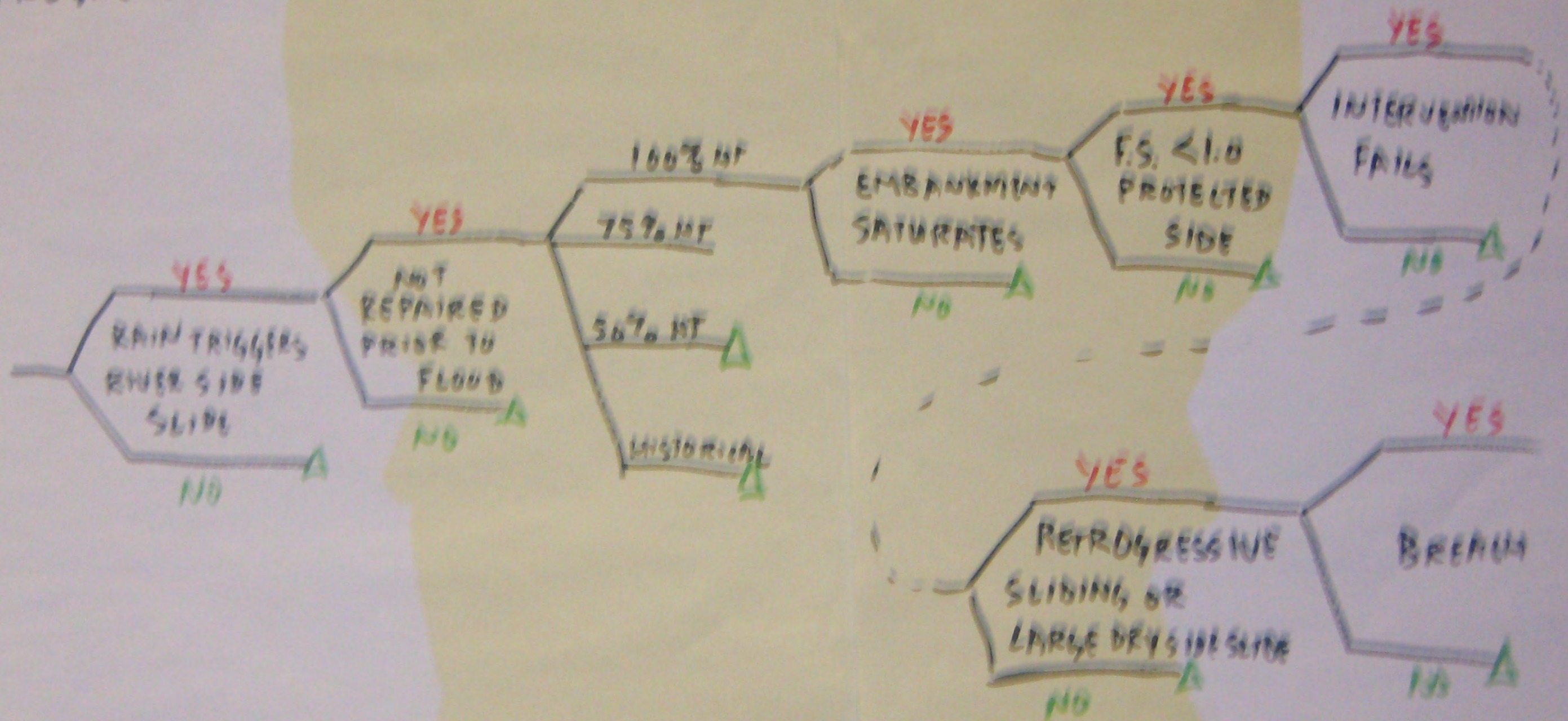


DALLAS FLOODWAY - DFM 13A - GLOBAL INSTABILITY - PROGRESSIVE SLIDING



DALLAS FLOODWAY PFM 13B
GLOBAL INSTABILITY - PROGRESSIVE SLIDES

(32)

