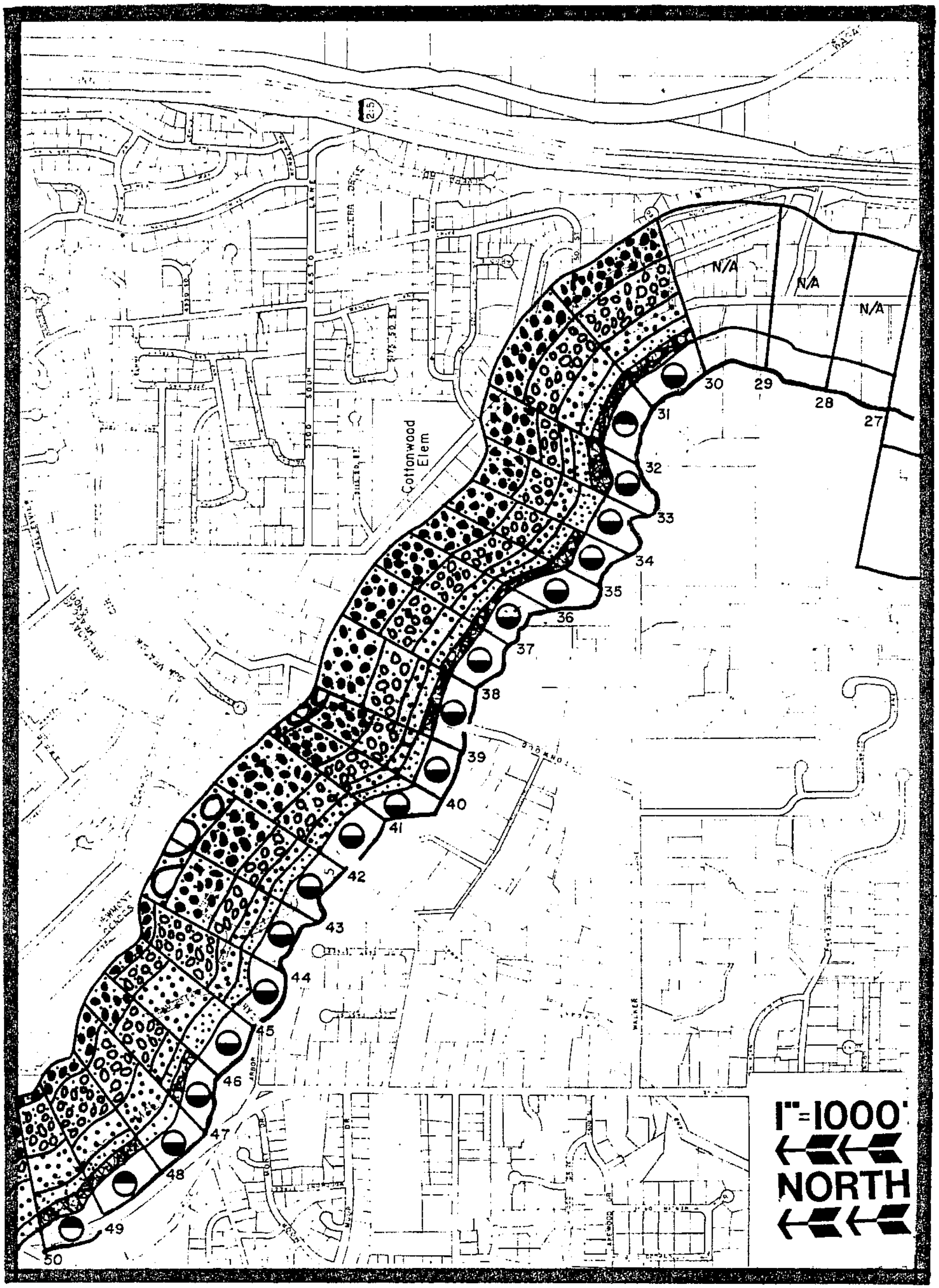
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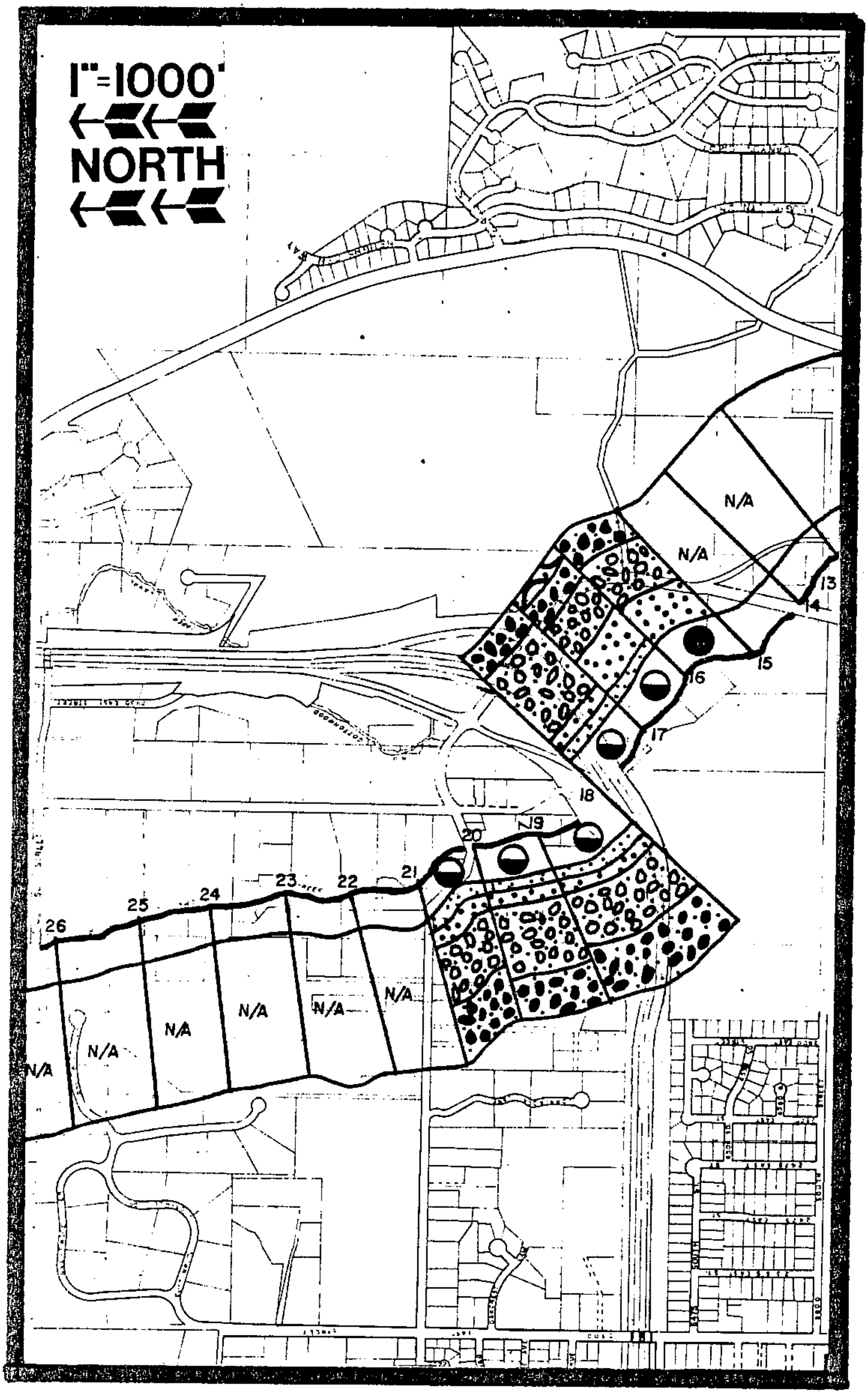

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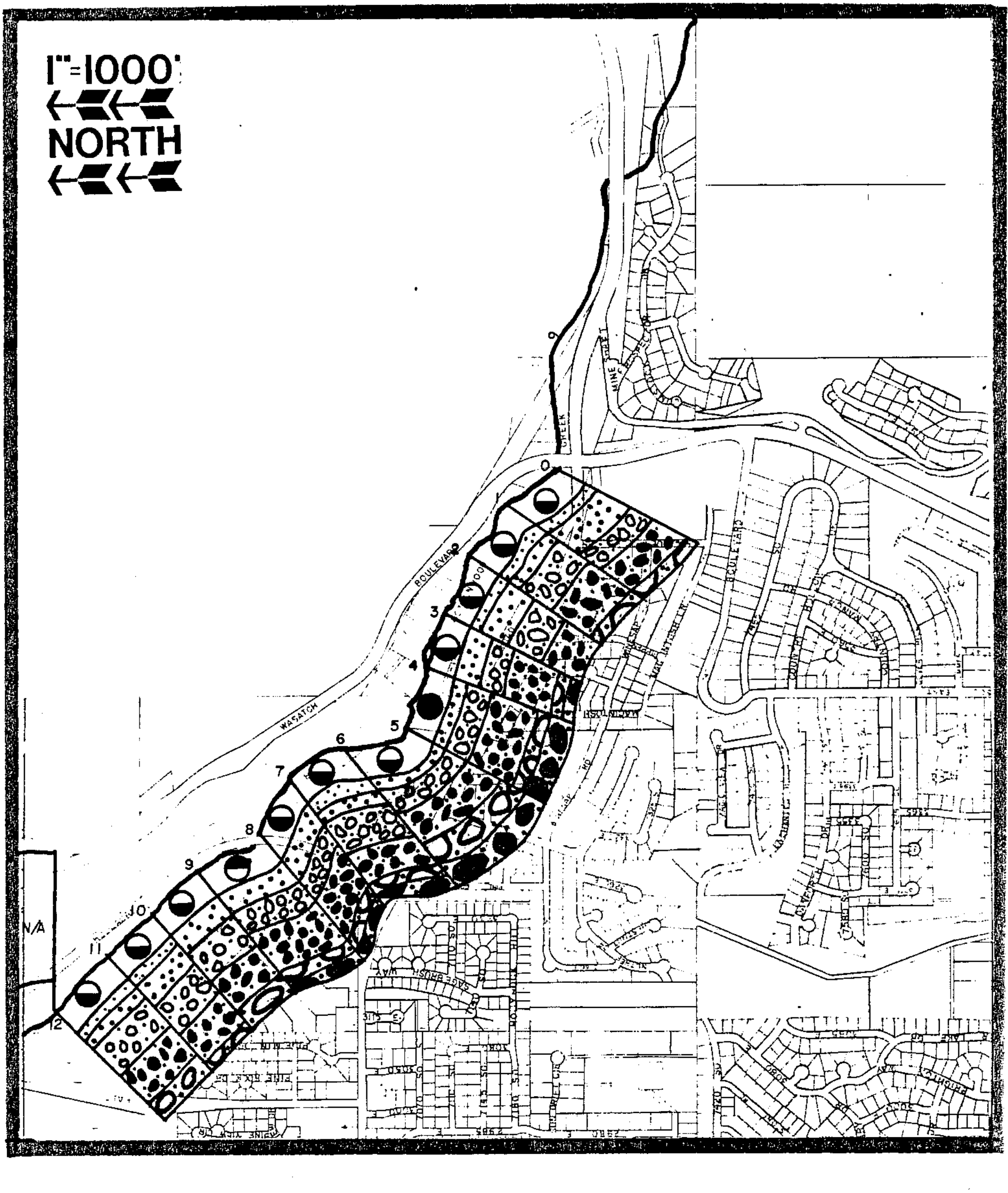
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WASATCH
CREEK
BOULEVARD

Upper Bank:

Approximately 85 percent of the upper bank has a greater than 40 percent slope with only 10 percent being less than 30 percent. Creek segments with slopes exceeding 60 percent are localized and found at points 1-3, 35-38, and 95-101. Mass wasting is enhanced by steep slopes and a lack of vegetation. Of the 38 points with significant mass wasting, all had less than 70 percent (fair to poor) vegetative density with shallow and discontinuous root masses. In general, bank protection from vegetation is lacking with 74 observation points showing fair or poor condition. This seems consistent with current flood control policies concerning vegetation removal when implementing channeling activities. There was little or no debris jams potential.

Lower Bank

Channel capacity was excellent or good with few exceptions. This is consistent with flood control policy to allow maximum flows through the creek channels. The size and amount of rock in the banks interfaced with mass wasting. Of the 13 points with extreme mass wasting, 11 points show bank rock content below 40 percent and consisting of small rubble sized material. Approximately 73 percent of the points identify bank rock content as fair or poor. However, this does not include structural bank stabilization practices such as gabions rip-rap, or concrete retaining walls. Channelization efforts have placed some bottom material along and upon the banks. This practice has cleared most of the channel from obstructions and flow deflectors as well as pool sediment deposition areas. 65 points were identified having minor or no obstructions and flow deflectors. Cutting is associated with both mass wasting and bank rock content. 44 points indicated significant lower bank cutting (fair and poor condition). Of these, 36 had little bank rock content and fair and/or poor mass wasting conditions. The inventory showed little deposition, probably due to channeling activities.

Channel Bottom

Bottom material mainly consisted of rock with sharp edges or rounded corners and edges. Sixty-two points identified rock angularity as either excellent or good. Only near the Jordan River confluence did rock angularity drop to the poor classification. Generally, rock brightness and aquatic vegetation was not a factor with most exposed bottom rock with bright surfaces. This is most likely due to channeling efforts as well as dewatering the creek. Most aquatic vegetation was found below storm drains and other outlets. Much of the creek bottom material consisted of a loose assortment with little overlapping. Only in natural undisturbed areas were tightly packed and overlapping bottom material found. A large range in bottom size distribution was identified (See Figure 3). However, stability was generally lacking. Only minor bottom scouring was identified and is not considered a factor. Major deposition areas were found at points 79 to 101.

