Fern Ridge Dam, Oregon

Seepage and Piping Concerns

(Internal Erosion)

SPRA Training – 25 May 2005

2002 and 2003 OBSERVATIONS

Location of Depressions

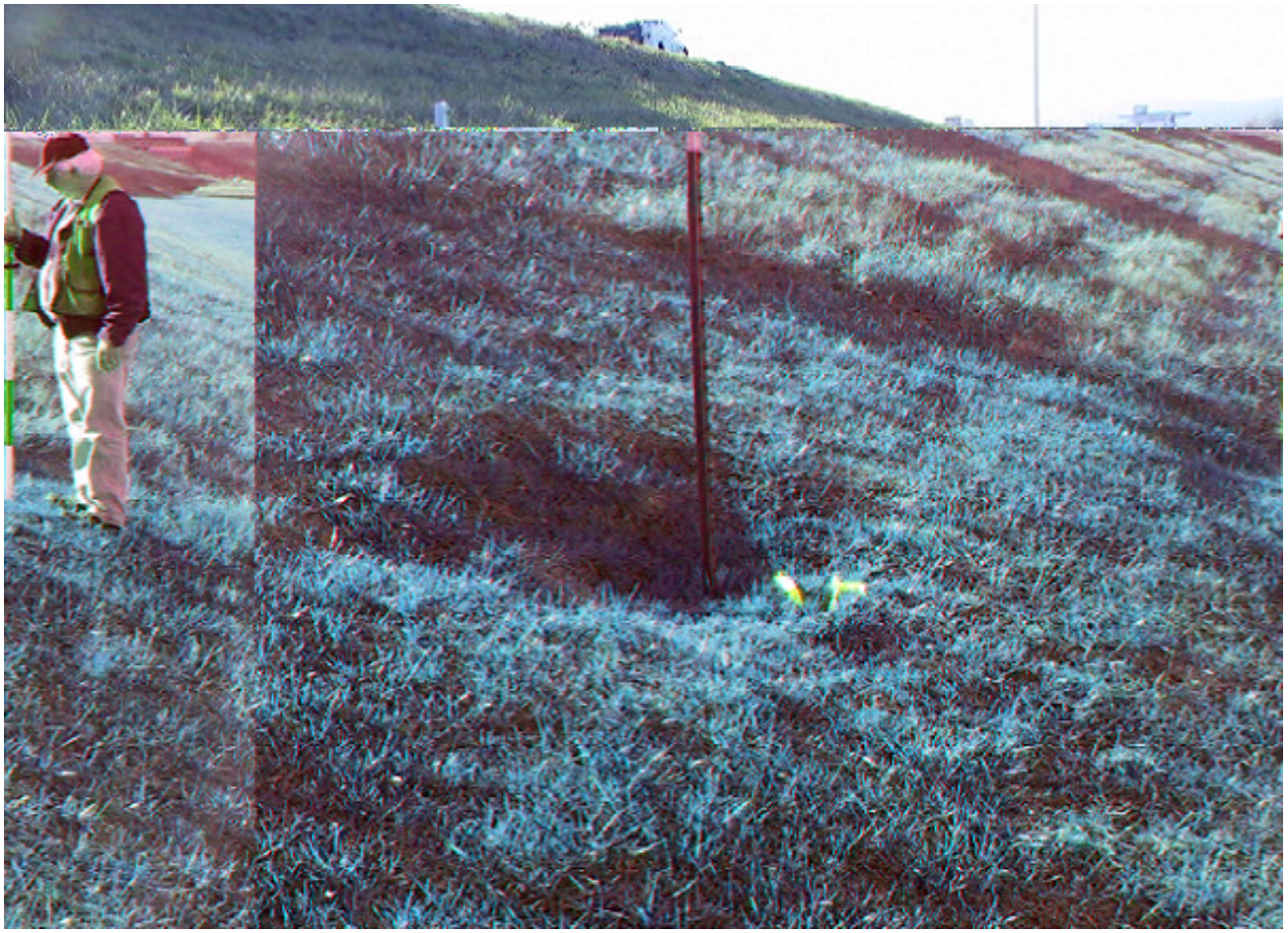