- ONLY ONCE HAD SLIDES BOTH SIDES AT SAME TIME, BUT THEY WERE NEAR TOE OF LEVEE
- ~~ABOUT 11% CHANCE OF HAVING SLIDES IN ANY GIVEN YEAR INCLUDING ALL TYPES OF SLIDES~~
- 310 SLIDES 50-YR OBSERVATION
- 2006 DROUGHT - FOLLOWING ^{5-10-YR} RAIN EVENT → 20 SLIDES
- DESICCATION CRACKING HAS BEEN OBSERVED ON LEVEE CREST
- HISTORICAL SLIDES DOWNSLOPE FROM CREST
- SCARPS TYPICALLY 4'-6' HIGH - SLIDE DEPTHS ~ 8'
- SOME SLIDES DEEPER

DALLAS FLOODWAY PFM 13A

(27)

100% HT. STAGE, HIGH K VALUES, FULLY SOFTENED
PERMEABLE SAND LAYER NOT INCLUDED
 $P_{fs} < 1.0$ = SMALL MIN F.S. = 1.07

DALLAS
100%
FULLY
MORE

• CRACK
OBSER
IN R
TEXA
DATA

• CRACK
FLOOD
EMI
DRO

ESTIM
0.05
0.1)

DAL
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DALLAS FLOODWAY PFM #13A

GLOBAL INSTABILITY - SINGLE SLIDE
BREACH - 100% HT.

MORE LIKELY

- LIKELY HAVE WATER POURING OVER TOP OF LEVEE
- SLIDE MASS DISRUPTED MATERIAL MORE ERODIBLE
- LOW NOTCH AREA IN CREST WOULD CONCENTRATE FLOW

LESS LIKELY

- SLIDE MAY HAVE OCCURRED AT PEAK WATER LEVEL AND ON DESCENDING LIMB OF HYDROGRAPH ~ 12 HRS TO DROP 1 ft.
- COULD TAKE A WHILE TO ERODE CLAY EMBANKMENT

ESTIMATE: 0.95, 0.9, 0.9, 0.7, 0.9, 0.6, 0.9, 0.7, 0.8, 0.7, 0.7, 0.7, 0.75, 0.8

LOW	MED	HIGH
0.6	0.775	0.95

RATIONALE: MOST THOUGHT IT WOULD ERODE FASTER THAN RIVER WOULD DROP

29

30

DALLAS FLOODWAY PFM 13A NODE 4 INTERVENTION FAILS - 100% HT

MORE LIKELY

LESS LIKELY

FREQUENT MONITORING
WHEN RIVER NEAR LEVEE
CREST

ESTIMATES: 0.9, 0.75, 0.5,
0.4, 0.9, 0.7, 0.8, 0.9, 0.6,
0.8, 0.8, 0.6, 0.5, 0.8

LOW		HIGH
~~HIGH~~	MED	~~LOW~~
0.4	0.78	0.9

RATIONALE: DIFFICULT TO STABILIZE
LARGE SLIDE MASS, NOT MUCH MOVEMENT
TO LOSE FREEBOARD, SAFETY OF WORKERS
MAY BE AN OVERRIDING ISSUE

DALLAS FLOODWAY PFM 13A

(29)

INODE 4 - INTERVENTION FAILS

MORE LIKELY

LESS LIKELY

100% HEIGHT STAGE LEVEL

- MODELED FAILURE SURFACES INTERSECT RIVER LEVEL - WON'T TAKE MUCH MOVEMENT TO LOSE FREEBOARD
- WOULD TAKE A MAJOR EFFORT TO DEAL WITH THIS SITUATION
- SAFETY ISSUE FOR FLOOD FIGHTERS
- RARE TO SEE CRACKS BEFORE SLIDES ON OTHER LEVEES
- DUMPING MATERIAL ONTO SLIDE PROVIDES MORE DRIVING FORCE

- EQUIPMENT & MATERIALS AVAILABLE
- MAY BE PRECURSORS - CRACKING IN CREST OR SEEPAGE AT FACE - COULD INCREASE BACK PRESSURE AT SUMPS
- ~~MAY TAKE TIME FOR SLIDE TO DEVELOP AND MOVE ONCE F.S. DROPS BELOW 1.0~~
- ~~AS RIVER DROPS MOVEMENT~~