B. Little Cottonwood Creek

The study area for Little Cottonwood Creek included the creek below the mouth of Little Cottonwood Canyon to interstate fifteen. About 9.5 miles of creek was inventoried totaling 114 observation points.

The parent geologic material is predominately granitic and was found throughout the creek. Much of the creek has been straightened and channelized. The size composition distribution of bottom material is represented in Figure 4. Large boulders, greater than one foot were found to point 18 where extensive gabion construction occurred. Rubble, 3-12

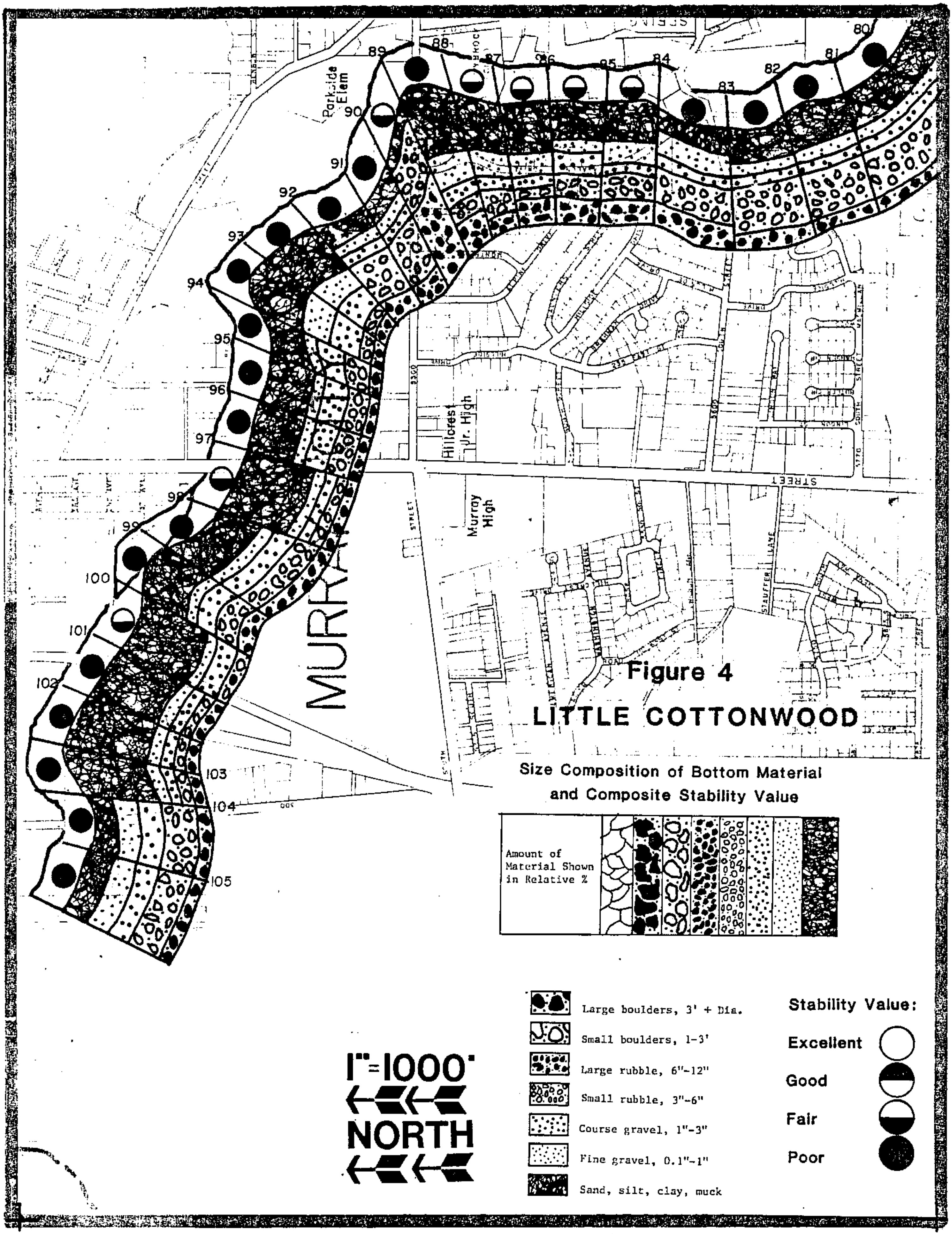
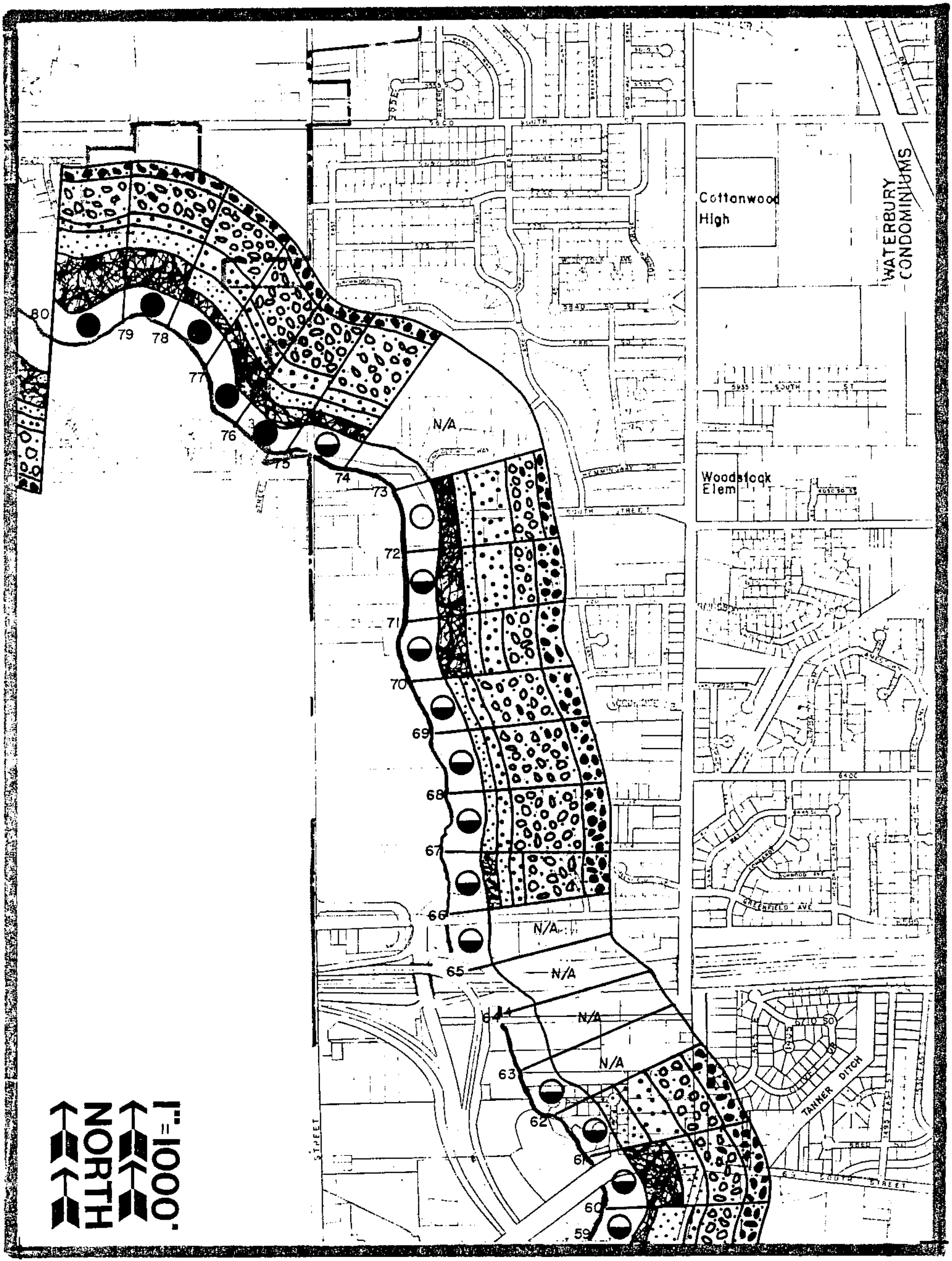


