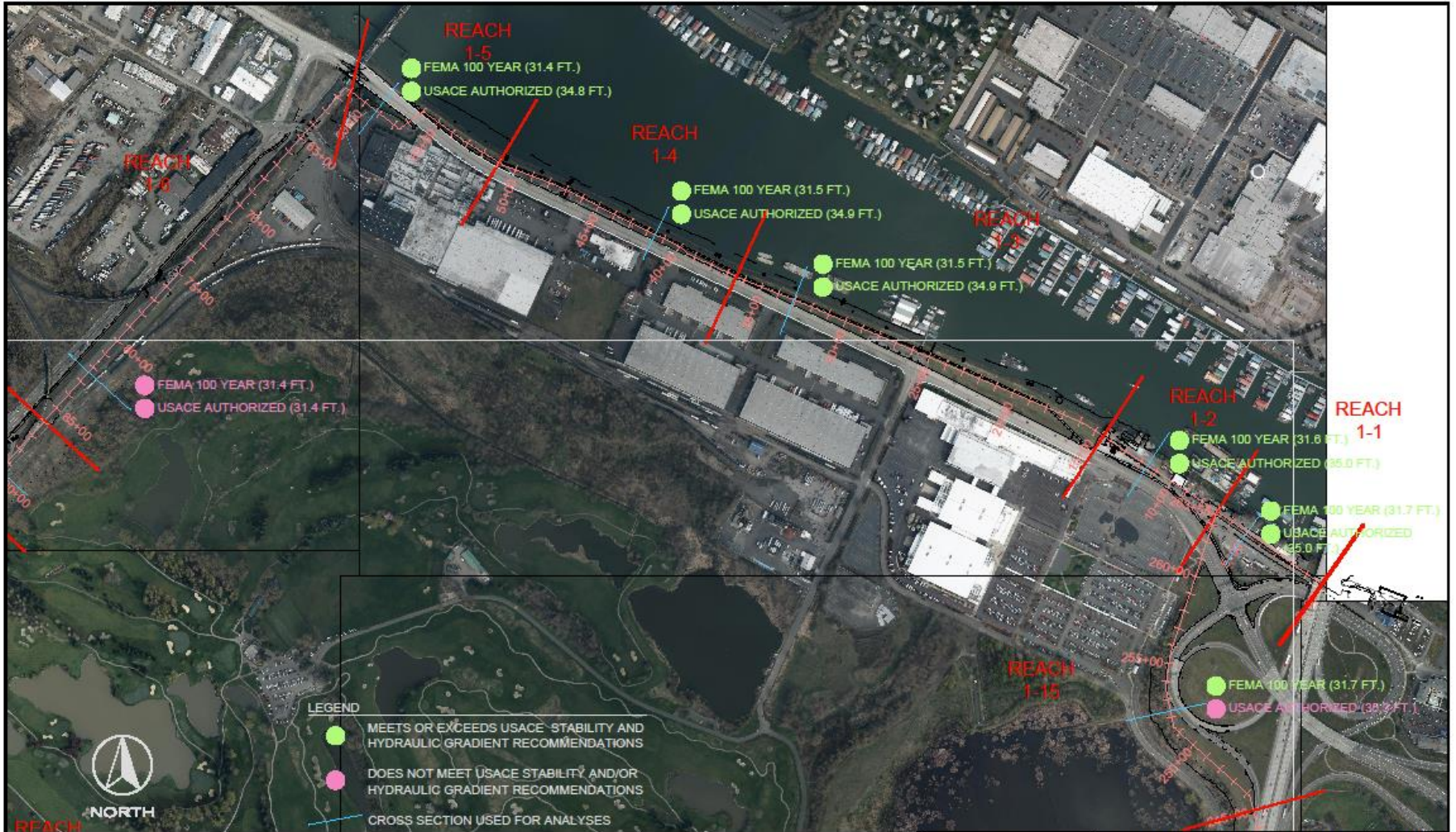


PEN 1 & PEN 2

Phase 3 Analyses

- Flood Levels Analyzed:
 - USACE Authorized Floods (RIP Conditions)
 - Reverse Analysis to Check Max Flood Height Tolerable
- Levee Seepage & Stability (Cornforth)
- Freeboard and Wave Runup (WEST)



BASE MAP CREATED BY MCDD, DATED 8/14/2014.