DALLA
NODE
MOR

ESTIM
0.4,
0.8,
LOW
HIGH
0.4

RATIO
LARG
TO LO
MAY

DALLAS FLOODWAY PFM 13A

(28)

100% STAGE HEIGHT HIGH K VALUES
FULLY DESICLATED CH FDN MATERIAL

MORE LIKELY

LESS LIKELY

- CRACKS HAVE BEEN OBSERVED FILLED W/ SAND IN RIVER CHANNELS NE TEXAS (NO SPECIFIC DATA HERE)
- CRACKS OBSERVED IN FLOOD PLAIN SIMILAR TO EMBANKMENT DURING DROUGHT

• VERTICAL CRACKS, WIDELY SPACED, NARROW WOULD NOT INCREASE HORIZ. K SIGNIFICANTLY

- CRACKS TEND TO CLOSE IN RIVER DUE TO MORE FREQUENT EXPOSURE TO WATER

• K VALUE USED FOR FULLY DESICLATED MAY BE HIGH

ESTIMATES - 0.25, 0.1,
0.05, 0.01, 0.01, 0.01, 0.3,
0.1, 0.01, 0.05, 0.3, 0.3, 0.3

LOW	MED	HIGH
0.01	0.1	0.3

ALL
NODE
MORE
100%
MOD
SUR
RIVE
TAK
TO

LARGEST EFFECT OF FSS IS HIGHER PERM.
IN THAT MATERIAL

DALLAS FLOODWAY PFM 13A

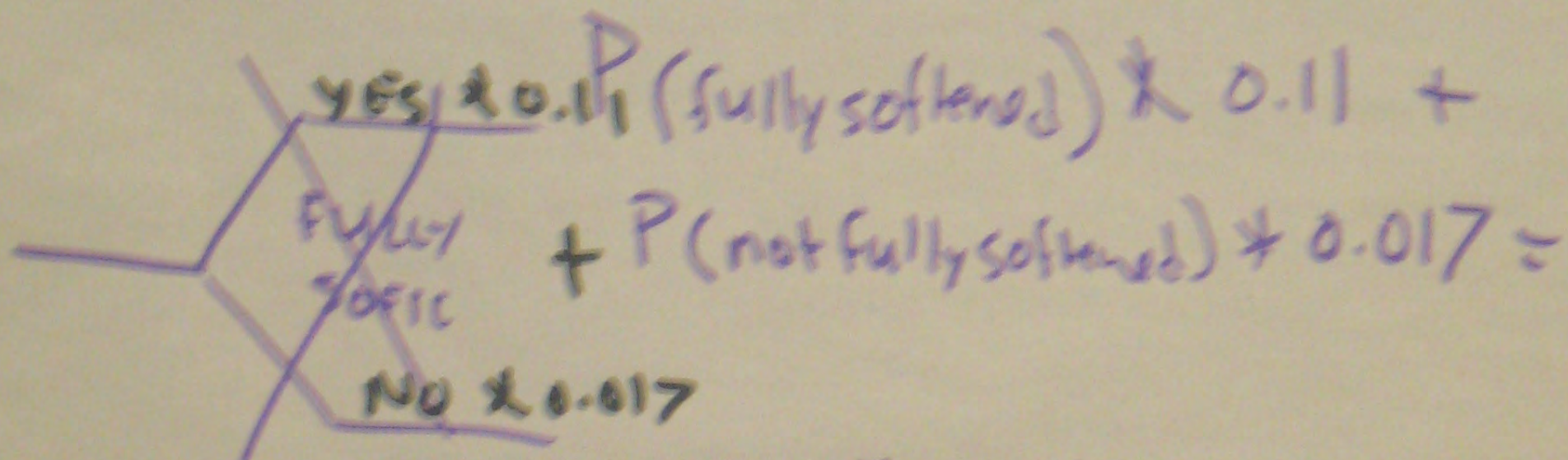
(27)