Figure 4

LITTLE COTTONWOOD

Size Composition of Bottom Material and Composite Stability Value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Woodstock Elem
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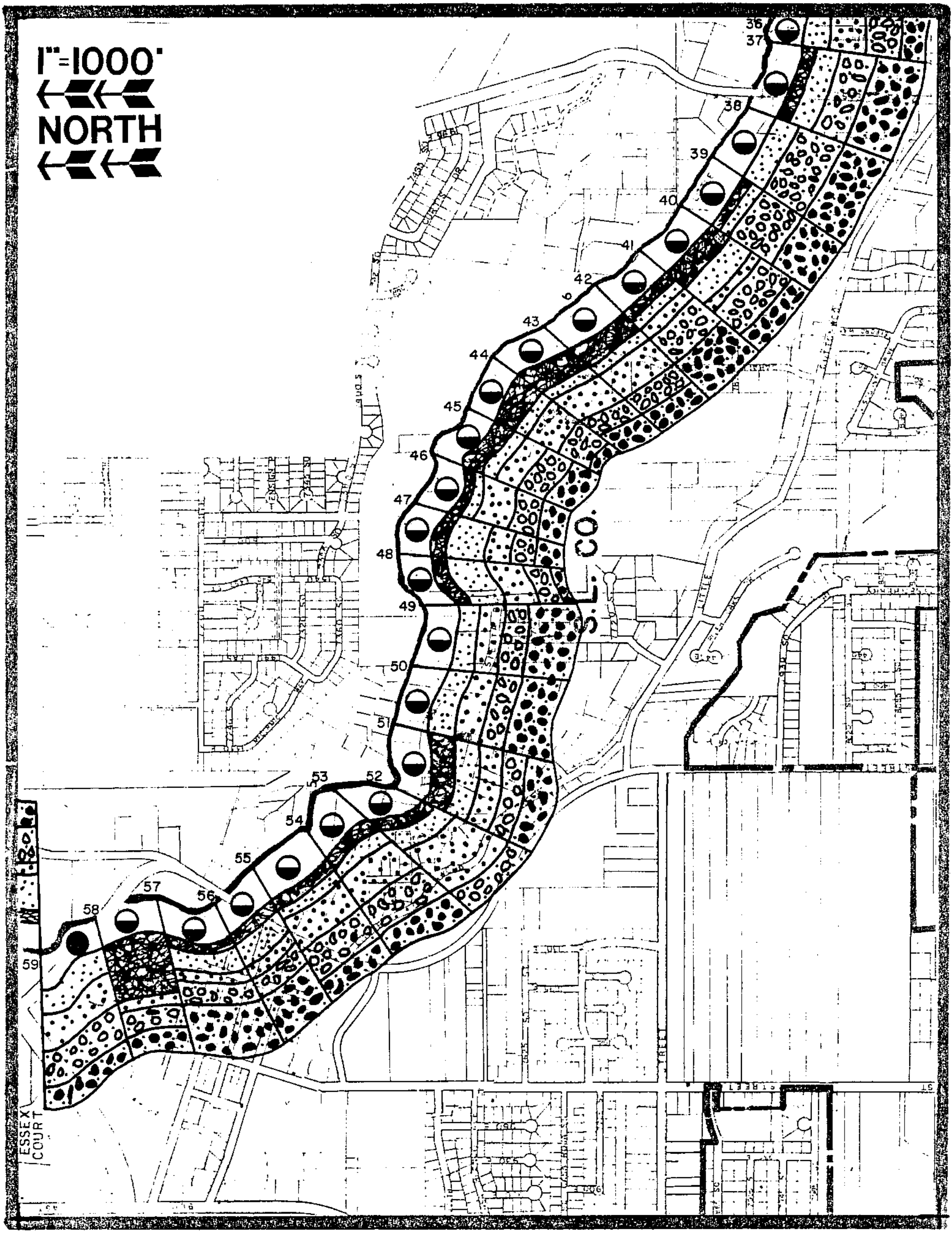
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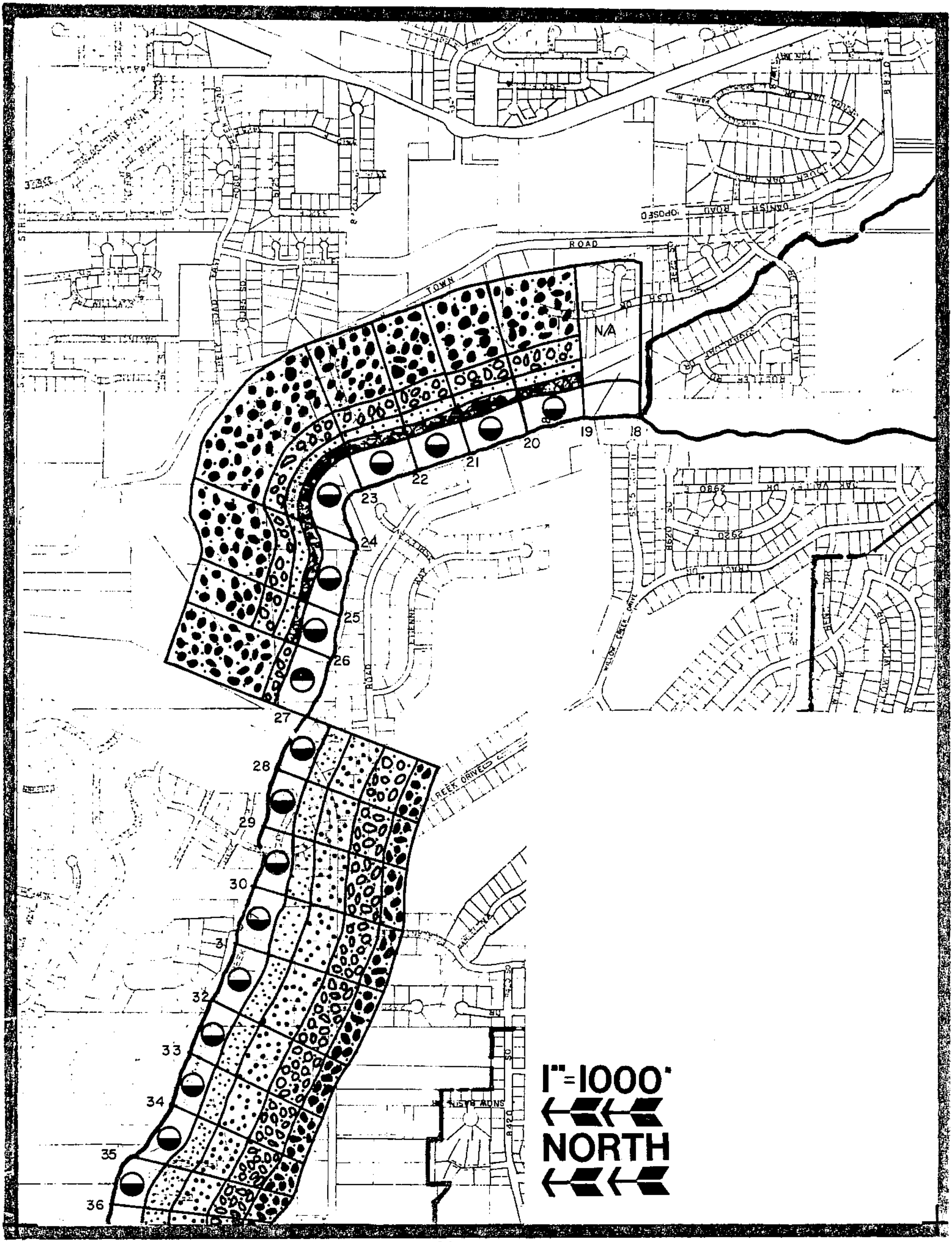
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CREEK DRIVE
SNOW BASIN
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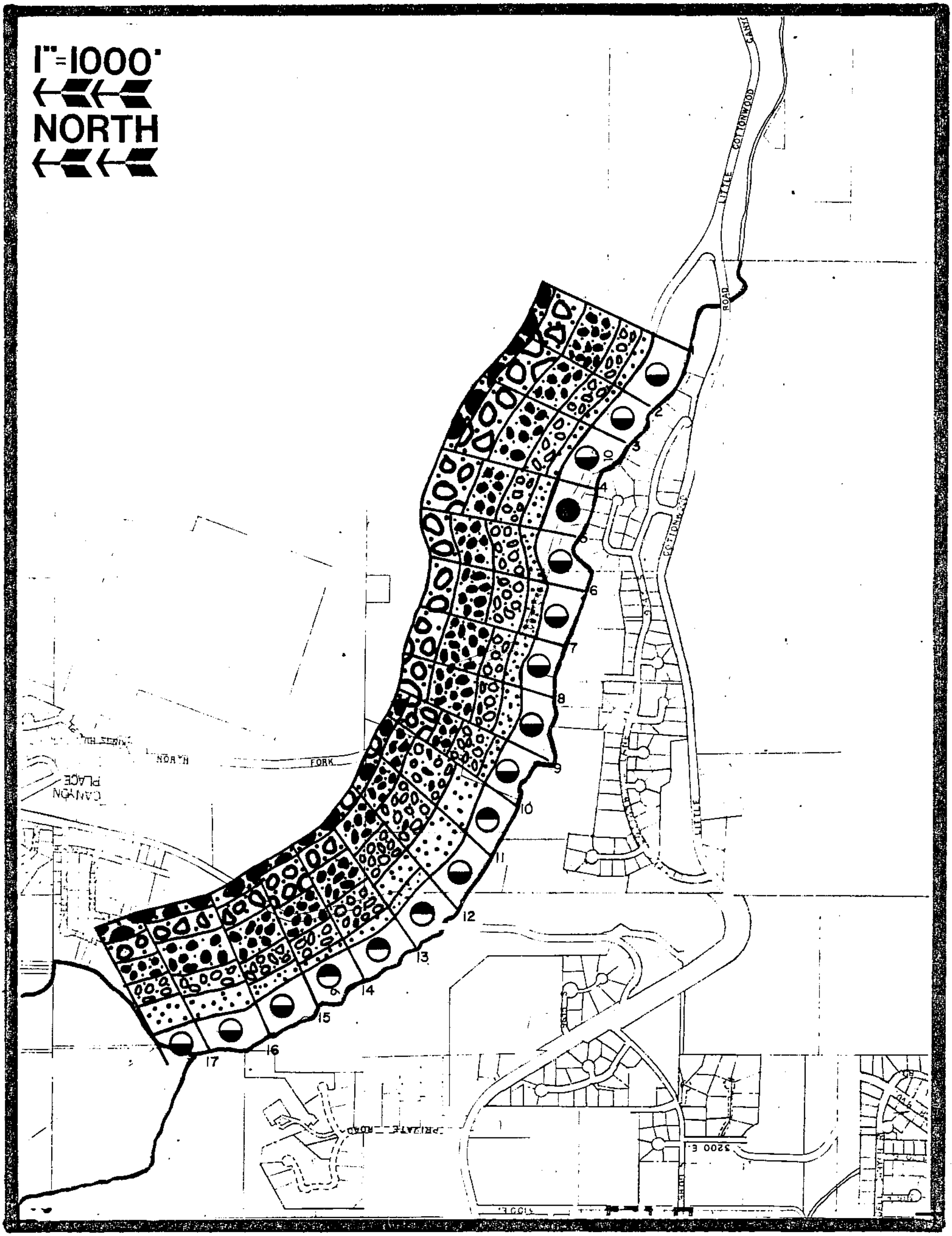
NORTH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LITTLE COTTONWOOD ROAD
COTTONWOOD
LITTLE
NORTH FORK
CANYON PLACE
PRIVATE ROAD
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3100 E.
1
2
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4
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16
17

inches, was found throughout the inventory but dominated middle points. Sediment-laden muck dominated at point 80 and below.

Creek characteristics varied with both natural and man-caused events. Inventory results are summarized in Appendix B. Much of the channel bottom has been disturbed below point 65 and have particularly poor marks. Summed weighted scores for individual creek conditions resulted in 6 points having good condition, 77 points in fair condition and 25 points in poor condition. Two observation points were omitted due to construction activities. While the creek scored very good in channel capacity and obstructions and flow deflectors, other characteristics faired less well. Individual conditions are discussed below.

Upper Bank

Approximately 73 percent of the observation points identified greater than 40 percent slopes for upper banks. Twenty-three percent of the points had slopes of less than 30 percent. However, extensive gabion construction minimized bank cutting and mass wasting. Significant mass wasting was found in 21 points, where slopes exceeded 40 percent and bank vegetation poor. Half of the mass wasting occurred above point 26B which is also directly above a major sediment catch basin. For the most part vegetation scored low with 93 points in the poor category, and less than 50 percent with discontinuous shallow root mass condition. This is mostly due to bank stabilization practices placed prior to the inventory and channelization efforts. Channeling and debris removal have minimized debris jam potential. Limited debris jam potential exists at road bridges, drop structures and other flood control devices.

Lower Banks

Channel capacity for the study area was excellent, only 4 points showing fair or poor condition. Bank rock content was excellent until Point 27 where bank rock dropped to less than 40 percent of 3-6 inch rock. Bank rock dropped to poor and fair conditions below Point 75. Channeling efforts have removed obstructions and flow deflectors. thirteen points identified having frequent obstruction and flow deflectors. Thirty points show lower bank cutting in either fair or poor condition. Over half of the points are associated with mass wasting and all possess a shallow and discontinuous vegetative root mass. Most of the moderate cutting occurred in reaches below Point 73 where the least amount of bank rock content was found. The inventory identified scouring and deposition areas scattered throughout the reach with major deposition occurring below Point 96.

Channel Bottom

Rock with angular fragments resist tumbling. The most angular rock was located at the top of the study area. Rock became more rounded in two dimensions as the creek dropped elevation. Overall rocks remained bright indicating minimal nutrient loading. Local aquatic vegetation appeared mostly below storm drain and irrigation outlet structures but further down the stream returned to bright. Bottom particle packing was good in the upper segments where limited construction activities have taken place but became fair to poor in channelized and construction areas. Twenty-seven points show particle packing in good or excellent condition. 74 percent are in fair or poor condition. Extreme scouring and/or deposition was identified below Point 75 and scattered areas of moderate deposition occurred throughout the inventory.

C. Mill Creek

The study area of Mill Creek included 7.9 miles from Gilroy Road west to the confluence of the Jordan River. A total of 83 observation points were studied on the Jordan River tributary.

Parent geologic material, originating in Mill Creek Canyon consists largely of limestone and sedimentary shale and sandstone. Smaller amounts of granite were identified in the creek channel.

Size composition of bottom materials was observed and recorded. Figure 4, shows size composition for the creek. Few large or small boulders were found over the study area. Large rubble (6-12 inches) and small rubble predominated to Point 40. This observation corresponds to the higher channel gradients of the creek. Small amounts of deposition occur throughout this segment, particularly on the lower banks. However, much of this segment had recently been disturbed and it is to be assumed that existing deposition had been relocated or removed. Rifflepool conditions are located in this segment. Past Point 45, the channel gradient lessens and the creek meanders and is channeled into the Jordan River. Within this segment, the bottom consists mostly of deposited silt and muck with evidence of present dredging. The creek has been linear channeled below Point 64 and passes through meadow lands and vacant lots.

The creek reach scored 57 points (70 percent) in the fair condition category, 9 points (11 percent) in good condition and 6 points (7 percent) in poor condition. Ten points were unavailable for observation due to construction.

Overall, Mill Creek showed a discrete relationship among inventory components. Inventory observations are plotted in Figure 5. Discussion on the three channel strata follows.