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SEEPAGE AND STABILITY ANALYSES SNAPSHOT
 PENINSULA 1 LEVEE ASSESSMENT
 PORTLAND, OREGON

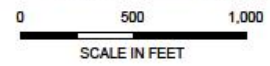
JAN 2015
 PROJ. 2319
 FIG. 1

PEN 1-Cornforth & 14.2014.DWG.NAU



LEGEND

- MEETS OR EXCEEDS USACE STABILITY AND HYDRAULIC GRADIENT RECOMMENDATIONS
- DOES NOT MEET USACE STABILITY AND/OR HYDRAULIC GRADIENT RECOMMENDATIONS
- CROSS SECTION USED FOR ANALYSES



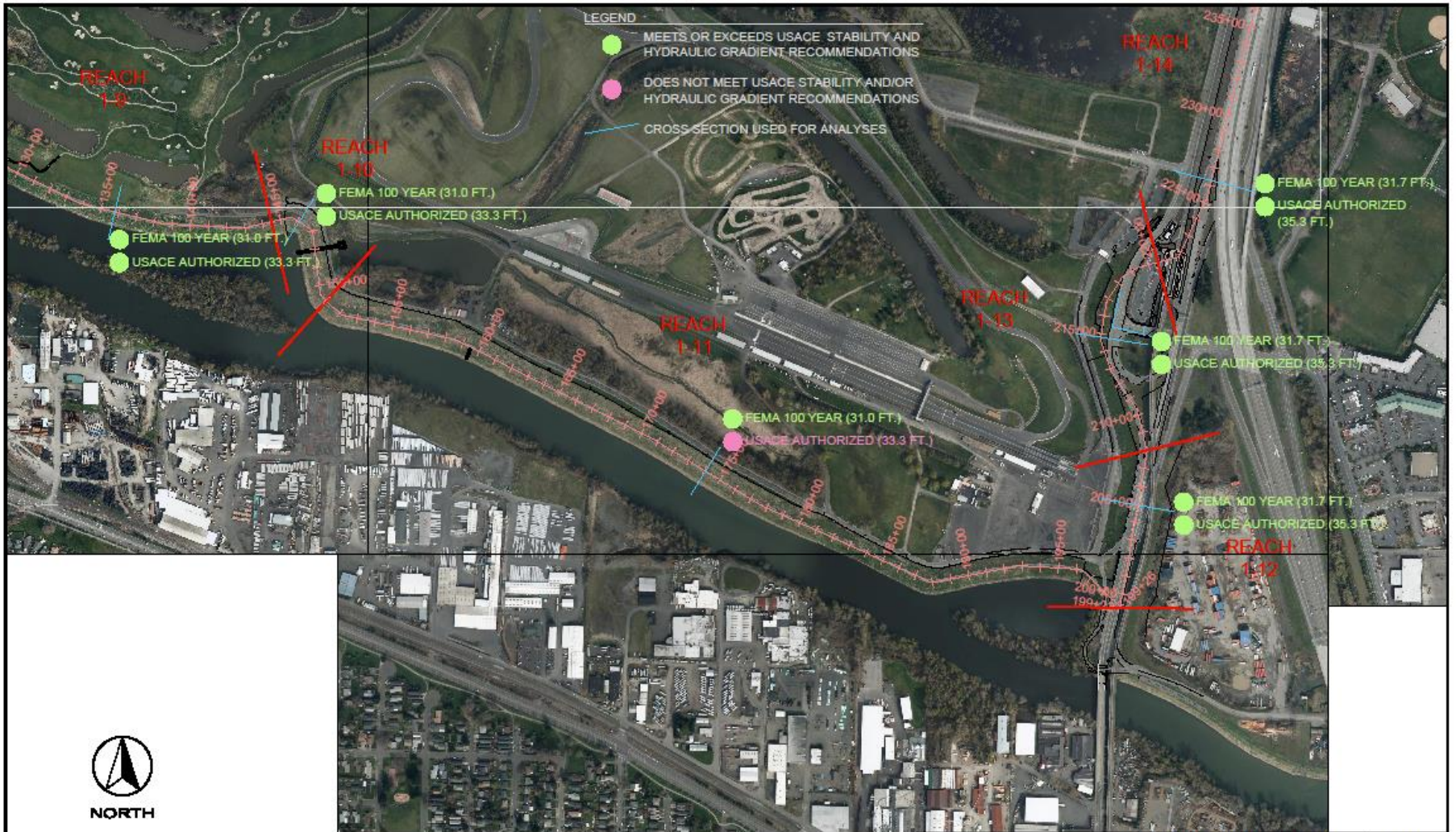
BASE MAP CREATED BY MCDD, DATED 8/14/2014.