100% HT. STAGE, HIGH k VALUES, FULLY SOFTENED
PERMEABLE SAND LAYER NOT INCLUDED

$P_{FS < 1.0} = \text{SMALL MIN F.S.} = 1.07$

PERMEABLE SAND LAYER BLOCKED FROM
RIVER

$P_{FS < 1} = 7.8\%$



PROB ~~F.S. < 1.0~~ - FULLY DESICCATED
MORE LIKELY LESS LIKELY

NO SLIDES IN THIS
AREA

EMBANKMENT IS CL-
WOULD NOT EXPECT
SURFICIAL SLIDES
- NO SEEPAGE OBSERVED

DALLAS FLOODWAY PFM #13A

(26)

PROB F.S. < 1.0

PROBABILISTIC ANALYSES - FACTORS MAKING THEM REPRESENTATIVE

MORE REPRESENTATIVE

LESS REPRESENTATIVE

- | | |
|--|--|
| <ul style="list-style-type: none">• ~~USING~~ LINEAR UNIFORM DISTRIBUTION LOOK REASONABLE FOR EFF. NORMAL STRESS RANGE• SCATTER OF SHEAR STRENGTH DATA TYPICALLY APPEARED TO FOLLOW UNIFORM DISTRIBUTION MORE CONSERVATIVE THAN TRIANGULAR OR NORMAL | <ul style="list-style-type: none">• NO TENSION CRACK IN STABILITY MODELS, F.S. = 1.77 NO CRACK F.S. = 1.66 WITH CRACK• BEST ESTIMATE SHEAR STRENGTH SKEWED TOWARD LOWER BOUND BUT MEAN USED IN M.C. ANALYSIS IN MIDDLE OF UNIFORM DIST. ~~ON~~ |
|--|--|

RESULTS - 100% HT STAGE - HIGH K

$P_{fs < 1} = 1.67\%$ BASE, 11.25% FSS

LARGEST EFFECT OF FSS IS HIGHER PERM. IN THAT MATERIAL

DALLAS FLOODWAY PFM 13A

(27)

100% HT. STAGE, HIGH K VALUES, FULLY SOFTENED PERMEABLE SAND LAYER NOT INCLUDED

DALLAS FLOODWAY PFM # 13 A (25)
GLOBAL INSTABILITY - SINGLE SLIDE
NODE 2 - PERMEABILITY - LOWEST VALUES
MORE LIKELY LESS LIKELY

A ZONE OF VERY LOW
PERMEABILITY SOIL
COULD CONTROL BEHAVIOR
SEEPAGE

LOWEST PERMEABILITY ESTIMATES

0.15, 0.5, 0.2, 0.3, 0.25, 0.1, 0.15, 0.1, 0.25,
0.1, 0.1, 0.1, 0.2, 0.3

HIGH	MED	LOW
0.5	0.175	0.1

RATIONALE

BEST EST. $k \approx 1 - (\text{HIGH } k + \text{LOW } k)$

TO LOW SAND K - MAY
NOT BE REASONABLE

DALLAS FLOODWAY PFM 13A
GLOBAL INSTABILITY - SINGLE SLIDE
NODE 2 - PERMEABILITY

(24)

MORE LIKELY

ESTIMATES: 0.1, 0.01,
0.01, 0.1, 0.1, 0.1, 0.1,
0.05, 0.001, 0.08, 0.05,
0.05, 0.01, 0.01

LOW	MED	HIGH
0.001	0.05	0.1

LESS LIKELY

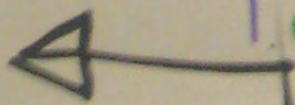
- ALL ~~LOW~~ HIGH K VALUES
USED SIMULTANEOUSLY
IN ANALYSIS - EMB
AND FDN.