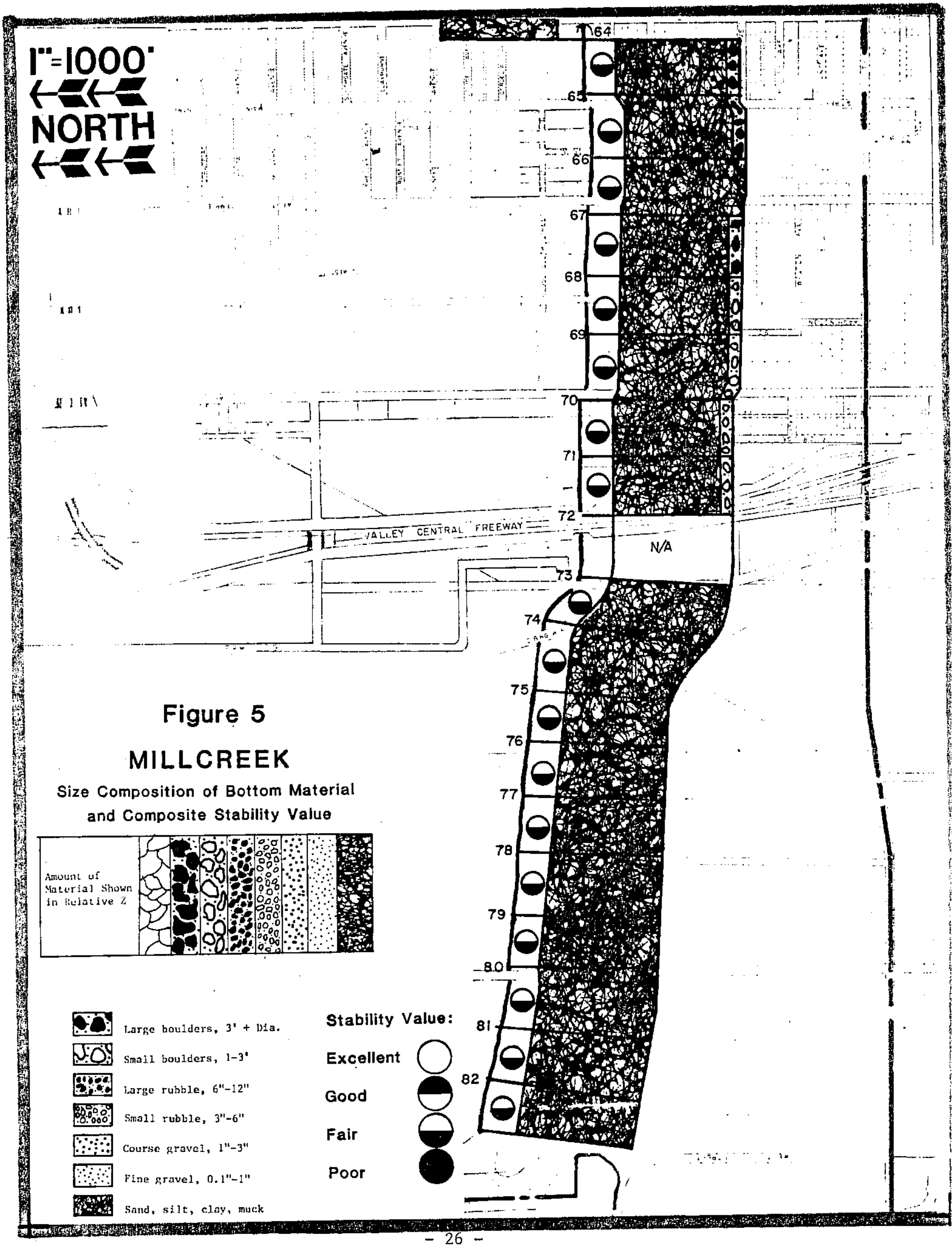
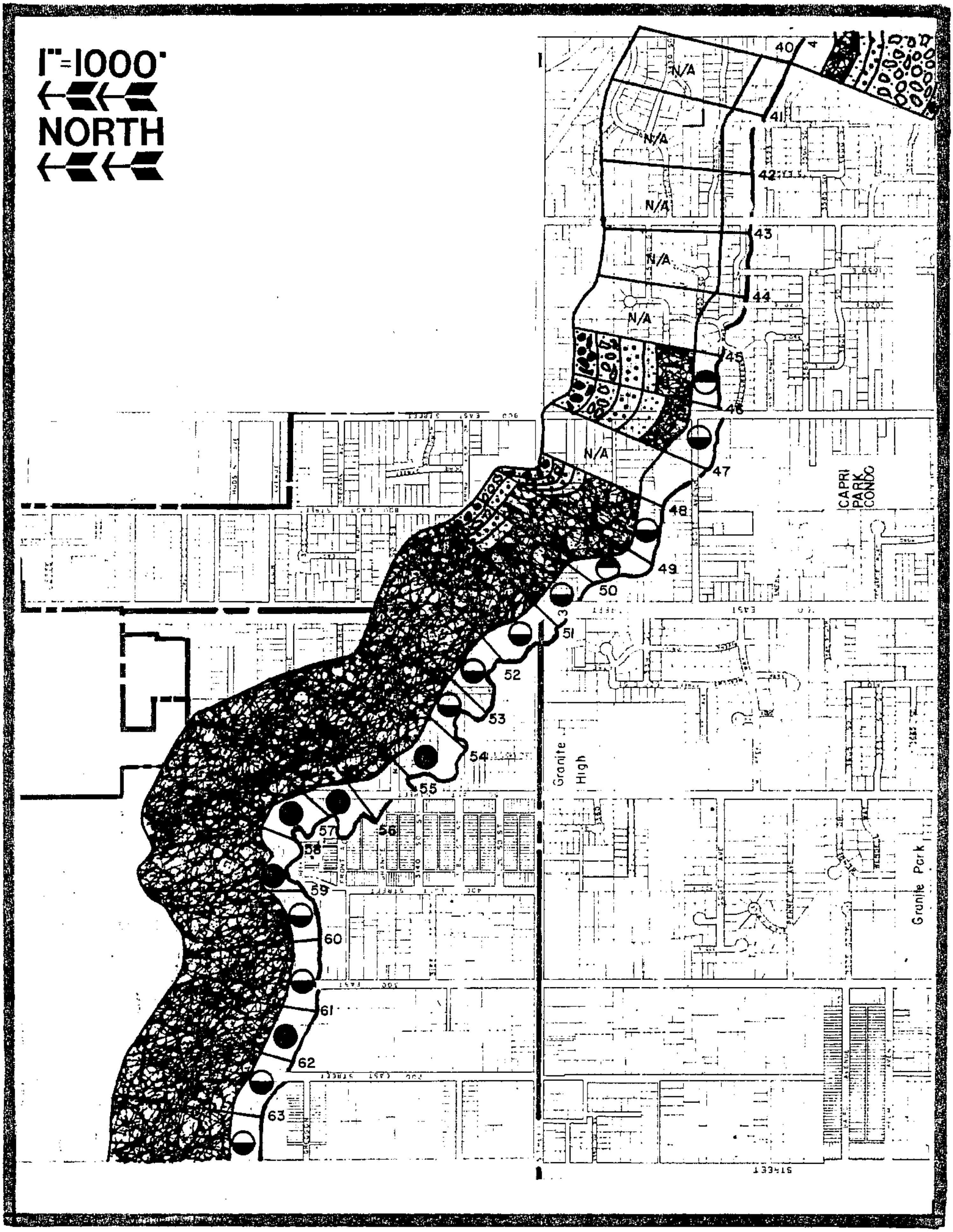
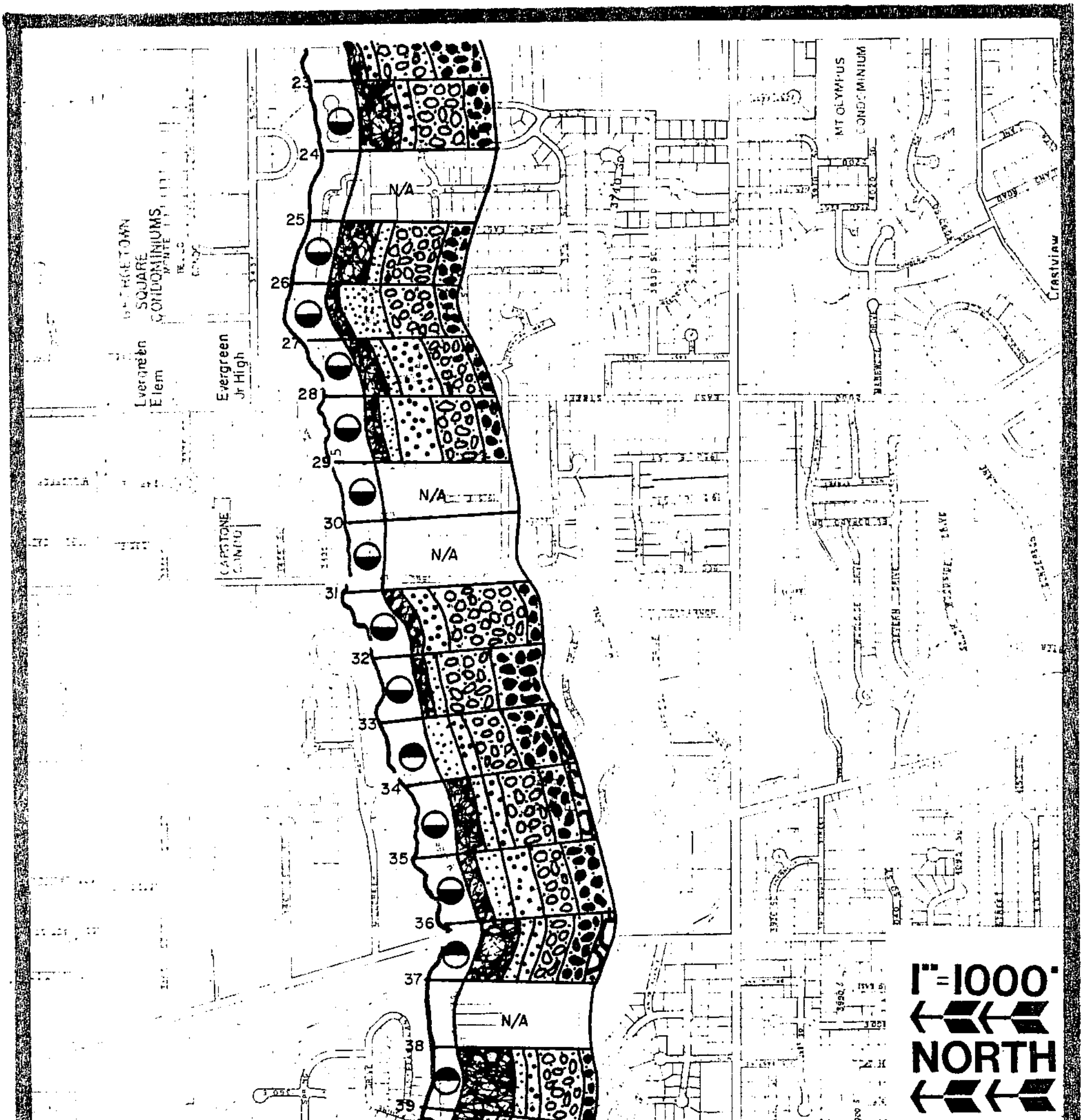


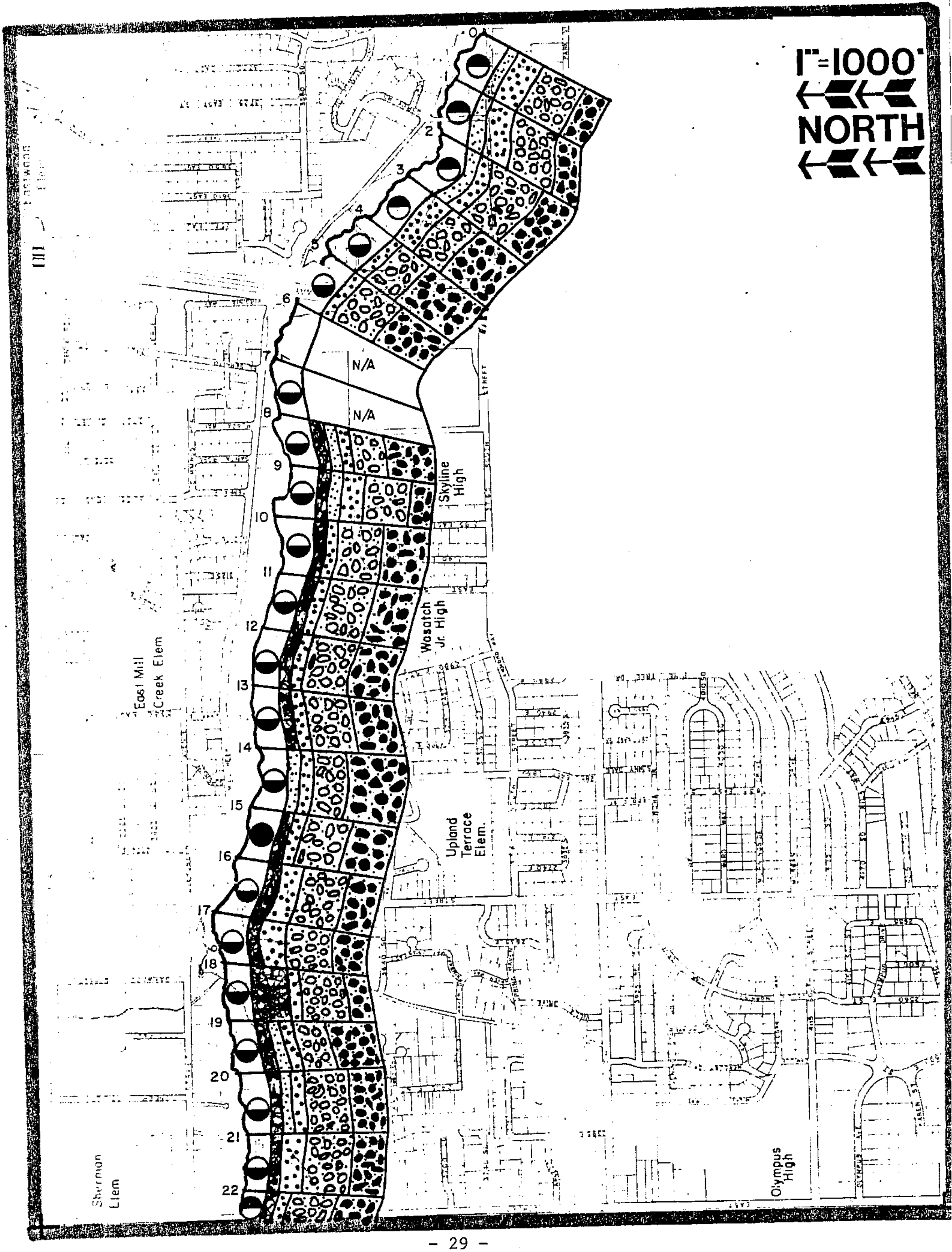
Figure 5

MILLCREEK

Size Composition of Bottom Material and Composite Stability Value


1"=1000'
NORTH
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
N/A
CAPRI PARK CONDO
Granite High
Granite Park


23
24
N/A
25
26
27
28
29
N/A
30
N/A
31
32
33
34
35
36
37
N/A
38
39
GEORGETOWN SQUARE CONDOMINIUMS
Evergreen Elem
Evergreen Jr High
CAPSTONE CONDO
MT OLYMPUS CONDOMINIUM
Crestview
1"=1000'
NORTH

1"=1000'
NORTH
0
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
N/A
N/A
Skyline High
Wasatch Jr. High
East Mill Creek Elem
Upland Terrace Elem.
Olympus High
Sherman Elem

Upper Bank

Upper bank creek characteristics exhibit trends quite different from the other two creeks. Where most of the Big and Little Cottonwood Creek points identify 40 plus percent landform slope, Mill Creek has only 25 percent with slopes in excess of 40 percent. Mill Creek has a minimum amount of mass wasting, relative to the other two creeks. Only three points, directly west of Belt Route 215, identified significant levels of mass wasting, while 66 percent of the points show little or no mass wasting and low potential for future wasting. Like the other two creeks, little debris is available to the creek and riparian vegetation is in poor condition, having shallow and discontinuous root masses. Eighty percent of the points show vegetation is fair or in poor condition. Points 73 and higher have a 200 percent vegetation grass cover, but no overstory.

Lower Banks

Channel capacity was found to be good to excellent the length of the creek. Obstruction and flow deflectors were also found to be lacking. Channel capacity, obstruction and flow deflector data support current flood control implementation policy. Bank rock content ranged from less than 20 percent of gravel sized rock to greater than 65 percent content consisting of boulders. Eleven points show bank rock in good to excellent condition and 62 points in fair or poor condition. Lower bank cutting was found to be localized. The creek segment between points 7 and 20 has significant-continuous cutting 12 to 24 inches in depth. This can partly be attributed to higher channel gradients. A recently installed drop structure may alleviate future cutting, but some stabilization on existing cuts may be required. Relatively little cutting occurred below Point 28. Recent deposition and/or scouring was observed between Points 9 and 17.

This may be related to bank cutting and channelization. Massive deposition has occurred on all points below 52 where the creek velocity slows to permit settling.