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SEEPAGE AND STABILITY ANALYSES SNAPSHOT
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 PROJ. 2319
 FIG. 2

PEN 1-Cornforth 8.14.2014.DWG.NAU



LEGEND

- MEETS OR EXCEEDS USACE STABILITY AND HYDRAULIC GRADIENT RECOMMENDATIONS
- DOES NOT MEET USACE STABILITY AND/OR HYDRAULIC GRADIENT RECOMMENDATIONS
- CROSS SECTION USED FOR ANALYSES



NORTH

0 500 1,000

SCALE IN FEET

BASE MAP CREATED BY MCDD, DATED 8/14/2014.

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SEEPAGE AND STABILITY ANALYSES SNAPSHOT
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 PROJ. 2319

FIG. 3

PEN-1-Cornforth 8.14.2014.DWG.NAU

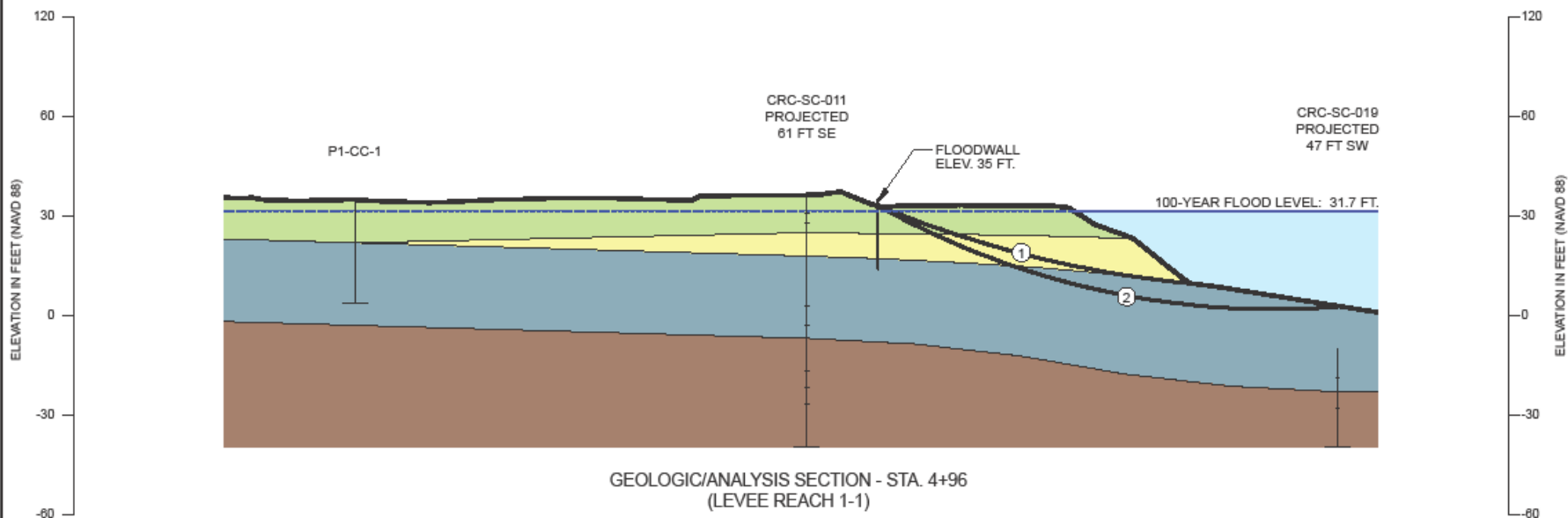
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	2.54	YES
2	2.37	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