Sinkholes on D/S face

September 2002

February 2003

Station 44+00

Sinkholes on D/S face



Station
20+00

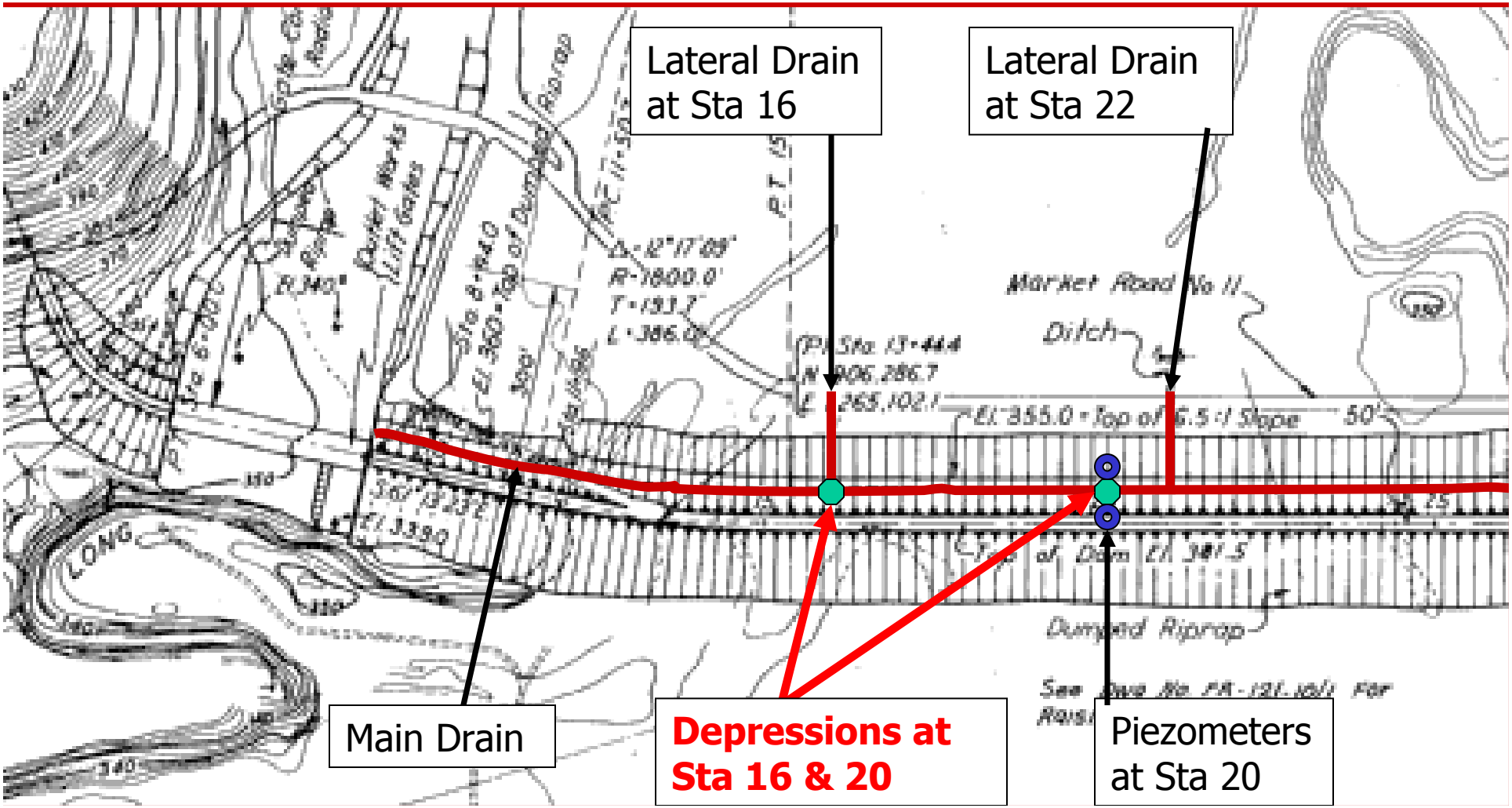
February 2003

Sinkhole on D/S face