- EMBANKMENT & FDN CL
K TESTS LUMPED - COMPACTED
EMBANKMENT SHOULD HAVE
LOWER K THAN NATURAL
FDN. DEPOSIT

RATIONALE: UNLIKELY TO HAVE WIDE SPREAD
HIGH PERMEABILITY SOIL IN ONE AREA

FACTORS INDICATING LOWEST PERMEABILITY

COMPACTED EMBANKMENT
COULD TEND TOWARD
LOWER VALUES



DALLAS FLOODWAY PFM 13A
GLOBAL INSTABILITY - SINGLE SLIDE
CRITICAL SECTION STA 220 E

(23)

NODE 1 - CONTINUOUS CLEAN SAND LAYER
CONNECTED TO RIVER

USE NUMBERS FROM PFM #8 - STA 220 E

NODE 2 - PERMEABILITY

FACTORS INDICATING HIGH PERMEABILITY

MORE LIKELY

LESS LIKELY

• OPPORTUNITY FOR
DESICCATED CLAY IN
FOUNDATION CH MATERIAL

• PERMEABILITY VALUES
SELECTED AS UPPER 90TH
PERCENTILE OF LAB TESTS -
MAY NOT BE REPRESENTATIVE

• DRIVEN BY HIGH K IN
EMBANKMENT -
ASSUMES ENTIRE EMB
HIGH VALUE

• HIGH CL K SIMILAR
TO LOW SAND K - MAY
NOT BE REASONABLE

DALLAS FLOODWAY PFM 13A
GLOBAL INSTABILITY - SINGLE SLIDE
NODE 2 - PERMEABILITY

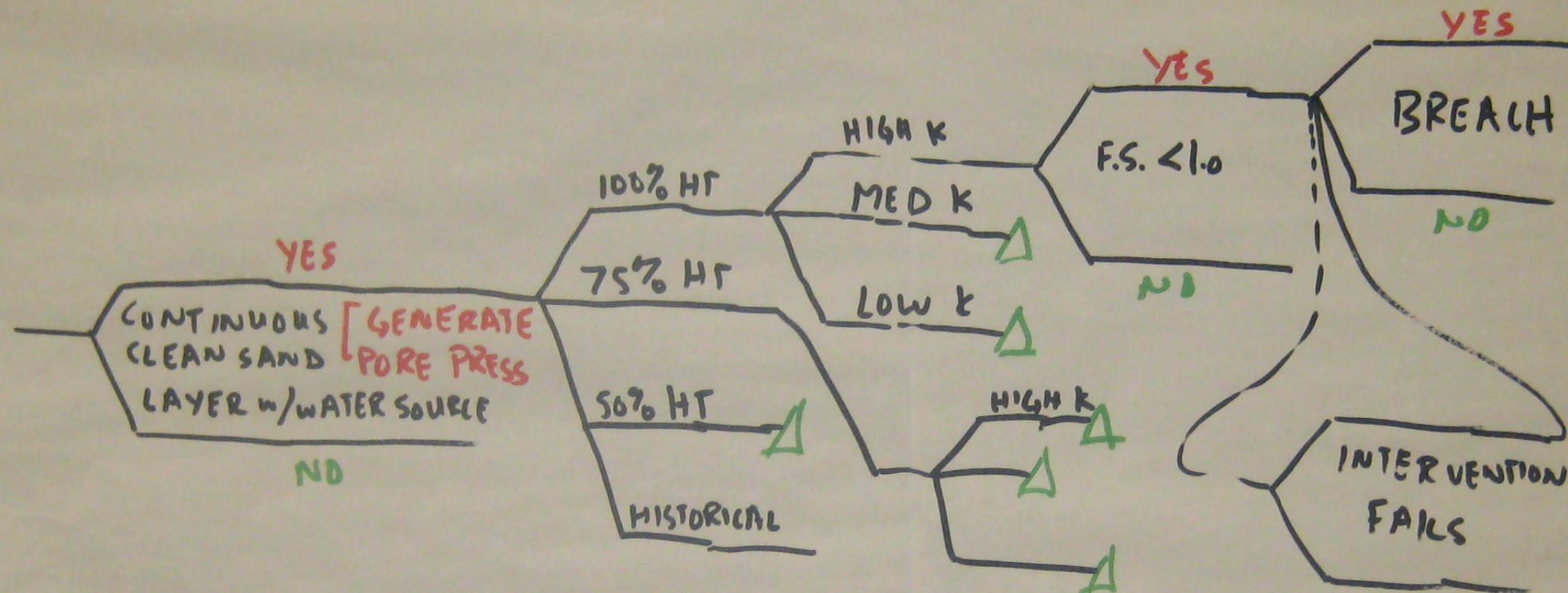
(24)

MORE LIKELY

LESS LIKELY

• ALL ~~LOW~~ HIGH K VALUES

DALLAS FLOODWAY - POTENTIAL FAILURE MODE 13A - GLOBAL INSTABILITY SINGLE SLIDE



COMPARISON TO SITE - USE SAME NUMBERS.