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100 YEAR FLOOD LEVEL

PENINSULA 1 LEVEE ASSESSMENT
 PORTLAND, OREGON

JAN 2015
 PROJ. 2319
 FIG. 1-1

- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

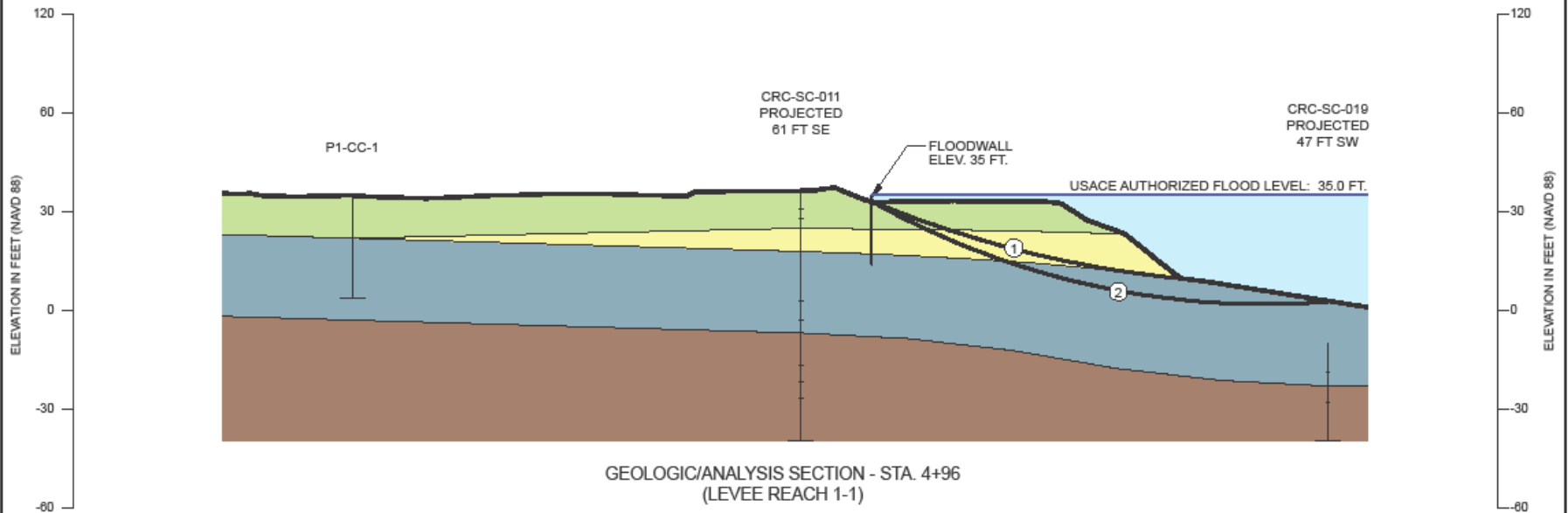
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	2.81	YES
2	2.45	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: NO REVERSE ANALYSIS PERFORMED DUE TO FLOODWALL OVERTOPPING.



GEOLOGIC/ANALYSIS SECTION - STA. 4+96
(LEEVE REACH 1-1)

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USACE AUTHORIZED FLOOD LEVEL
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 PORTLAND, OREGON

JAN 2015
 PROJ. 2319
 FIG. 1-2

2319\Flood Levels\Sec-4+96-500.AI.NAU

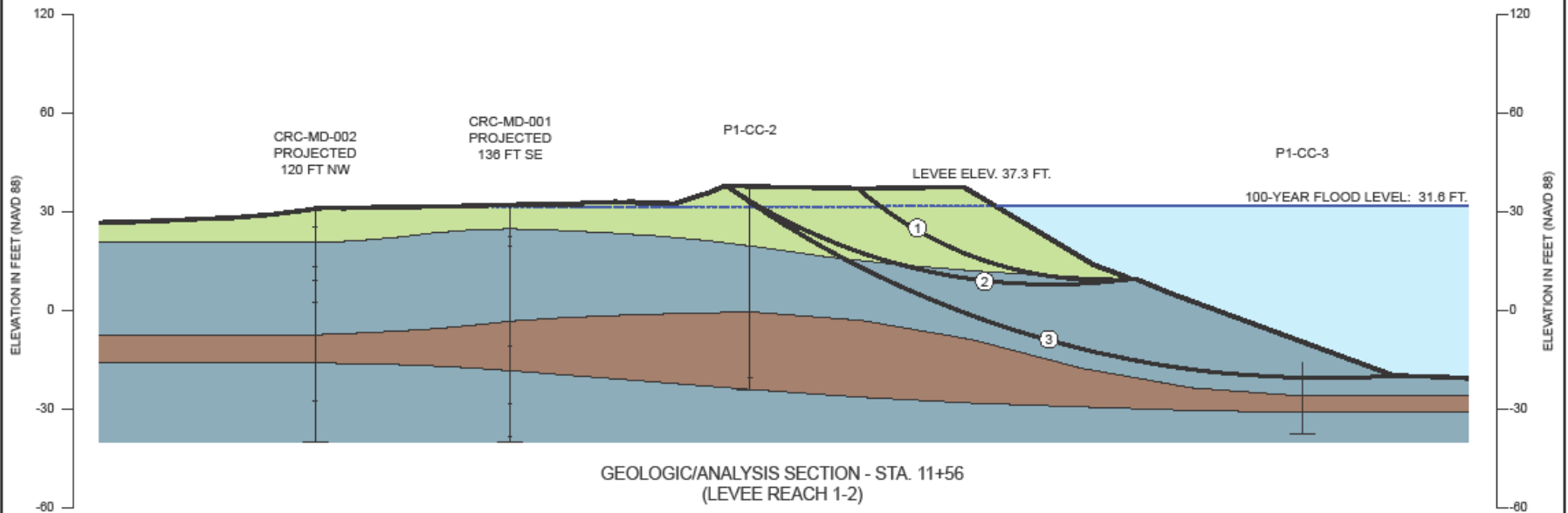
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.83	YES
2	2.83	YES
3	2.09	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 11+56
(LEVEE REACH 1-2)