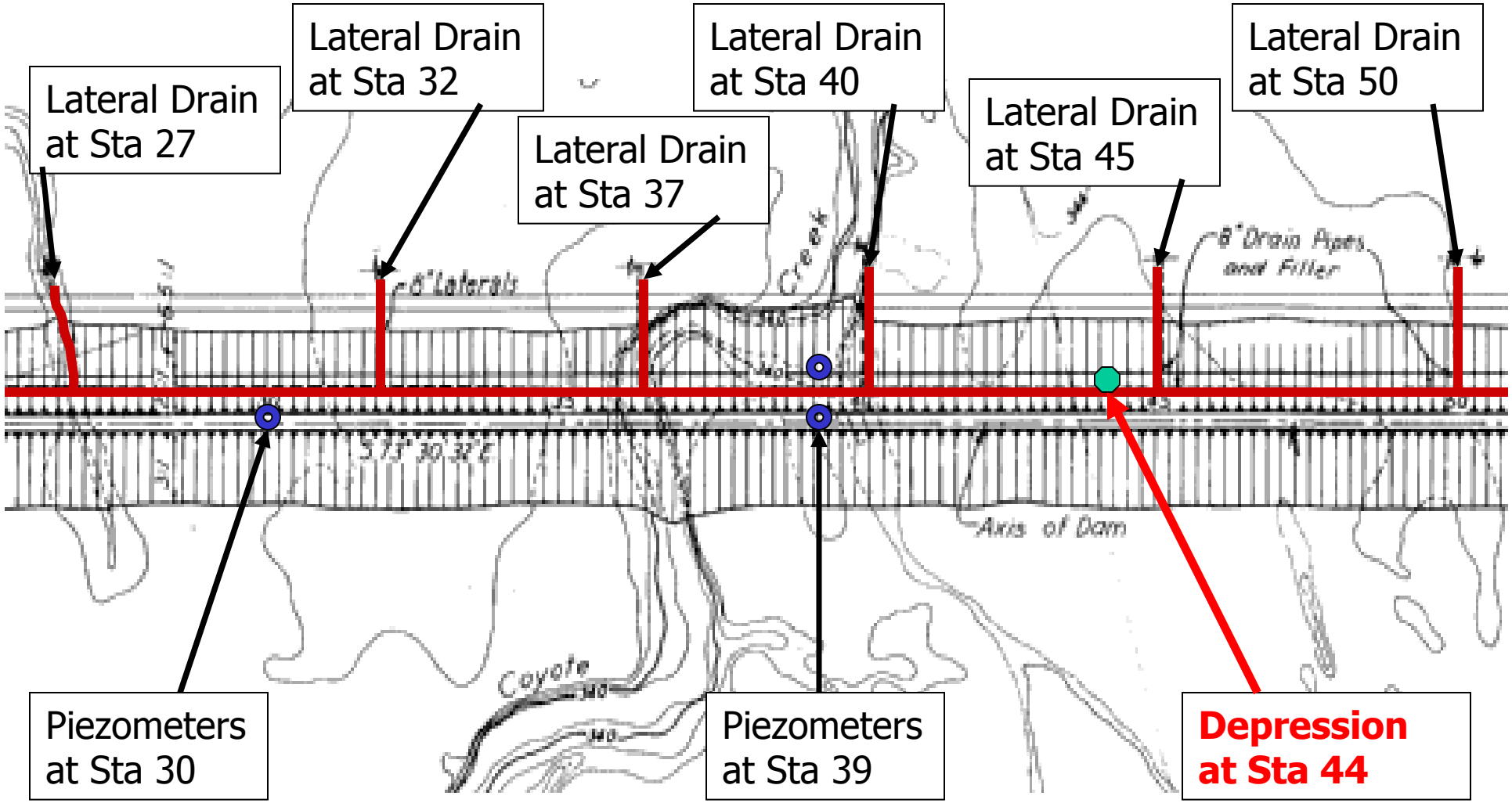
Station
16+00

February 2003

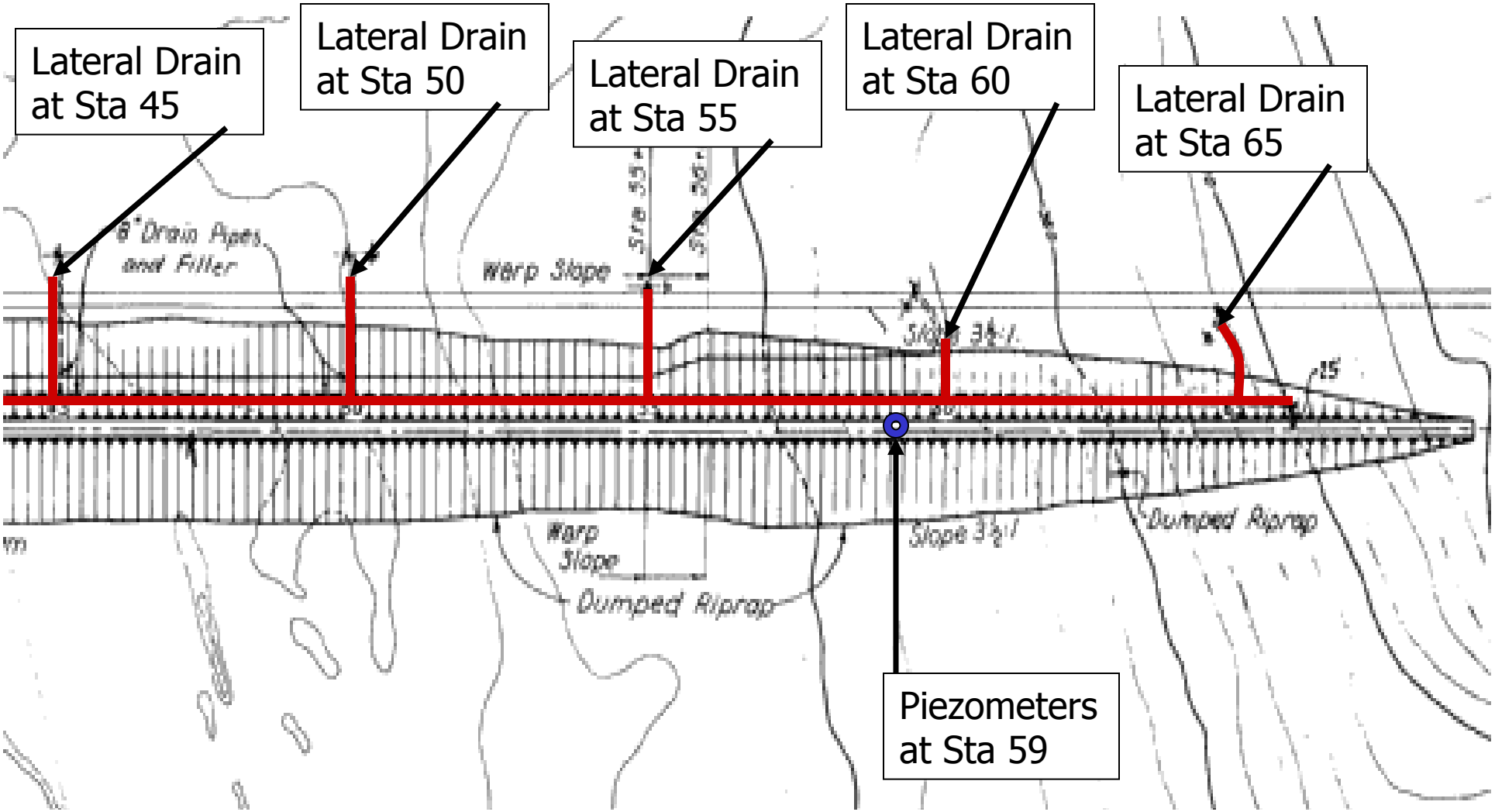
Plan View (Sta. 0+00 – 25+00)



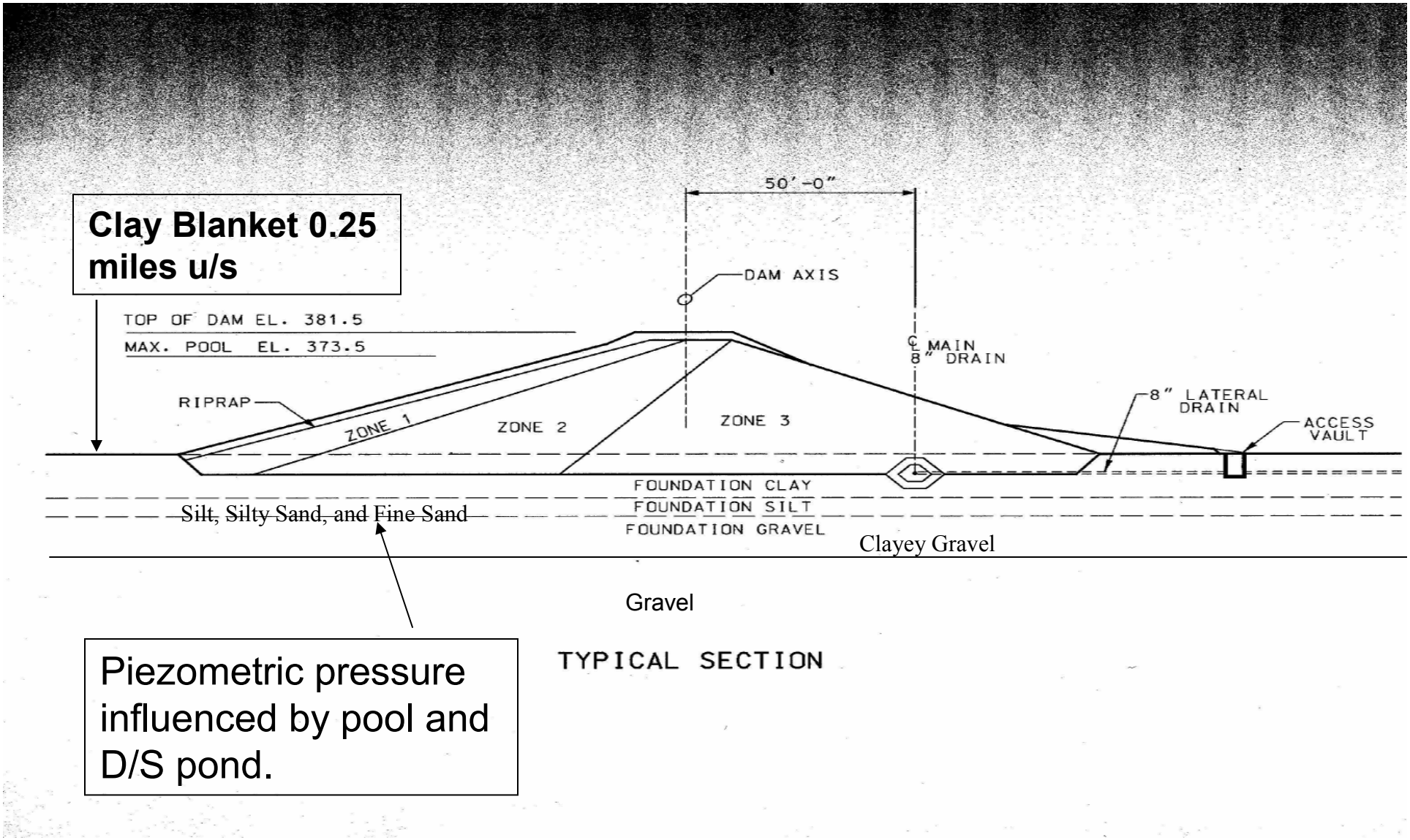
Plan View (Sta. 25+00 – 50+00)