Channel Bottom

A fairly sharp deliniation of bottom materials occur in the study area, between Points 0 to 45 and 45 to 82. The upper portion of the creek to Point 38 identifies rubble with sharp edges and corners to rounded edges and corners. Below Point 38, the edges and corners are well rounded in two dimensions. Generally, rock brightness is good to fair indicating some movement through the creek. At the upper end of the creek, bottom materials were moderately packed with some overlapping. The bottom was less stable in areas of construction and dredging activities. Bottom material distribution and stability corresponded to upper and lower segments with the upper part more stable. The lower part (Below Point 48) was found to be less stable consisting of a loose assortment of silt and muck. While bottom scouring and deposition occurred throughout the study area, the upper part showed localized deposition. The vast majority of deposition occurred below Point 45. Only minor aquatic vegetation was found on the upper portion of the creek. Points 18 to 22 had little or no aquatic vegetation, the other points possessed present but spotty vegetation. Since only silt and muck was found on the lower section, no moss or algae was found on rocks.

V. CONCLUSIONS

This study is intended to provide information that can be applied to policy and implementation decision making. Management implications of channelization are ongoing. Man caused manipulation of creek channels create the need for further and in many cases, increased manipulation, perpetuating implementation of flood control measures. For example, over half of the three creeks are dredged annually, each ongoing year at inflated costs. In 1982, the county spent over $414,000 for creek dredging activities. Cyclic climatic events, both drought andd flood, accelerate management decisions. Highly visible implementation schedules corresponding to climatic events may provide public relations and/or political relief during times of crisis but may also be at environmental expense.

Data gathered during the streambank stabilization inventory support the assumption that riparian vegetation adjacent to the creek channels is in poor condition and have not received adequate attention during creek policy implementation. This is not to say that some vegetation is not a detriment and cause injury or damage and should not be removed. Rather, vegetation is not identified as a coefficient and is not considered as a potential solution component or solution in itself and is presently not part of decision options. A vegetative maintenance program to promote extensive root growth while maintaining safe vegetative canopies can be integrated into conventional creek zone programs, maximizing flood control benefits.

Single purpose control implementation is supported by inventory data. Channel capacity, debris removal and channelization to remove obstructions and create uniform topographic bottoms scored very high indicating ongoing efforts in these areas. Bank stabilization efforts, including rip-rap, gabion baskets and retaining walls have been placed in much of the creeks. A need still exists for localized bank stabilization, but on a small scale and in a reactive posture. The creek bed will be self-stabilized over time by the dynamic nature of the system. Continued, but reduced sediment removal will probably be needed. Sediment catch basins and traps recently installed should minimize the need to enter most segments of the creeks allowing bottom restabilization to occur.

Since most of the large scale flood control work has been completed in the tributaries, it would seem that a transition to structural maintenance mode is the next logical step. A vegetative maintenance program can be developed and integrated into creek policy decision making.

Access to the creeks continues to be a problem in implementing creek policy. Limited access requires that heavy construction and maintenance equipment must travel greater distances, resulting in the periodic destruction to bottom stability, aquatic habitat and visuals. Increased access via maintenance easements parallel to the creek channel will reduce the need to drive appreciable distances. Dedicated easements should be required on all new site planning and negotiated for key locations on existing developments.

A considerable amount of sediment loading to the creeks is caused from development construction activities near and adjacent to creek channels. Construction setbacks should be required on all stream zone development. Additionally, all construction activities should have approved erosion/sediment control plans prior to actual construction. Existing riparian vegetation should be retained in development activities and integrated into erosion/sediment control planning.

The streambank stabilization inventory was intended to provide documentation as to the Jordan River tributaries environmental conditions. Inferences, based on inventory results, allowed assumptions to be expanded to conclusions based on logic. Other conclusions and other logics may be as sound depending on perceived economies and diseconomies.

APPENDICES

APPENDIX 1

STREAM: BIG COTTONWOOD

SHEET 1 OF 4

		UPPER BANKS				LOWER BANKS					BOTTOM						REACH SCORE	
POINT		LANDFORM SLOPE	MASS WASTING	DEBRIS JAM POTENTIAL	VEGETATIVE PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	FLOW DEFLECTORS	CUTTING	DEPOSITION	ROCK ANGULARITY	BRIGHTNESS	PARTICLE PACKING	DISTRIBUTION	SCOURING	AQUATIC VEGETATION	WEIGHTED VALUE	RANKING
0		●	●	○	●	○	○	◒	●	○	◓	●	◓	●	◓	●	102	◒
1		◒	◒	○	●	○	○	◒	◒	◓	○	●	◓	◒	○	●	90	◒
2		●	●	○	●	○	○	◒	●	○	◓	●	◓	●	◓	●	109	◒
3		●	◒	○	●	○	○	◒	●	○	◓	●	◓	●	◓	●	102	◒
4		○	●	◓	●	○	◒	◒	●	○	◒	●	◒	●	●	●	116	●
5		○	●	○	◒	○	◒	◓	●	○	◒	●	◒	●	●	●	111	◒
6		●	●	◓	●	◓	●	◓	●	○	◓	●	◒	○	◒	●	100	◒
7		○	●	◓	●	◓	●	◓	●	○	◓	●	◒	○	◒	●	102	◒
8		○	◓	◓	●	◓	○	◓	◓	○	◓	●	◒	○	◓	●	76	◓
9		○	●	○	●	◓	●	◓	●	◓	◓	●	◓	●	◓	●	108	◒
10		○	◓	○	◒	○	◓	◒	◓	◓	◓	●	◓	●	◓	●	88	◒
11		○	◒	◓	●	◓	○	◓	◓	◓	○	●	◒	●	○	●	89	◒
12	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
13	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
14	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
15		●	●	◓	●	○	◒	◒	●	◒	◓	●	●	●	◓	●	135	●
16		◒	◓	○	●	○	◓	◓	◓	◓	◓	●	◒	◒	◓	●	91	◒
17		◒	◓	◒	●	○	◓	◓	◒	◓	◓	●	●	◒	◓	●	101	◒
18		◒	◓	◒	●	○	◓	◓	◒	◓	◓	●	●	◒	◓	●	104	◒
19		◒	◓	◒	●	◒	◓	○	◒	◓	◓	●	●	◒	◓	●	103	◒
20		◒	○	◒	●	◒	◓	○	◒	◓	◓	●	●	●	○	●	99	◒
21	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
22	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
23	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
24	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
25	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
26	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○

* CONSTRUCTION ACTIVITIES

SYMBOLS:
EXCELLENT ○
GOOD ◓
FAIR ◒
POOR ●

STREAM: BIG COTTONWOOD

SHEET 2 OF 4

		UPPER BANKS				LOWER BANKS					BOTTOM						REACH SCORE	
POINT		LANDFORM SLOPE	MASS WASTING	DEBRIS JAM POTENTIAL	VEGETATIVE PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	FLOW DEFLECTORS	CUTTING	DEPOSITION	ROCK ANGULARITY	BRIGHTNESS	PARTICLE PACKING	DISTRIBUTION	SCOURING	AQUATIC VEGETATION	WEIGHTED VALUE	RANKING
27	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
28	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
29	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
30		◒	◒	◓	◒	◓	◒	◓	◒	○	◒	●	◒	◒	○	●	89	◒
31		◒	◓	○	●	◓	◒	○	◓	○	◒	●	◓	◓	○	●	75	◓
32		◒	◓	○	●	◓	●	○	◒	○	◓	●	◒	◒	○	●	91	◒
33		◒	◓	○	●	◓	◓	○	◒	○	◓	●	◒	◒	○	●	84	◒
34		◒	◓	○	●	◓	◓	○	◒	○	◓	●	◒	◒	○	●	84	◒
35		●	◓	○	●	◓	◒	○	◒	○	◓	●	◒	◒	○	●	88	◒
36		●	◓	○	●	◓	◒	○	◒	○	◓	●	◒	◓	○	●	88	◒
37		●	◓	○	●	◓	◒	○	◒	○	◓	●	◒	◓	○	●	84	◒
38		●	◓	○	●	◓	◒	○	◒	○	◓	●	◒	◓	○	●	84	◒
39		◒	◒	◓	◒	◓	◒	◓	◓	○	◓	●	◒	◒	◓	●	98	◒
40		◒	◒	◓	◒	◓	◓	◓	◓	○	◒	◒	◒	◒	○	◓	84	◒
41		◒	◒	◓	◒	◓	◒	◓	◓	◓	◒	●	◒	◒	○	◓	98	◒
42		◒	◓	◓	●	◓	◒	◓	◓	○	◒	●	◒	◒	○	◓	106	◒
43		◒	◒	◓	◒	◓	◒	◓	◓	◓	◒	●	◒	◒	○	◓	79	◒
44		◓	◒	◓	●	◓	◓	◒	◓	◓	○	●	●	●	◓	●	113	◒
45		◒	◒	◓	◒	◓	◒	◓	◒	◓	○	●	◓	◒	◓	●	106	◒
46		●	◒	●	●	○	○	◒	◒	◓	○	○	◒	◒	◓	◓	107	◒
47		●	○	◓	◓	○	◓	◓	●	◓	○	○	◒	◓	◓	○	77	◒
48		◒	○	◓	◓	○	◒	○	○	◓	○	◓	◓	◓	◓	○	69	◓
49		○	○	◓	◓	○	◒	◓	◓	◓	◓	○	◓	◓	◓	○	70	◓
50		●	○	○	●	○	○	◒	◓	○	○	◓	◓	◒	◓	◓	79	◒
51		◒	◒	◓	●	◓	◓	◓	◒	○	○	◒	◒	◒	◓	●	119	●
52		◒	◒	◓	◒	◓	◓	◓	●	○	○	●	●	●	○	●	98	◒
53		◒	◓	◓	◒	◓	◓	◓	◓	○	◓	●	◒	◒	○	●	91	◒

* CONSTRUCTION ACTIVITIES

SYMBOLS:
EXCELLENT ○
GOOD ◓
FAIR ◒
POOR ●

STREAM: BIG COTTONWOOD

SHEET 3 OF 4

POINT	UPPER BANKS				LOWER BANKS					BOTTOM						REACH SCORE	
	LANDFORM SLOPE	MASS WASTING	DEBRIS JAM POTENTIAL	VEGETATIVE PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	FLOW DEFLECTORS	CUTTING	DEPOSITION	ROCK ANGULARITY	BRIGHTNESS	PARTICLE PACKING	DISTRIBUTION	SCOURING	AQUATIC VEGETATION	WEIGHTED VALUE	RANKING
54	○	◓	○	●	◓	◒	◓	◓	○	◓	●	●	●	○	●	88	◒
55	○	◓	○	●	◓	●	◓	◓	○	◓	●	●	●	○	●	84	◒
56	◓	◓	○	◒	◓	◒	◒	◒	◓	○	●	●	●	○	●	96	◒
57	◓	◒	◒	◒	◓	◒	◒	◒	○	○	●	◒	●	○	●	90	◒
58	◒	◒	◓	◒	◓	◒	◓	◓	◓	◓	◒	◒	◒	○	◒	93	◒
59	◒	◒	◓	◒	◓	◒	◓	◓	◓	◒	◒	◒	◒	○	◒	95	◒
60	◓	◓	◓	◒	◓	◒	◓	◓	◓	○	○	◓	◒	○	◓	104	◒
61	◓	◓	◒	◒	◓	◒	◒	◓	◓	○	◓	◒	◒	○	◓	77	◒
62	◓	◓	◒	◒	◓	◒	◒	◒	◓	◒	◓	◒	◒	○	◓	96	◒
63	◓	◓	◒	◒	◓	◒	◒	◒	◓	◒	◓	◒	◒	○	◓	90	◒
64	◒	●	◒	◒	◓	◒	◒	●	○	○	○	◓	◒	○	◒	115	◒
65	◒	●	◓	●	◓	●	◓	●	○	○	○	◓	◓	○	◓	94	◒
66	◓	◓	○	◒	◓	◒	○	◓	○	○	○	◓	◒	○	◓	71	◓
67	◓	◒	◓	◒	◓	◒	○	◓	◓	○	○	◓	◒	○	◓	92	◒
68	◓	◒	◓	◒	◓	◒	◓	◓	◓	○	○	◓	◓	○	◓	84	◒
69	◓	◒	◓	◓	◓	◒	◓	◓	○	○	◓	◒	◒	◓	◒	77	◒
70	◓	◓	○	○	○	○	○	◓	◒	◒	◓	◓	◒	◓	◓	85	◒
71	●	◒	○	●	◒	◒	○	◒	○	○	●	●	●	○	●	100	◒
72	●	●	○	●	◓	●	○	◒	○	◓	●	●	●	○	●	102	◒
73	●	●	○	●	◓	●	○	◒	○	◓	●	●	●	○	●	102	◒
74	◒	◓	◓	●	◒	●	○	◒	○	◓	●	●	●	○	●	97	◒
75	◒	◓	◓	◓	◒	●	○	◓	◓	◓	◒	◒	◒	○	◒	83	◒
76	◒	◓	◓	◓	◒	●	○	◓	◓	◓	◒	◒	◒	○	◒	83	◒
77	◒	◓	◓	◓	◒	●	○	◓	◓	◓	◒	◒	◒	○	◓	83	◒
78	◒	◓	◓	◓	◒	●	○	◓	◓	◓	◒	◒	◒	○	◓	83	◒
79	◒	◓	◓	◓	◒	●	◓	◓	◓	◒	◒	◒	◒	○	◒	86	◒
80	◒	◓	◓	◓	◓	●	◓	◒	◒	◒	◒	◒	◒	◒	◒	105	◒