0 30 60
SCALE IN FEET

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100 YEAR
FLOOD LEVEL

PENINSULA 1 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2319

FIG. 2-1

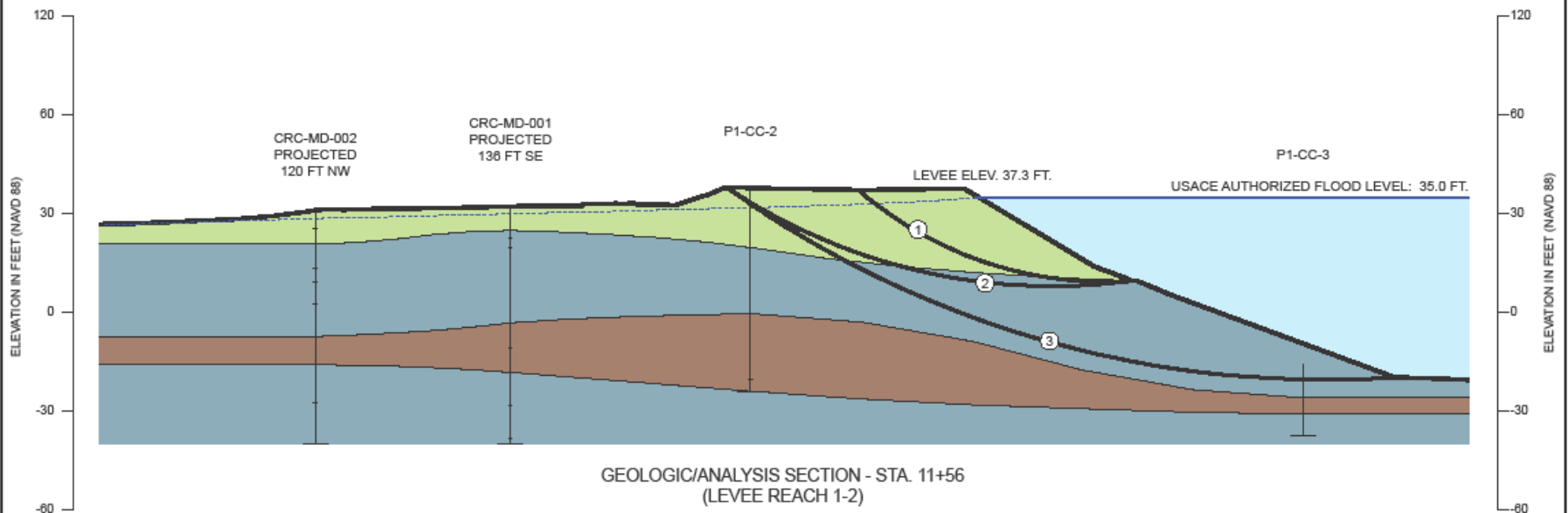
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	2.04	YES
2	3.19	YES
3	2.32	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 11+56
(LEVEE REACH 1-2)

0 30 60
SCALE IN FEET

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USACE AUTHORIZED FLOOD LEVEL
 PENINSULA 1 LEVEE ASSESSMENT
 PORTLAND, OREGON