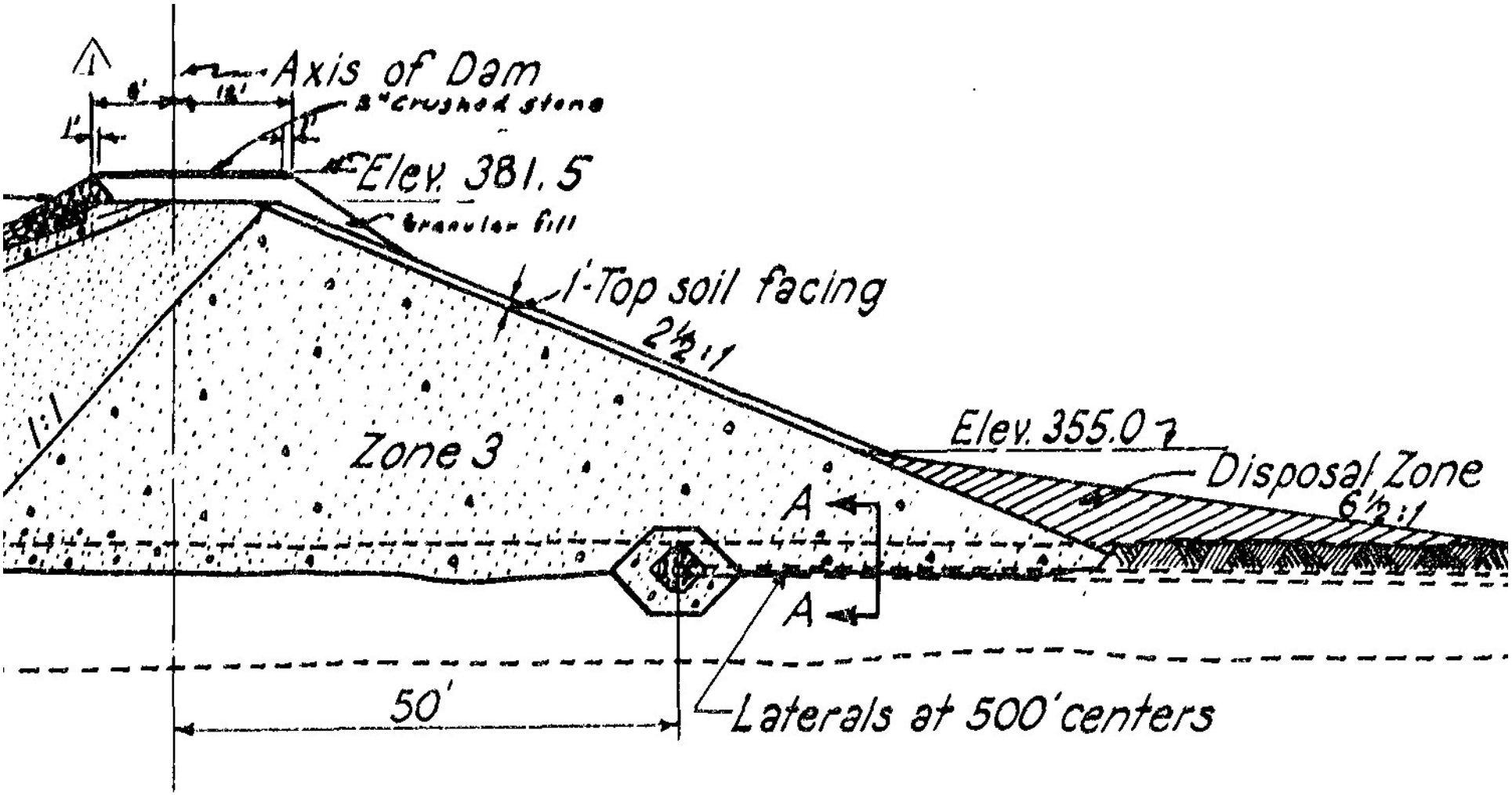
Plan View (Sta. 50+00 – 70+00)