SYMBOLS: EXCELLENT ○
GOOD ◓
FAIR ◒
POOR ●

STREAM: BIG COTTONWOOD

SHEET 4 OF 4

	UPPER BANKS				LOWER BANKS					BOTTOM						REACH SCORE	
POINT	LANDFORM SLOPE	MASS WASTING	DEBRIS JAM POTENTIAL	VEGETATIVE PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	FLOW DEFLECTORS	CUTTING	DEPOSITION	ROCK ANGULARITY	BRIGHTNESS	PARTICLE PACKING	DISTRIBUTION	SCOURING	AQUATIC VEGETATION	WEIGHTED VALUE	RANKING
81	◒	◓	◓	◓	◒	●	◓	◒	◒	◒	◒	◒	●	◒	◒	110	◒
82	●	◒	◒	●	◒	●	◒	◓	◒	◒	◒	◒	●	○	◒	109	◒
83	◒	◓	◓	◓	◒	●	◓	◓	◒	◒	◒	◒	●	◒	◒	106	◒
84	●	◓	◒	●	◓	●	◓	◒	○	◓	◓	◒	◒	◓	◒	98	◒
85	◒	◓	◓	◓	◓	◓	◓	○	○	◓	◓	◒	◒	◓	●	80	◒
86	◒	◒	◒	●	◓	●	◒	◓	○	◒	◒	●	◒	◓	◒	102	◒
87	◒	◒	◒	◒	◓	●	◒	◒	◓	●	◒	●	◒	◒	◒	114	◒
88	◒	◒	◓	◒	◓	◒	◓	◓	○	◓	◓	◒	◒	◓	◒	89	◒
89	◓	◒	◓	●	◒	◒	◒	◒	●	◓	◒	●	◒	◒	◒	102	◒
90	◒	◒	◓	●	◓	●	◒	◒	●	◒	◒	●	◒	◒	◒	123	●
91	●	●	◓	●	◓	●	◒	●	◒	◒	◒	●	◒	◓	◒	121	●
92	◒	◓	◓	◓	◓	●	◓	◓	○	◓	◓	◒	◒	○	◒	79	◒
93	◓	◓	◓	◒	◒	◒	◓	◓	◓	◓	◓	◓	◒	○	◒	81	◒
94	◒	◓	◓	◒	◓	◒	◓	◓	○	◓	◒	◒	◒	◓	◒	93	◒
95	●	◓	○	◓	◓	●	◓	◒	○	◒	○	◒	◒	◓	◒	89	◒
96	●	◓	◓	◒	○	●	○	◓	○	●	○	●	◒	◓	◒	90	◒
97	●	◓	◓	◒	○	●	○	◓	○	●	○	●	◒	◓	◒	90	◒
98	●	◓	◓	●	◒	●	◓	◓	○	●	◒	●	●	●	◒	115	●
99	●	◓	◓	●	◒	●	◓	◓	○	●	◒	●	●	●	◒	115	●
100	●	◓	◓	●	●	●	◒	◓	○	●	◒	●	●	●	◒	119	●
101	●	◓	◓	●	●	●	◒	◓	○	●	◒	●	●	●	◒	119	●
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○

SYMBOLS:
EXCELLENT ○
GOOD ◓
FAIR ◒
POOR ●

APPENDIX 2

STREAM: LITTLE COTTONWOOD

SHEET 1 OF 5

		UPPER BANKS				LOWER BANKS					BOTTOM						REACH SCORE	
POINT		LANDFORM SLOPE	MASS WASTING	DEBRIS JAM POTENTIAL	VEGETATIVE PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	FLOW DEFLECTORS	CUTTING	DEPOSITION	ROCK ANGULARITY	BRIGHTNESS	PARTICLE PACKING	DISTRIBUTION	SCOURING	AQUATIC VEGETATION	WEIGHTED VALUE	RANKING
1		◒	◓	◒	●	◓	○	○	◓	◓	○	●	○	◒	○	●	98	◒
2		◒	◒	◒	●	◓	○	○	◓	◓	○	●	○	◒	○	●	84	◒
3		◒	◒	◒	●	◓	○	○	◓	◓	○	●	○	◒	○	●	80	◒
4		◒	◓	●	●	◓	○	○	◓	◓	○	●	◓	●	◒	◒	116	●
5		◓	◓	◒	●	◓	○	○	◓	◓	○	●	○	●	○	●	109	◒
6		◒	◓	◒	●	◓	○	○	◒	◓	○	●	○	●	○	●	89	◒
7		◒	◒	◓	●	◓	○	○	◒	◓	○	●	○	◓	○	◒	109	◒
8		◒	◒	◓	●	◓	○	○	◒	◓	○	◒	◓	◓	○	◒	84	◒
9		◒	◓	○	●	◓	○	◒	◓	◓	○	●	●	●	○	●	91	◒
10		◒	◓	◓	●	◓	○	◓	◓	○	○	●	◒	●	○	●	75	◓
11		◒	◓	◓	●	◓	○	◓	◓	○	○	●	◒	●	○	●	85	◒
12		◒	◓	○	◒	◓	○	○	◓	○	○	●	●	◒	○	●	71	◓
13		◒	◓	◒	●	○	○	○	○	◓	○	●	○	◓	○	●	74	◓
14		◒	◒	●	●	◓	○	○	◓	○	◓	●	○	○	○	●	75	◓
15		◒	◓	◒	●	◓	○	○	◓	◓	○	●	○	◒	○	●	83	◒
16		◓	○	◓	●	◓	◓	●	◓	◓	○	●	◓	◓	○	●	92	◒
17		◓	◓	◓	●	○	◓	◒	◓	◒	○	●	◒	◒	○	●	90	◒
18	B	◓	◓	◓	◒	○	○	○	◓	◓	◒	◒	◓	○	○	◒	71	◓
19	B	◓	○	◓	◓	◓	◓	◓	◓	◓	◒	●	◒	◒	◓	●	84	◒
20	B	◒	◒	◓	◒	○	◓	◓	◓	◓	◒	●	●	◒	○	●	90	◒
21	B	●	◒	○	◒	○	○	◓	◓	◓	◒	●	●	◒	◓	●	98	◒
22	B	●	◒	○	◒	○	○	◓	◓	◓	◒	●	●	◒	◓	●	98	◒
23	B	●	◒	○	◒	○	○	◓	◓	◓	◒	●	●	◒	◓	●	98	◒
24	B	◒	◒	◓	●	○	◓	◓	◓	○	◒	●	●	●	◓	●	99	◒
25	B	◒	◒	◓	●	○	◓	◓	◓	○	◒	●	●	●	◓	◒	106	◒
26	B	◓	○	◓	●	○	◓	◓	○	○	◒	●	●	◒	◓	●	83	◒
18	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○

* CONSTRUCTION ACTIVITIES

SYMBOLS:
EXCELLENT ○
GOOD ◓
FAIR ◒
POOR ●

STREAM: LITTLE COTTONWOOD

SHEET 2 OF 5

	UPPER BANKS						LOWER BANKS							BOTTOM								REACH SCORE		
POINT		LANDFORM SLOPE	MASS WASTING	DEBRIS JAM POTENTIAL	VEGETATIVE PROTECTION			CHANNEL CAPACITY	BANK ROCK CONTENT	FLOW DEFLECTORS	CUTTING	DEPOSITION		ROCK ANGULARITY	BRIGHTNESS	PARTICLE PACKING	DISTRIBUTION	SCOURING	AQUATIC VEGETATION			WEIGHTED VALUE	RANKING
19		●	○	○	●			◓	○	◓	◓	○		◒	●	●	●	●	●			104	◒
20		●	○	○	●			◓	○	◓	◓	○		◒	●	●	●	●	●			104	◒
21		●	○	○	●			◓	○	◓	◓	○		◒	●	●	●	●	●			104	◒
22		●	○	○	●			◓	○	◓	◓	○		◒	●	●	●	●	●			104	◒
23		●	◓	○	●			◓	○	○	◓	◓		◒	●	●	●	●	●			109	◒
24		●	◓	○	●			◓	○	○	◓	○		◒	●	●	●	●	●			109	◒
25		●	◓	○	●			◓	○	○	◓	○		●	●	●	●	●	●			106	◒
26		●	◓	○	●			○	○	○	○	○		◒	●	●	○	○	●			69	◓
27		●	◓	◒	◓			◓	◒	◓	○	◒		◒	●	◒	◒	◒	●			104	◒
28		●	◓	◒	◓			◓	◒	◓	◒	◒		◒	●	◒	◒	◒	●			112	◒
29		●	◒	◒	◓			◓	◒	◒	◒	◒		◒	●	◒	◒	◒	◒			113	◒
30		●	◒	◒	◓			◓	◒	◒	◒	◒		◒	●	◒	◒	◒	◒			113	◒
31		●	◓	◒	◒			◓	◒	○	○	◒		◒	●	◓	◓	○	◒			79	◒
32		●	◓	◒	◒			◓	◒	○	○	◓		◒	●	◓	◓	○	◒			79	◒
33		●	◒	◓	●			○	◒	◓	◓	◒		◒	●	◒	◒	◒	●			104	◒
34		●	◓	◓	◒			◓	◒	◒	◓	◓		◒	●	◒	◒	◓	●			104	◒
35		●	◓	◓	◒			◓	◒	◒	◓	◓		◒	●	◒	◒	◓	●			101	◒
36		◒	○	◓	◒			○	◒	◓	○	◒		◒	●	●	◒	◒	●			98	◒
37		●	○	○	●			◓	○	○	◓	○		◓	●	◒	◒	○	●			79	◒
38		◒	○	○	●			◓	○	○	◓	◓		◒	●	●	●	●	●			104	◒
39		◒	○	○	●			◓	○	○	◓	◓		◒	●	●	●	●	●			104	◒
40		◒	○	○	●			◓	○	○	◓	◒		◒	●	●	●	●	●			108	◒
41		●	○	○	●			◓	○	○	◓	◓		◓	●	●	●	●	●			105	◒
42		◒	◒	○	●			◓	◓	○	◓	○		◒	●	●	●	●	●			104	◒
43		◒	◓	○	●			◓	◓	○	◓	◒		◒	●	●	●	●	●			113	◒
44		◒	◓	○	●			◓	●	◓	◓	○		◒	●	●	●	●	●			112	◒
45		◒	○	○	●			◓	◓	◓	◓	◒		◓	○	◒	◒	◒	◓			92	◒

* CONSTRUCTION ACTIVITIES

SYMBOLS: EXCELLENT ○
GOOD ◓
FAIR ◒
POOR ●

STREAM: LITTLE COTTONWOOD

SHEET 3 OF 5

		UPPER BANKS				LOWER BANKS					BOTTOM						REACH SCORE	
POINT		LANDFORM SLOPE	MASS WASTING	DEBRIS JAM POTENTIAL	VEGETATIVE PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	FLOW DEFLECTORS	CUTTING	DEPOSITION	ROCK ANGULARITY	BRIGHTNESS	PARTICLE PACKING	DISTRIBUTION	SCOURING	AQUATIC VEGETATION	WEIGHTED VALUE	RANKING
46		◒	○	○	●	◓	◓	◓	◓	◒	◓	○	◒	◒	◒	◓	92	◒
47		○	○	◓	◒	◓	◒	◓	◓	◒	◓	●	◒	●	◒	●	106	◒
48		◓	○	○	●	◓	○	◓	○	◒	◓	○	●	●	◒	○	91	◒
49		○	○	○	●	◓	●	◓	○	◓	◓	○	◓	◒	◓	◓	80	◒
50		○	○	○	●	◓	●	◓	○	◓	◓	○	◓	◒	◓	◓	78	◒
51		○	○	◓	●	◓	◓	◓	◓	◒	○	○	◓	◒	◒	◓	91	◒
52		◓	○	○	●	◓	○	○	◓	◓	◒	◒	◒	●	◓	◒	86	◒
53		◒	○	◓	●	◓	◓	◓	◓	◓	◓	○	◓	◒	◓	◓	84	◒
54		◒	○	◓	●	◓	◓	◓	◓	◓	◓	○	◓	◒	◓	◓	84	◒
55		◒	○	◓	●	◓	◓	◓	◓	◓	◓	○	◓	◒	◓	◓	84	◒
56		◒	○	◓	●	◓	◓	◓	◓	◓	◓	○	◓	◒	◓	◓	84	◒
57		◒	○	○	●	○	◓	○	◓	◒	○	○	◒	◒	◓	◓	84	◒
58		●	◒	○	●	○	●	◓	◒	◓	◒	●	●	●	●	●	123	●
59		●	●	○	●	○	●	◓	●	◓	◒	◓	◒	●	◓	◓	112	◒
60		●	○	○	●	○	○	○	○	◓	◒	○	◓	◓	◓	◓	78	◒
61		◒	◓	○	●	○	◒	○	◒	○	◒	◓	◓	◒	○	◓	80	◒
62		◓	○	◒	●	●	●	◒	◒	◒	◒	◓	◓	◓	◓	◓	98	◒
63	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
64	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
65		●	○	○	●	◓	○	◓	◓	○	○	●	◒	●	○	●	90	◒
66		◒	○	○	●	◓	◒	○	◓	○	◒	●	●	●	●	●	104	◒
67		◒	○	○	●	◓	◒	○	◓	○	◒	●	●	●	●	●	104	◒
68		◓	○	○	●	◓	◒	○	◓	○	◒	●	●	●	●	●	103	◒
69		◓	○	○	●	◓	◒	○	◓	○	◒	●	●	●	●	●	103	◒
70		◓	○	○	●	◓	◒	◓	◓	◒	◒	◓	◒	◒	◓	◓	90	◒
71		◓	○	○	●	◓	◒	◓	◓	◒	◒	◓	◒	◒	◓	◓	90	◒
72		◓	○	○	●	◓	◒	◓	◓	◒	◒	◓	◒	◒	◓	◓	90	○