JAN 2015
 PROJ. 2319
 FIG. 2-2

2319@food Levee/Sec-11+56-500.AI.NAU

- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

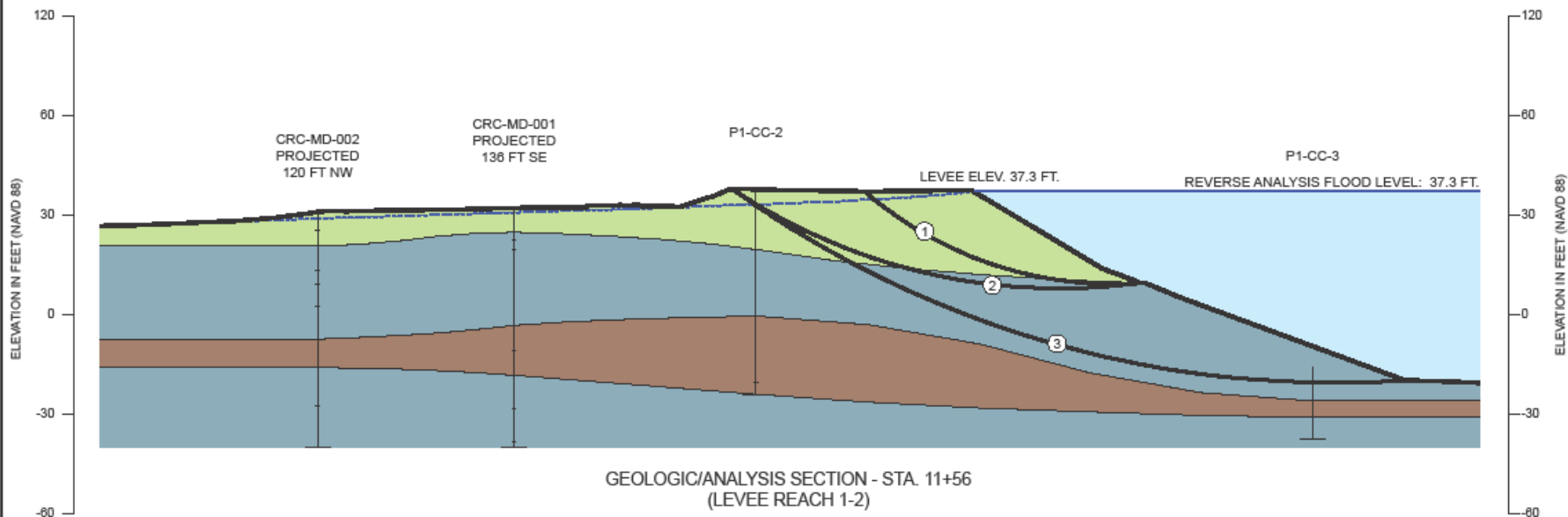
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	2.29	YES
2	3.61	YES
3	2.50	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: RAISING THE WATER SURFACE ABOVE 37.3 FEET OVERTOPS THE LEVEE.



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REVERSE ANALYSIS FLOOD LEVEL

PENINSULA 1 LEVEE ASSESSMENT
 PORTLAND, OREGON

JAN 2015
 PROJ. 2319
 FIG. 2-3

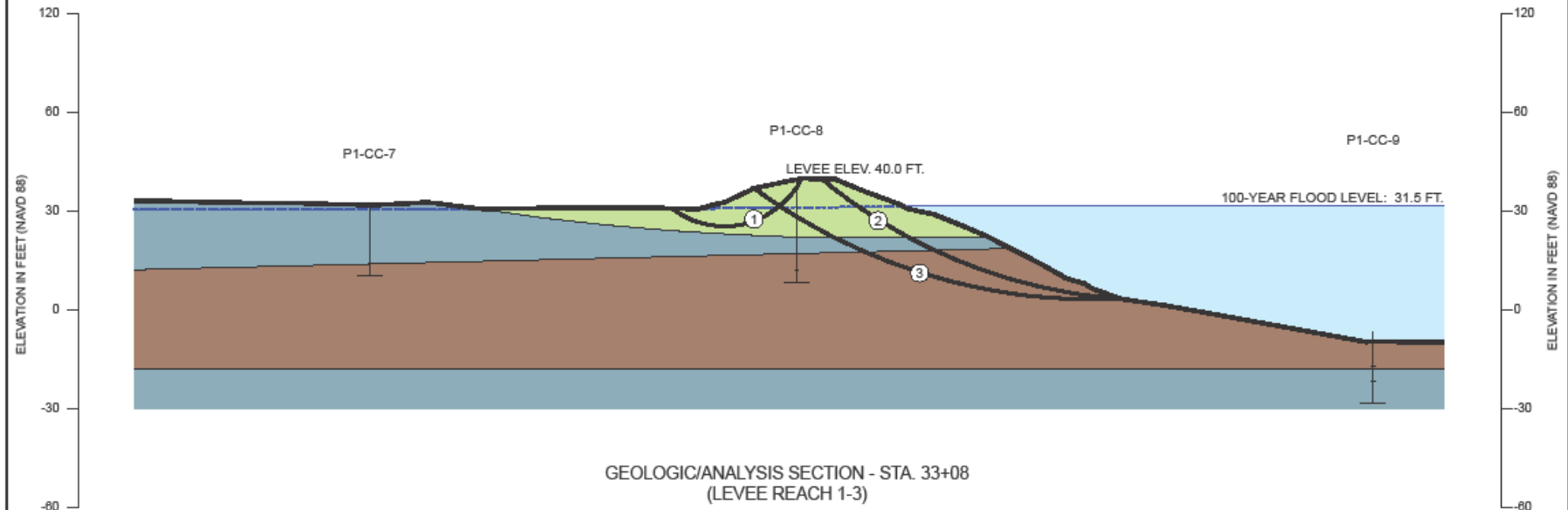
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	2.13	YES
2	1.55	YES
3	1.91	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.1**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 33+08
(LEVEE REACH 1-3)