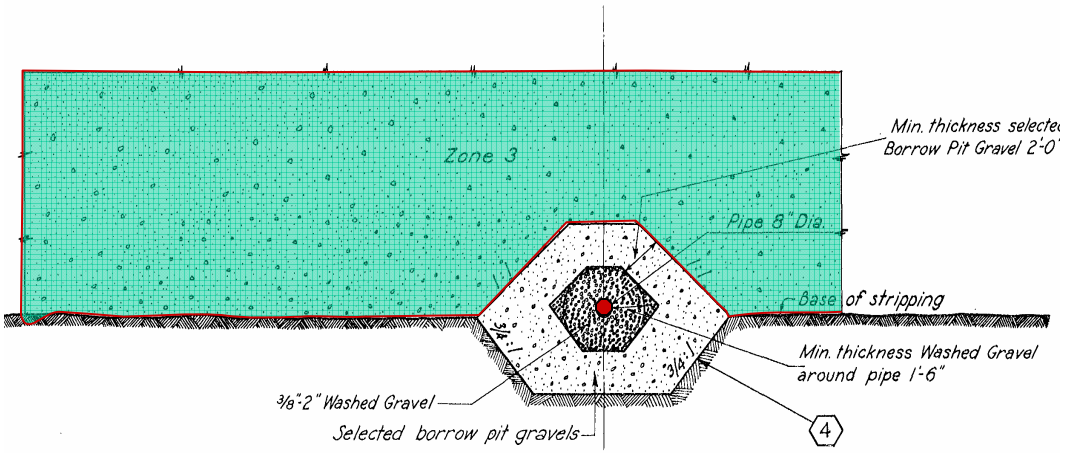
Fern Ridge Cross Section



Details of D/S Embankment Structure



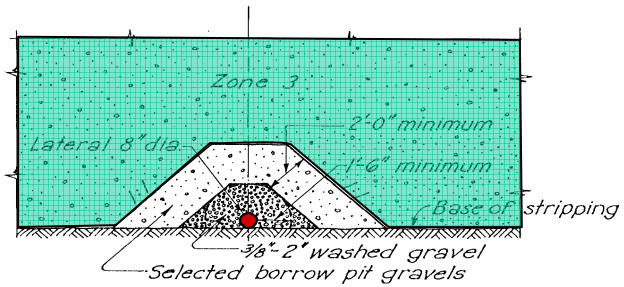
Drain System Details



DRAIN AND FILTER

SCALE: 1/4" = 1'-0"

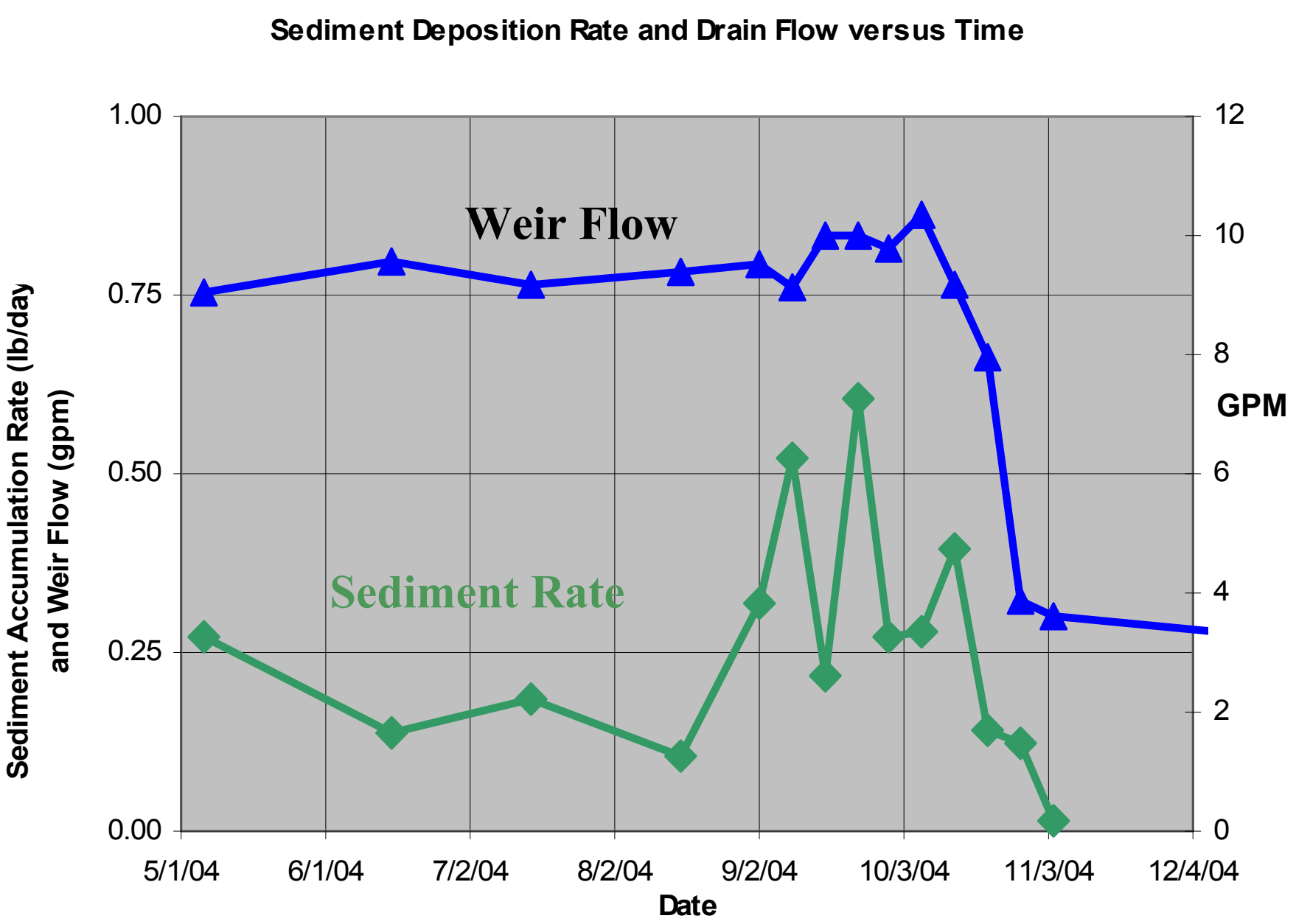
Note:
Pipe shall be 8"-14 gauge corrugated metal with bituminous coating. Main shall be perforated bottom 120° with 3/8" holes @ 1 1/2" centers in valley of corrugations except at joints. Joints shall be 1/2 circle band, 7" width, riveted to pipe for 1 corrugation. Joints shall be locked by means of an angle iron riveted to abutting sections and bolted. After bolting all parts of joint shall be coated with same bituminous material as pipe. Connections to laterals shall be made with standard tee sections.