DALLAS FLOODWAY PFM #8 - HEAVE
CRITICAL SECTION ON WEST SIDE - 335W
COMPARE TO 220E
MORE LIKELY

(22)

LESS LIKELY

NODE 1 - CLEAN CONTINUOUS
SAND CONNECTED TO RIVER

ESTIMATES: 0.001, 0.1,
0.1, 0.1, 0.01, 0.1, 0.1,
0.01, 0.01, 0.05, 0.0025, 0.1,
0.0025

LOW MED HIGH
0.001 0.05 0.1

NODE 2 - HEAVE

100% HT 0.01, 0.1, 0.1, 0.01, 0.05, 0.03, 0.01, 0.3, 0.2
0.09, 0.05, 0.005, 0.1

75% HT 0.01, 0.05, 0.02, 0.005, 0.01, 0.02, 0.005, 0.1, 0.1
0.05, 0.01, 0.001, 0.01

50% HT 0.01, 0.01, 0.01, 0.001, 0.001, 0.01, 0.001, 0.01, 0.01
0.01, 0.001, 0.001, 0.005

	LOW	MED	HIGH
100% HT	0.005	0.05	0.3
75% HT	0.001	0.01	0.1
50% HT	0.001	0.01	0.01

THICKER CLAY LAYER
@ 335W - 30'

COMPARED TO 6' @ 220E
AT EXIT POINT

- F.S. 1.3 @ 335W vs. .5 @ 220E
AGAINST HEAVE

- SAND LAYER DOES NOT
DAYLIGHT INTO RIVER
CHANNEL

DALLAS FLOODWAY PFM #7

(21)

BACKWARD EROSION OF EXPOSED SAND LAYER
STA 250W MOST CRITICAL ON WEST SIDE -
DIFFERENT EXPOSED POPULATION
COMPARISON TO STA 311E

MORE LIKELY

- LINE SOURCE ^{POSSIBLE} AT
ENTRANCE W/ EXPOSED
SAND, VS. "POINT" SOURCE
@ STA 311E

- CLEAN SANDS SHOW
UP ADJACENT TO THIS
SECTION IN BORING LOGS,
BUT SIMILAR TO 311E

LESS LIKELY

- SOURCE MAY NOT BE
"LINE" SOURCE BUT
RATHER A POND.

- RAMPS HERE SIMILAR
TO 311E FOR ACCESS

NO SIGNIFICANT DIFFERENCES
COMPARED TO 311E - USE SAME
NUMBERS.

DALLAS FLOODWAY PFM #8 - HEAVE
CRITICAL SECTION ON WEST SIDE - 335W
COMPARE TO 220E

(22)

MORE LIKELY

NODE 1 - CLEAN CONTINUOUS
SAND CONNECTED TO RIVER

ESTIMATES: 0.001 - 0.1

LESS LIKELY

THICKER CLAY LAYER
@ 335W - 30'
COMPARED TO 220E

USE SAME NUMBERS AS PFM #8,
ALTHOUGH IT IS RECOGNIZED THEY COULD
BE SLIGHTLY LOWER HERE.

DALLAS FLOODWAY PFM #7

(20)

BACKWARD EROSION OF SAND

NODE 6 - BREACH - COMPARE TO STA 220 E

MORE LIKELY

LESS LIKELY

- SAND LAYER CLOSER
TO BASE OF EMBANKMENT

- CREST EL. 1.4' LOWER
BASED ON 2003 SURVEY

- SAND LAYER NOT AS
THICK. 8' @ 220 AND
4' @ 311 E

USE NUMBERS FROM PFM #8
RATIONALE: NO SIGNIFICANT DIFFERENCES