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100 YEAR FLOOD LEVEL
 PENINSULA 1 LEVEE ASSESSMENT
 PORTLAND, OREGON

JAN 2015
 PROJ. 2319
 FIG. 3-1

2319\Flood Levels\Sec-33+07.08.A1.NAU

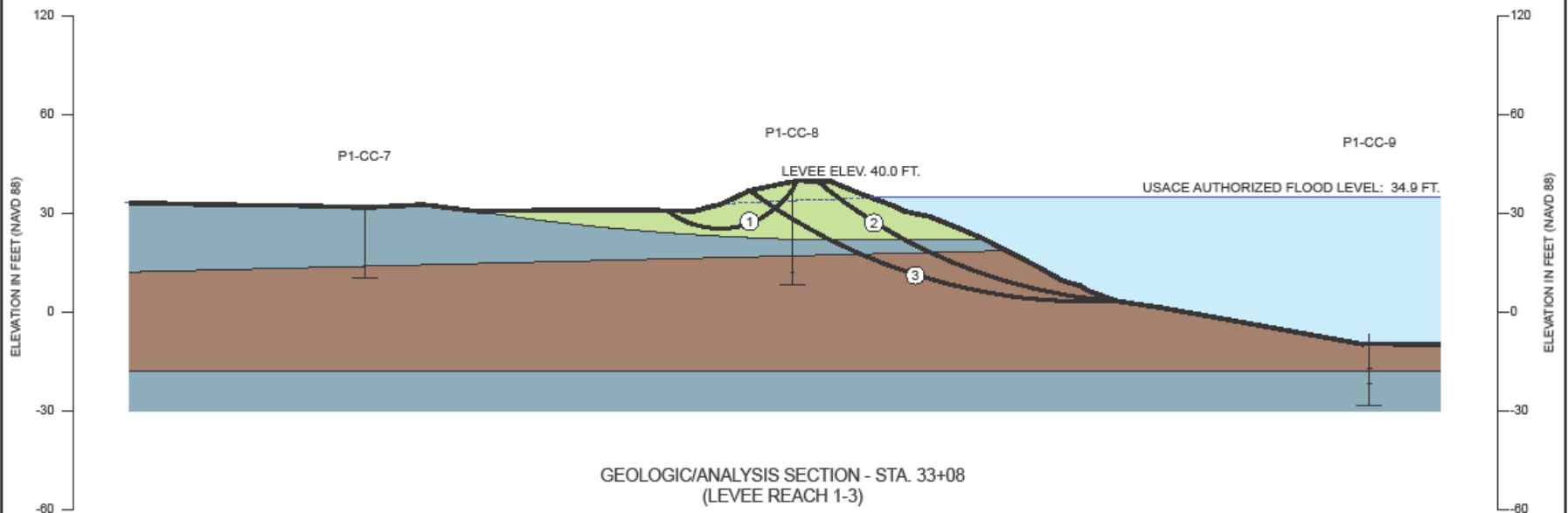
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.89	YES
2	1.87	YES
3	2.01	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.41**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 33+08
(LEVEE REACH 1-3)

0 30 60
SCALE IN FEET

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USACE AUTHORIZED
FLOOD LEVEL