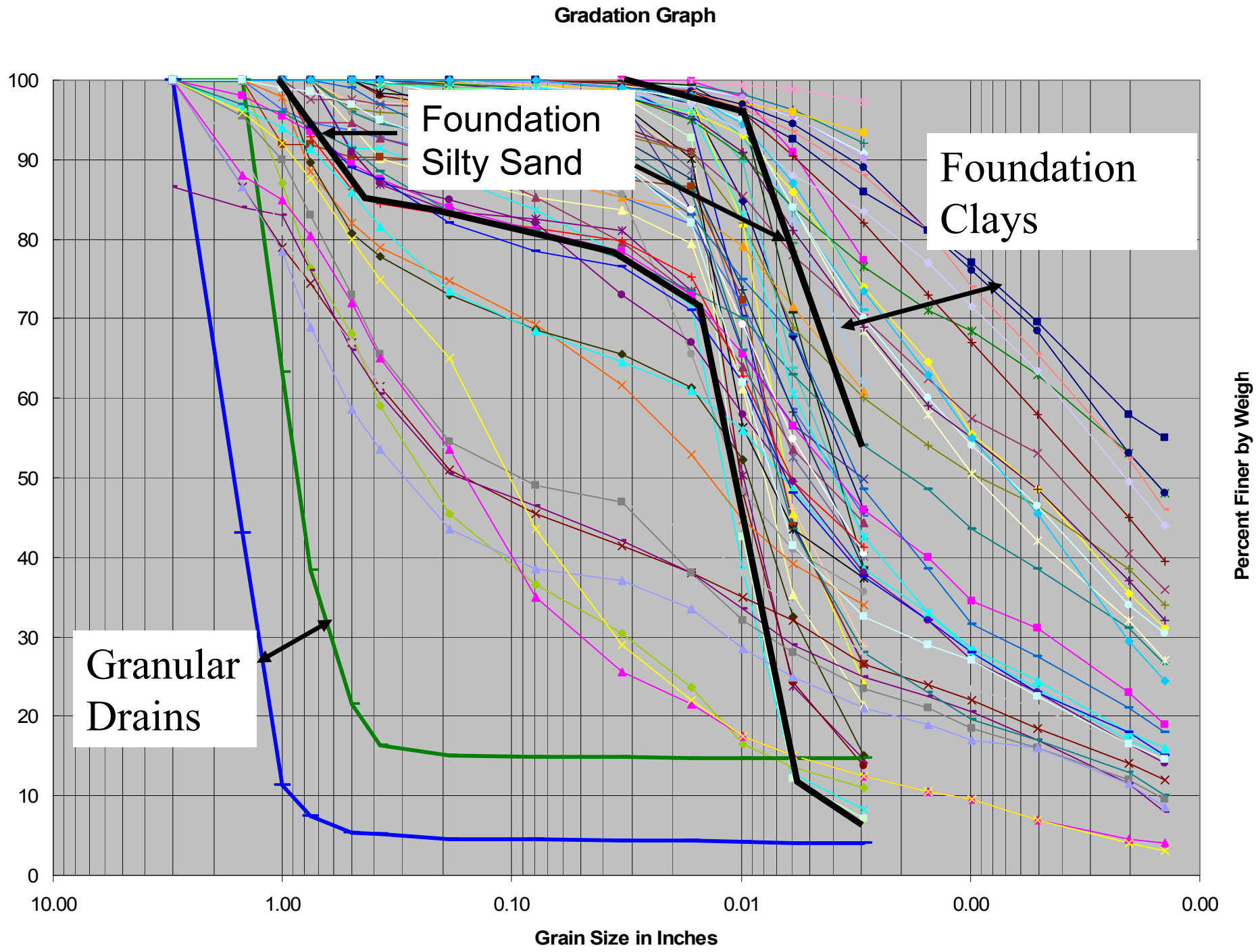


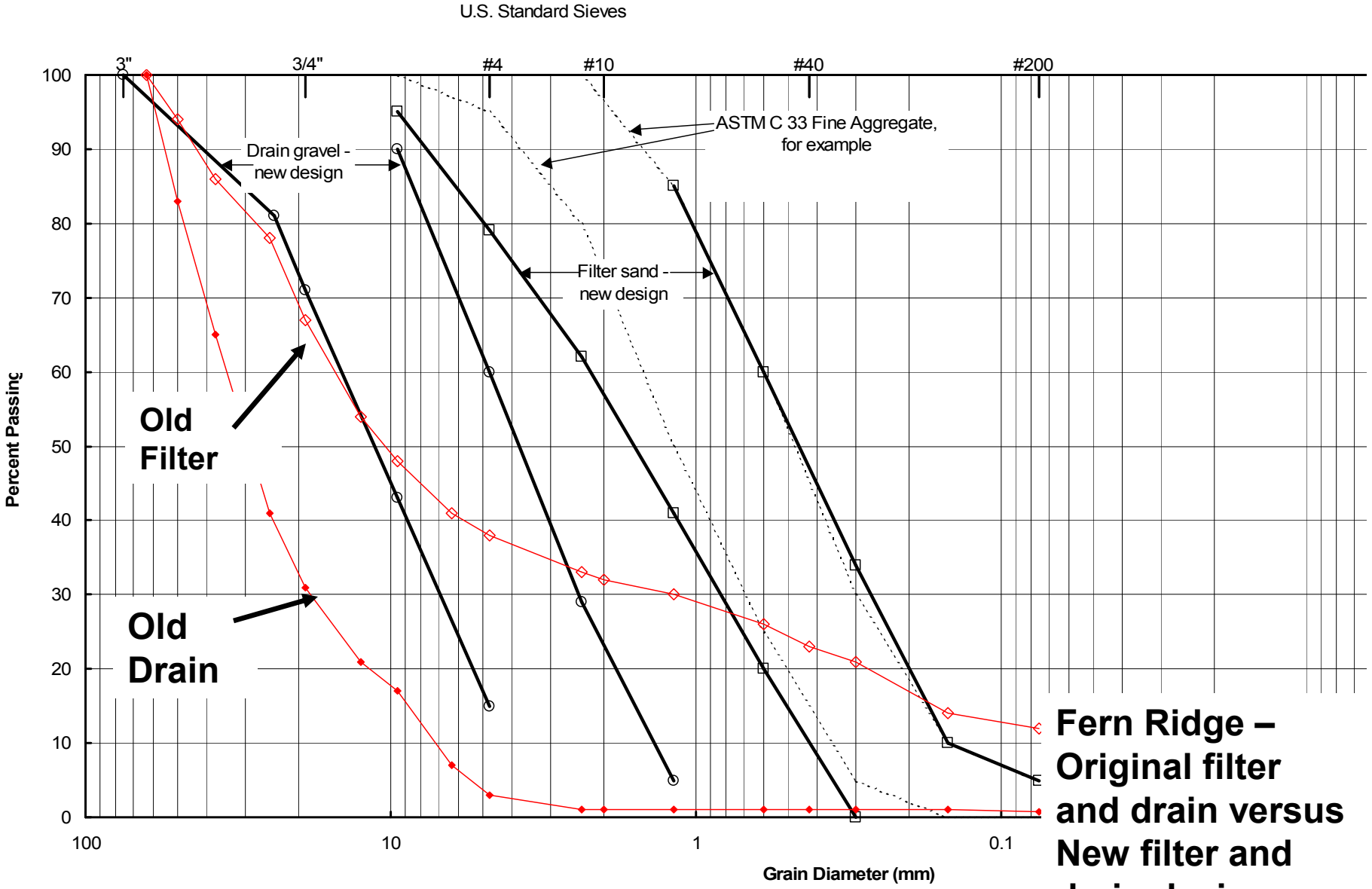
SECTION A-A

SCALE: 1/4" = 1'-0"

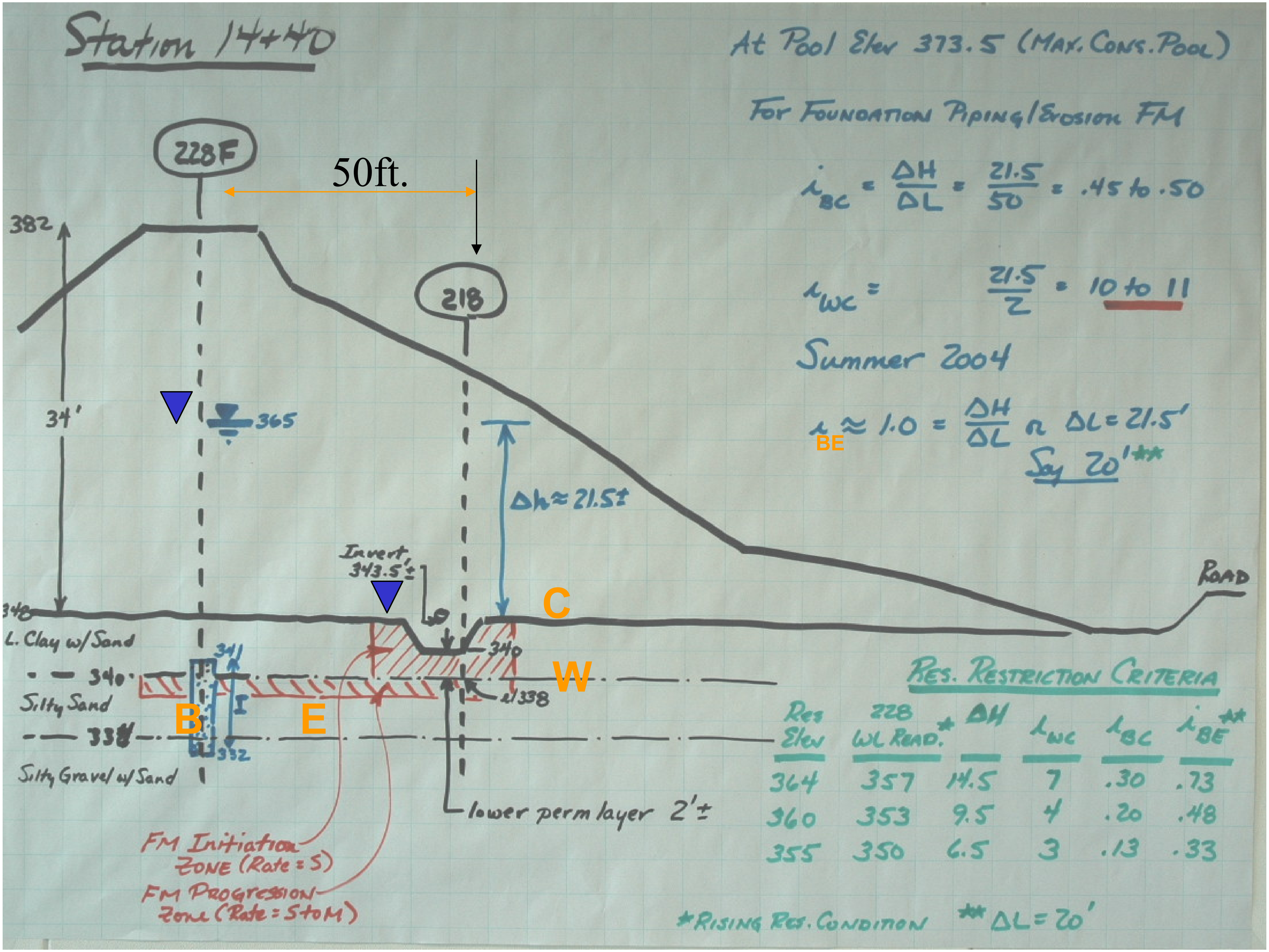
Note:
On the crest of the dam between stations 9+07.75 and 68+80 and stations 2+80 and 5+90.5 a 4" thick top coarse (49) shall be placed.