* CONSTRUCTION ACTIVITIES

SYMBOLS:
EXCELLENT ○
GOOD ◓
FAIR ◒
POOR ●

STREAM: LITTLE COTTONWOOD

SHEET 4 OF 5

		UPPER BANKS				LOWER BANKS					BOTTOM						REACH SCORE	
POINT		LANDFORM SLOPE	MASS WASTING	DEBRIS JAM POTENTIAL	VEGETATIVE PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	FLOW DEFLECTORS	CUTTING	DEPOSITION	ROCK ANGULARITY	BRIGHTNESS	PARTICLE PACKING	DISTRIBUTION	SCOURING	AQUATIC VEGETATION	WEIGHTED VALUE	RANKING
73	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
74		◒	○	○	●	◓	◒	○	◒	◓	●	●	●	●	●	●	113	◒
75		●	◒	●	●	◓	●	◒	●	◓	◒	●	●	●	●	●	134	●
76		●	◒	●	●	◓	●	◒	●	◒	◒	●	●	●	●	●	140	●
77		●	◒	◒	●	◓	●	◒	●	◒	◒	●	●	●	●	●	138	●
78		●	●	◓	●	◓	●	◓	●	◒	◒	●	●	●	●	●	137	●
79		●	●	◓	●	◓	●	◓	●	◒	◒	●	●	●	●	●	137	●
80		◓	◓	◓	●	◓	●	◓	◒	◒	◒	●	●	●	●	●	126	●
81		◓	◓	◓	●	◓	●	◓	◒	◒	◒	●	●	●	●	●	126	●
82		◓	◓	◓	●	◓	●	◓	◒	◒	◒	●	●	●	●	●	126	●
83		○	◓	◓	●	◓	●	○	◓	◓	●	●	●	●	●	●	124	●
84		●	○	○	●	◓	○	○	◓	◒	●	●	●	●	●	●	111	◒
85		●	○	○	●	◓	○	○	◓	◒	●	●	●	●	●	●	111	◒
86		●	○	○	●	◓	○	○	◓	◒	●	●	●	●	●	●	111	◒
87		○	○	○	●	◓	●	○	◓	◒	●	●	●	●	●	●	109	◒
88		◒	○	◒	●	◓	●	○	◓	◓	●	●	●	●	●	●	115	●
89		◓	○	◓	●	◓	◓	○	◓	◓	●	●	●	●	●	●	113	◒
90		◒	○	○	●	◒	●	○	◒	◓	●	●	●	●	●	●	116	●
91		◒	○	○	●	◒	●	○	◒	◓	●	●	●	●	●	●	116	●
92		●	○	○	●	◓	●	○	◒	◓	●	●	●	●	●	●	117	●
93		●	◓	◓	●	◒	●	◓	●	◒	◒	●	●	●	●	●	132	●
94		●	◓	○	●	◓	●	○	●	◓	◒	●	●	●	●	●	123	●
95		●	◓	○	●	◓	●	○	●	◓	◒	●	●	●	●	●	123	●
96		●	◓	○	●	◓	●	○	●	◓	◒	●	●	●	●	●	123	●
97		●	◒	○	●	○	◒	○	●	●	●	◒	◒	◒	○	◓	105	◒
98		◒	◓	○	●	○	●	○	◒	●	●	●	●	●	●	●	123	●
99		◒	◓	○	●	○	●	○	◒	●	●	●	●	●	●	●	127	●

* CONSTRUCTION ACTIVITIES/CONCRETE LINED

SYMBOLS:
EXCELLENT ○
GOOD ◓
FAIR ◒
POOR ●

STREAM: LITTLE COTTONWOOD

SHEET 5 OF 5

	UPPER BANKS				LOWER BANKS					BOTTOM						REACH SCORE	
POINT	LANDFORM SLOPE	MASS WASTING	DEBRIS JAM POTENTIAL	VEGETATIVE PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	FLOW DEFLECTORS	CUTTING	DEPOSITION	ROCK ANGULARITY	BRIGHTNESS	PARTICLE PACKING	DISTRIBUTION	SCOURING	AQUATIC VEGETATION	WEIGHTED VALUE	RANKING
100	●	○	○	●	○	●	○	◒	●	●	◒	◓	◒	◓	◓	101	◒
101	◓	○	◒	●	◓	◒	◓	◓	●	◒	●	◓	●	●	●	116	●
102	◓	○	◒	●	○	◒	◓	◓	●	◒	●	◓	●	●	●	120	●
103	◓	○	◒	●	◓	◒	◓	◓	●	◒	●	●	●	●	●	120	●
104	◒	○	○	●	◓	◒	◒	◓	●	●	◓	●	●	●	●	121	●
105	◒	○	○	●	◓	◒	◒	◓	●	●	○	●	●	●	◓	116	●
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○

SYMBOLS: EXCELLENT ○
GOOD ○
FAIR ○
POOR ○

APPENDIX 3

STREAM: MILL CREEK

SHEET 1 OF 4

		UPPER BANKS				LOWER BANKS					BOTTOM						REACH SCORE	
POINT		LANDFORM SLOPE	MASS WASTING	DEBRIS JAM POTENTIAL	VEGETATIVE PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	FLOW DEFLECTORS	CUTTING	DEPOSITION	ROCK ANGULARITY	BRIGHTNESS	PARTICLE PACKING	DISTRIBUTION	SCOURING	AQUATIC VEGETATION	WEIGHTED VALUE	RANKING
0		◓	○	○	◓	◓	◓	○	◓	○	○	◒	◓	◓	○	◒	59	◓
1		◓	○	○	◓	◓	◓	○	◓	○	○	◒	◓	◓	○	◒	59	◓
2		○	○	○	○	◓	◓	○	○	○	○	◓	◓	◓	○	◓	49	◓
3		○	○	○	○	◓	◓	○	◓	○	○	◓	◓	◓	○	◓	53	◓
4		●	◒	○	●	◓	●	○	◓	○	○	◓	◓	◓	○	◓	78	◒
5		●	◒	○	◒	◓	●	○	◒	○	○	◓	◓	◓	○	◓	79	◒
6	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
7		●	◒	◓	●	◓	●	◓	●	◓	○	◒	◓	◓	○	◓	95	◒
8		●	●	◒	●	◓	●	◒	●	◓	○	◒	◓	◓	◓	◒	111	◒
9		●	●	◒	●	◓	●	◒	●	◒	○	◒	◓	◒	○	◓	110	◒
10		●	●	◒	●	◓	●	◒	●	●	◓	◒	◓	◓	○	◓	111	◒
11		●	◒	◒	●	◓	●	◒	●	●	◓	◒	◓	◓	○	◓	110	◒
12		●	◒	◒	●	◓	●	◒	●	●	◓	◒	◓	◓	○	◓	108	◒
13		●	◒	◒	●	◓	●	◒	●	●	◓	◒	◓	◓	○	◓	108	◒
14		●	◒	●	●	◓	●	◒	●	●	◓	◒	◓	◓	○	◓	110	◒
15		●	◒	●	●	◓	●	◓	●	●	◓	◒	◓	◓	○	◓	117	●
16		●	◒	◓	●	◓	●	◓	◒	●	◓	◒	◓	◓	○	◓	101	◒
17		●	◒	◓	●	◓	◓	◒	◒	●	○	◒	◓	◓	○	◓	97	◒
18		◒	◓	◓	●	◓	●	◓	◒	○	◓	◒	◒	◒	○	●	91	◒
19		◒	◓	◓	●	◓	●	◓	◒	○	◓	◒	◒	◒	○	●	91	◒
20		◒	◓	◓	●	◓	●	◓	◒	○	◓	◒	◒	◒	○	●	91	◒
21		◒	◓	◓	●	◓	●	◓	◓	○	◓	◒	◒	◒	○	●	87	◒
22		◓	○	○	◓	◓	●	○	◓	○	◓	◒	◒	◒	○	●	76	◓
23		●	◒	◒	●	◓	●	◓	●	●	◓	◒	◓	◓	○	◓	106	◒
24	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
25		●	◒	◓	●	◓	●	○	●	●	◓	◒	◓	◓	○	◒	104	◒
26		●	◒	◒	●	◓	●	○	◒	○	◓	◒	◓	◓	○	◓	88	◒

* CONSTRUCTION ACTIVITIES

SYMBOLS: EXCELLENT ○
GOOD ◓
FAIR ◒
POOR ●

STREAM: MILL CREEK

SHEET 2 OF 4

		UPPER BANKS				LOWER BANKS					BOTTOM						REACH SCORE	
POINT		LANDFORM SLOPE	MASS WASTING	DEBRIS JAM POTENTIAL	VEGETATIVE PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	FLOW DEFLECTORS	CUTTING	DEPOSITION	ROCK ANGULARITY	BRIGHTNESS	PARTICLE PACKING	DISTRIBUTION	SCOURING	AQUATIC VEGETATION	WEIGHTED VALUE	RANKING
27		●	◒	◓	●	◓	●	◓	●	○	◓	◒	◓	◓	○	◓	92	◒
28		◒	◓	○	◒	◓	●	◓	◓	○	◓	◒	◓	◓	○	◓	78	◒
29		◒	○	◓	◒	◓	◒	○	◓	○	◒	◒	●	●	●	●	104	◒
30		◒	○	◓	◒	◓	●	○	◓	○	◒	◒	●	●	●	●	104	◒
31		◒	○	○	◒	◓	●	○	◓	○	◓	◒	◒	◒	○	◒	77	◒
32		●	◓	○	◒	◓	◒	○	◓	○	◓	◒	◒	◒	○	◒	79	◒
33		●	◓	◓	◒	◓	◓	○	◓	○	◓	◒	◒	◒	○	◒	69	◓
34		●	◓	◓	●	◓	◓	○	◓	○	◓	◒	◒	◒	○	◒	88	◒
35		●	○	◓	●	◓	◓	○	◓	○	◓	◒	◓	◒	○	◒	83	◒
36		◓	○	◓	○	◓	◓	○	◓	○	◓	◒	◒	◒	○	◒	66	◓
37	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
38		○	○	◓	●	◓	◓	○	◓	○	◓	◒	◒	◒	○	◒	75	◓
39		○	○	◓	●	◓	●	◓	◓	○	◒	◒	◒	◒	○	◒	80	◒
40	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
41	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
42	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
43	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
44	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
45		○	◓	○	◒	◓	●	◓	◓	○	◒	◒	◒	◒	○	◒	74	◓
46		○	◓	○	◒	◓	●	◓	◓	○	◒	◒	◒	◒	○	◒	78	◒
47	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
48		●	○	○	●	○	○	○	○	○	◓	●	●	●	○	●	78	◒
49		◓	○	◓	◒	◓	●	○	◓	○	◒	◒	◒	◒	○	◒	76	◓
50		◓	○	◓	◒	◓	●	○	◓	○	◒	◒	◒	◒	○	◒	77	◒
51		◓	○	○	●	◓	●	○	◓	○	●	◒	●	●	●	●	102	◒
52		○	○	○	●	◓	●	○	◓	●	●	◒	●	●	●	●	114	◒
53		◒	◓	○	●	○	●	○	◒	○	●	◒	●	●	●	●	112	◒

* CONSTRUCTION ACTIVITIES

SYMBOLS:
EXCELLENT ○
GOOD ○
FAIR ○
POOR ○

STREAM: MILL CREEK

SHEET 3 OF 4

		UPPER BANKS				LOWER BANKS					BOTTOM						REACH SCORE	
POINT		LANDFORM SLOPE	MASS WASTING	DEBRIS JAM POTENTIAL	VEGETATIVE PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	FLOW DEFLECTORS	CUTTING	DEPOSITION	ROCK ANGULARITY	BRIGHTNESS	PARTICLE PACKING	DISTRIBUTION	SCOURING	AQUATIC VEGETATION	WEIGHTED VALUE	RANKING
54		◒	◓	○	●	◓	●	○	◒	●	●	◒	●	●	●	●	125	●
55	*	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	*	○
56		◓	○	○	●	◓	●	○	◓	●	●	◒	●	●	●	●	116	●
57		◓	○	○	●	◓	●	○	◓	●	●	◒	●	●	●	●	116	●
58		◓	○	○	●	◓	●	○	◓	●	●	◒	●	●	●	●	116	●
59		○	○	○	●	○	●	○	◓	●	●	◒	●	●	●	●	113	◒
60		○	○	○	●	○	●	○	◓	●	●	◒	●	●	●	●	113	◒
61		○	○	○	●	◒	●	○	◓	●	●	◒	●	●	●	●	115	●
62		○	○	○	●	◒	●	○	○	●	●	◒	●	●	●	●	113	◒
63		○	○	○	●	◒	●	○	○	●	●	◒	●	●	●	●	113	◒
64		◓	○	○	●	○	●	○	○	●	●	◒	●	●	●	●	111	◒
65		◓	○	○	●	○	●	○	○	●	●	◒	●	●	●	●	111	◒
66		◓	○	◓	●	○	●	○	○	●	●	◒	●	●	●	●	113	◒
67		◓	○	◓	●	○	●	○	○	●	●	◒	●	●	●	●	113	◒
68		◓	○	◓	●	○	●	○	○	●	●	◒	●	●	●	●	113	◒
69		◓	○	◓	●	○	●	○	○	●	●	◒	●	●	●	●	113	◒
70		◓	○	◓	●	○	●	○	○	●	●	◒	●	●	●	●	113	◒
71		◓	○	◓	●	○	●	○	○	●	●	◒	●	●	●	●	113	◒
72	*	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	*	○
73		○	○	○	○	○	●	○	◓	●	●	◒	●	●	●	●	104	◒
74		○	○	○	○	○	●	○	◓	●	●	◒	●	●	●	●	104	◒
75		○	○	○	○	○	●	○	◓	●	●	◒	●	●	●	●	104	◒
76		○	○	○	○	○	●	○	◓	●	●	◒	●	●	●	●	104	◒
77		○	○	○	○	○	●	○	◓	●	●	◒	●	●	●	●	104	◒
78		○	○	○	○	○	●	○	◓	●	●	◒	●	●	●	●	104	◒
79		○	○	○	○	○	●	○	◓	●	●	◒	●	●	●	●	104	◒
80		○	○	○	○	○	●	○	◓	●	●	◒	●	●	●	●	104	◒