Sediment Deposition Rate and Drain Flow versus Time
Weir Flow
Sediment Rate
Sediment Accumulation Rate (lb/day and Weir Flow (gpm)
GPM
Date
1.00
0.75
0.50
0.25
0.00
12
10
8
6
4
2
0
5/1/04
6/1/04
7/2/04
8/2/04
9/2/04
10/3/04
11/3/04
12/4/04


Gradation Graph
Foundation Silty Sand
Foundation Clays
Granular Drains
100
90
80
70
60
50
40
30
20
10
0
10.00
1.00
0.10
0.01
0.00
0.00
Grain Size in Inches
Percent Finer by Weigh

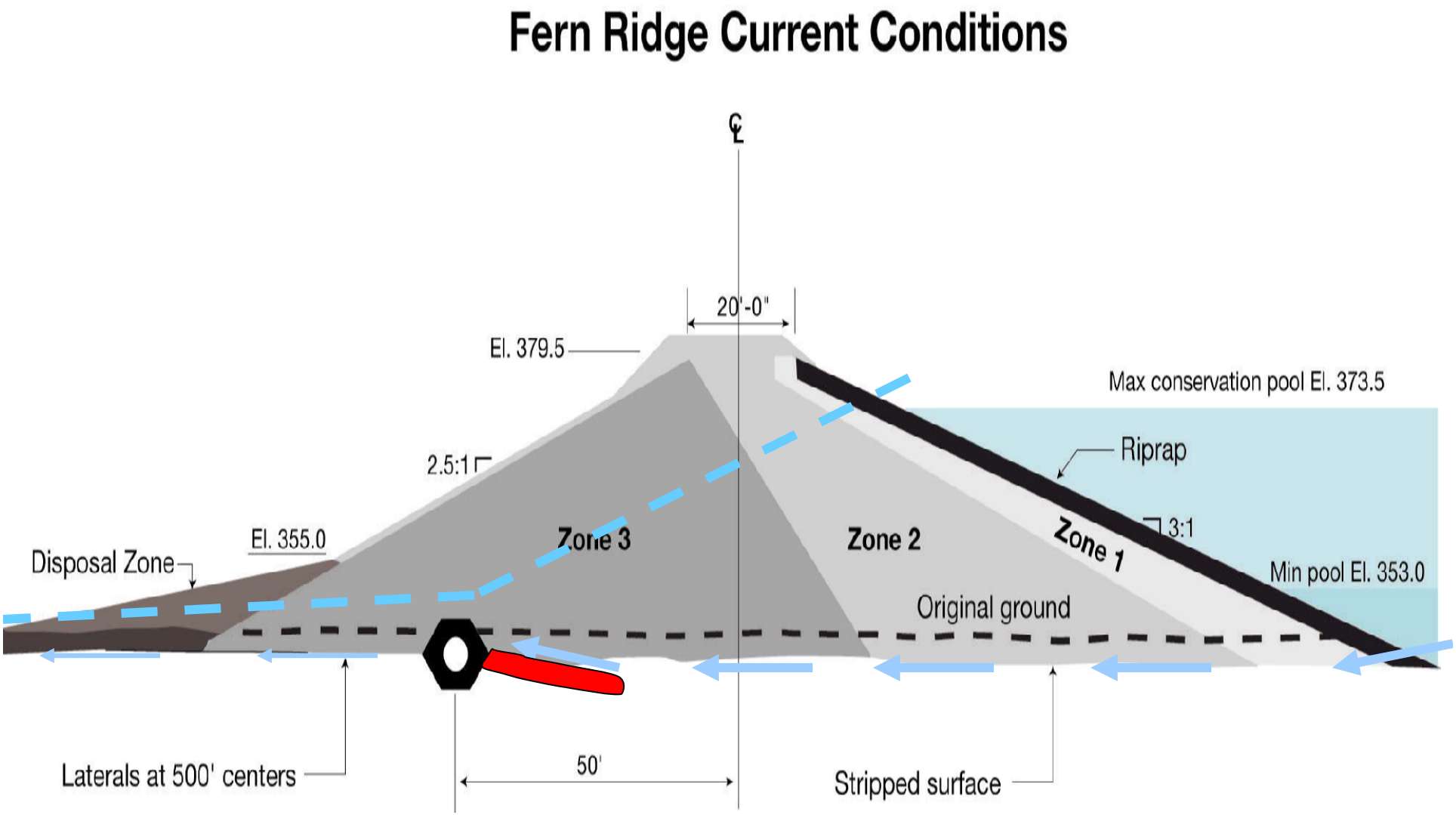


Fern Ridge – Original filter and drain versus New filter and drain design.



Station 14+40
At Pool Elev 373.5 (Max. Cons. Pool)
For Foundation Piping/Erosion FM
$i_{BC} = \frac{\Delta H}{\Delta L} = \frac{21.5}{50} = .45 \text{ to } .50$
$i_{WC} = \frac{21.5}{2} = 10 \text{ to } 11$
Summer 2004
$i_{BE} \approx 1.0 = \frac{\Delta H}{\Delta L}$ n $\Delta L = 21.5'$
Say 20'**
228F
218
50ft.
382
34'
365
348
$\Delta h \approx 21.5 \pm$
Invert, 343.5±
340
338
341
332
L. Clay w/ Sand
340
Silty Sand
338
Silty Gravel w/ Sand
B
E
C
W
I
lower perm layer 2'±
FM Initiation Zone (Rate = S)
FM Progression Zone (Rate = S to M)
Road
Res. Restriction Criteria
Res Elev | 228 WL Read.* | ΔH | i_{WC} | i_{BC} | i_{BE}**
364 | 357 | 14.5 | 7 | .30 | .73
360 | 353 | 9.5 | 4 | .20 | .48
355 | 350 | 6.5 | 3 | .13 | .33
*Rising Res. Condition
** ΔL = 20'

Continuation of Piping Failure



Questions?