* CONSTRUCTION ACTIVITIES

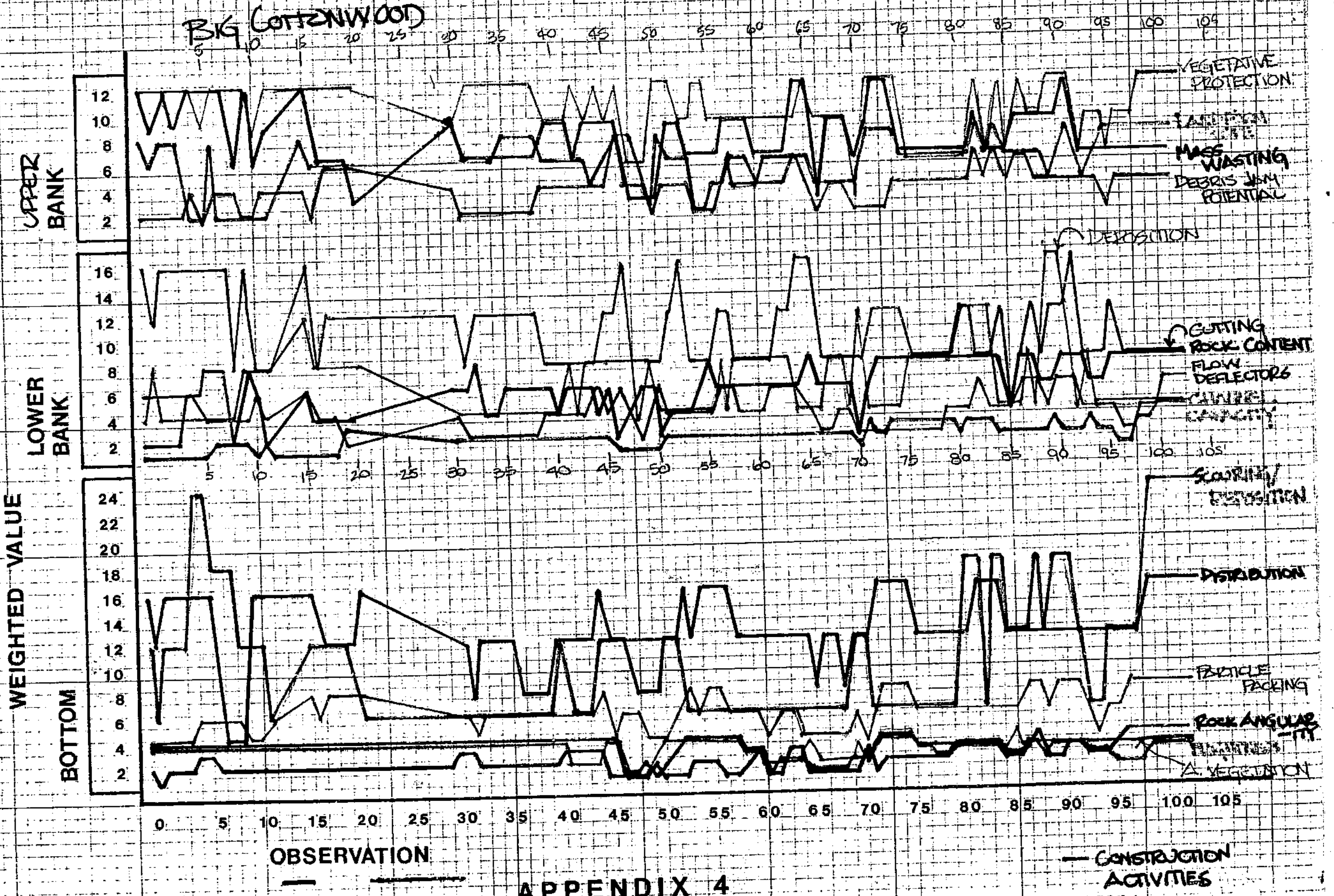
SYMBOLS:
EXCELLENT ○
GOOD ◓
FAIR ◒
POOR ●

STREAM: MILL CREEK

SHEET 4 OF 4

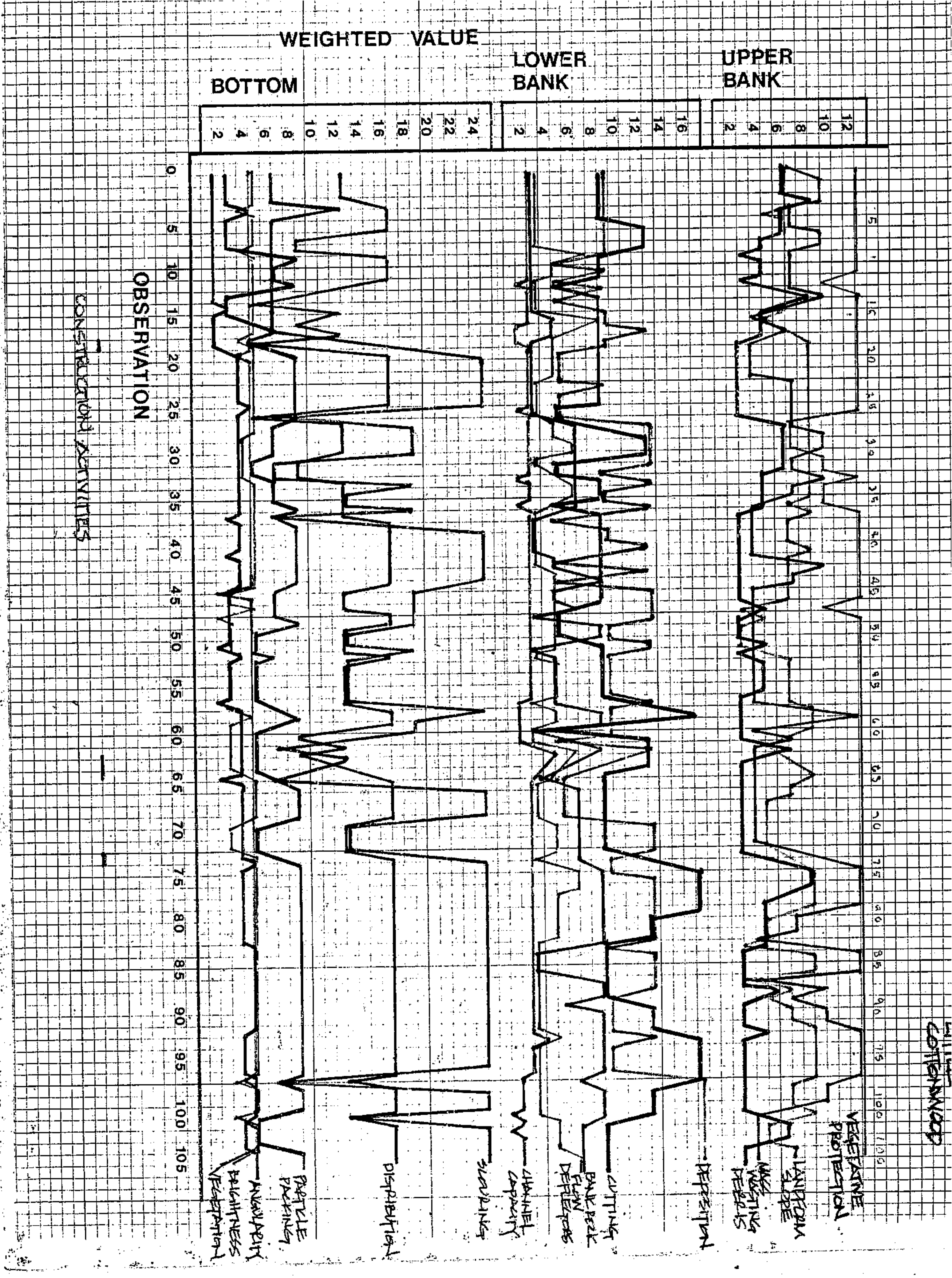
	UPPER BANKS				LOWER BANKS					BOTTOM						REACH SCORE	
POINT	LANDFORM SLOPE	MASS WASTING	DEBRIS JAM POTENTIAL	VEGETATIVE PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	FLOW DEFLECTORS	CUTTING	DEPOSITION	ROCK ANGULARITY	BRIGHTNESS	PARTICLE PACKING	DISTRIBUTION	SCOURING	AQUATIC VEGETATION	WEIGHTED VALUE	RANKING
81	○	○	○	○	○	●	○	◓	○	●	◒	●	●	●	●	104	◒
82	○	○	○	○	○	●	○	◓	○	●	◒	●	●	●	●	104	◒
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○

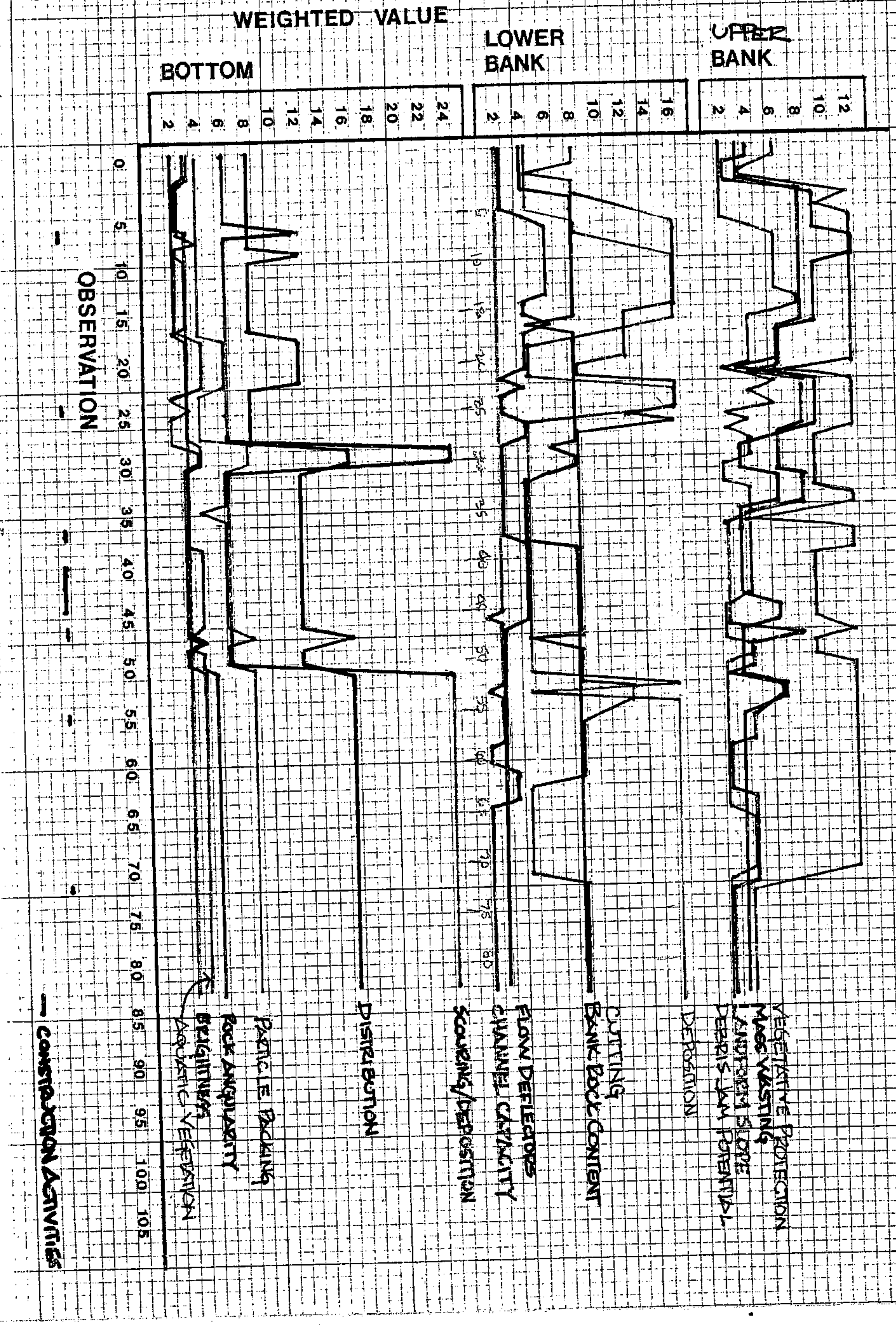
SYMBOLS: EXCELLENT ○
GOOD ○
FAIR ○
POOR ○



APPENDIX 4

Summary of Combined Matrix Values


WEIGHTED VALUE
BOTTOM
LOWER BANK
UPPER BANK
2 4 6 8 10 12 14 16 18 20 22 24
2 4 6 8 10 12 14 16
2 4 6 8 10 12
OBSERVATION
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105
CONSTRUCTION ACTIVITIES
VEGETATION
BRIGHTNESS
ANGULARITY
PARTICLE PACKING
DISTRIBUTION
SLOUGHING
CHANNEL CAPACITY
FLOW DEFLECTORS
BANK ROCK
CUTTING
DEPOSITION
DEBRIS
MASS WASTING
LANDFORM SLOPE
VEGETATIVE PROTECTION
COTTONWOOD


WEIGHTED VALUE
BOTTOM
2 4 6 8 10 12 14 16 18 20 22 24
LOWER BANK
2 4 6 8 10 12 14 16
UPPER BANK
2 4 6 8 10 12
OBSERVATION
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105
AQUATIC VEGETATION
BRIGHTNESS
ROCK ANGULARITY
PARTICLE PACKING
DISTRIBUTION
SCOURING/DEPOSITION
CHANNEL CAPACITY
FLOW DEFLECTORS
BANK ROCK CONTENT
CUTTING
DEPOSITION
DEBRIS JAM POTENTIAL
LANDFORM SLOPE
MASS WASTING
VEGETATIVE PROTECTION
MILL CREEK
— CONSTRUCTION ACTIVITIES