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PORTLAND, OREGON

JAN 2015
PROJ. 2319

FIG. 3-2

2319\Flood Level\Sec-33+08-500.AI.NAU

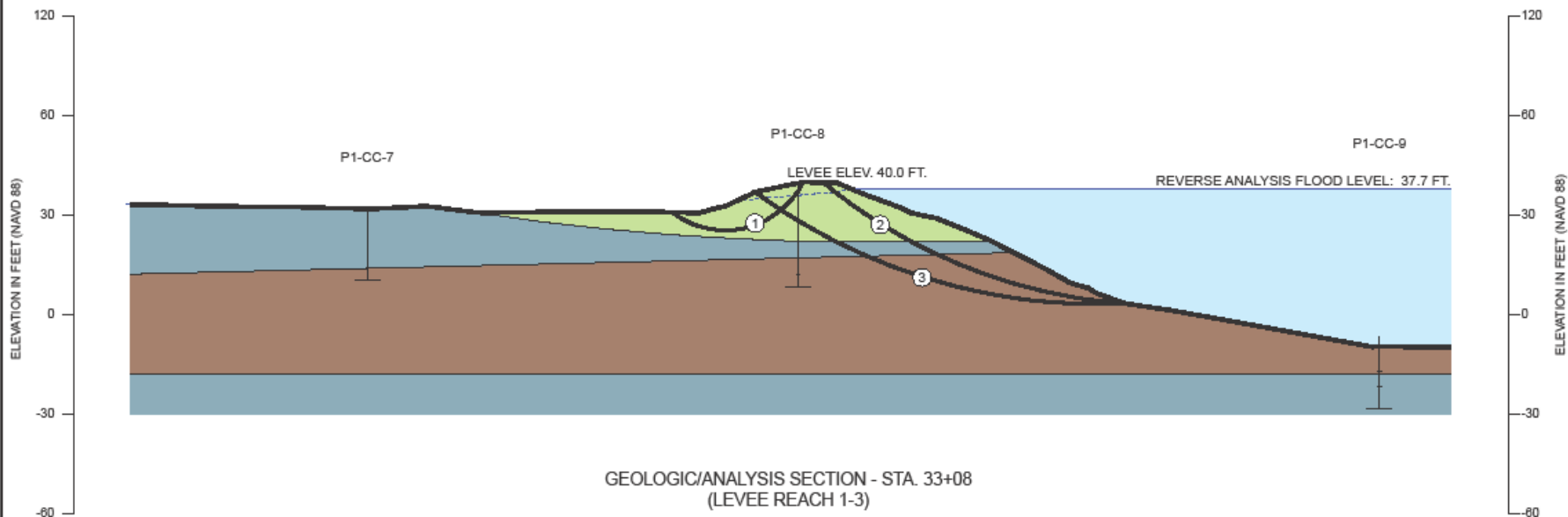
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.39	YES
2	1.79	YES
3	2.22	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.58**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 33+08
(LEVEE REACH 1-3)

0 30 60
SCALE IN FEET

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REVERSE ANALYSIS FLOOD LEVEL
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 PORTLAND, OREGON

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 PROJ. 2319
 FIG. 3-3

2319\Flood Level\Sec-33+08-1.4.AI.NAU

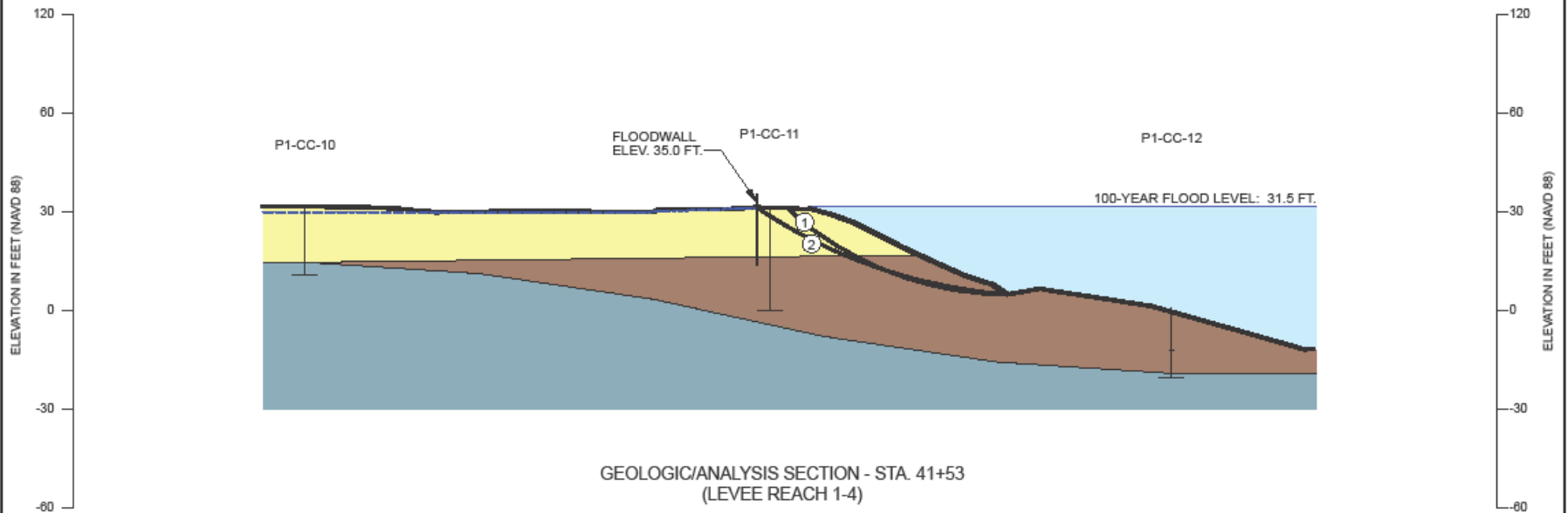
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.89	YES
2	1.84	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



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100 YEAR FLOOD LEVEL
 PENINSULA 1 LEVEE ASSESSMENT
 PORTLAND, OREGON

JAN 2015
 PROJ. 2319

FIG. 4-1

- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

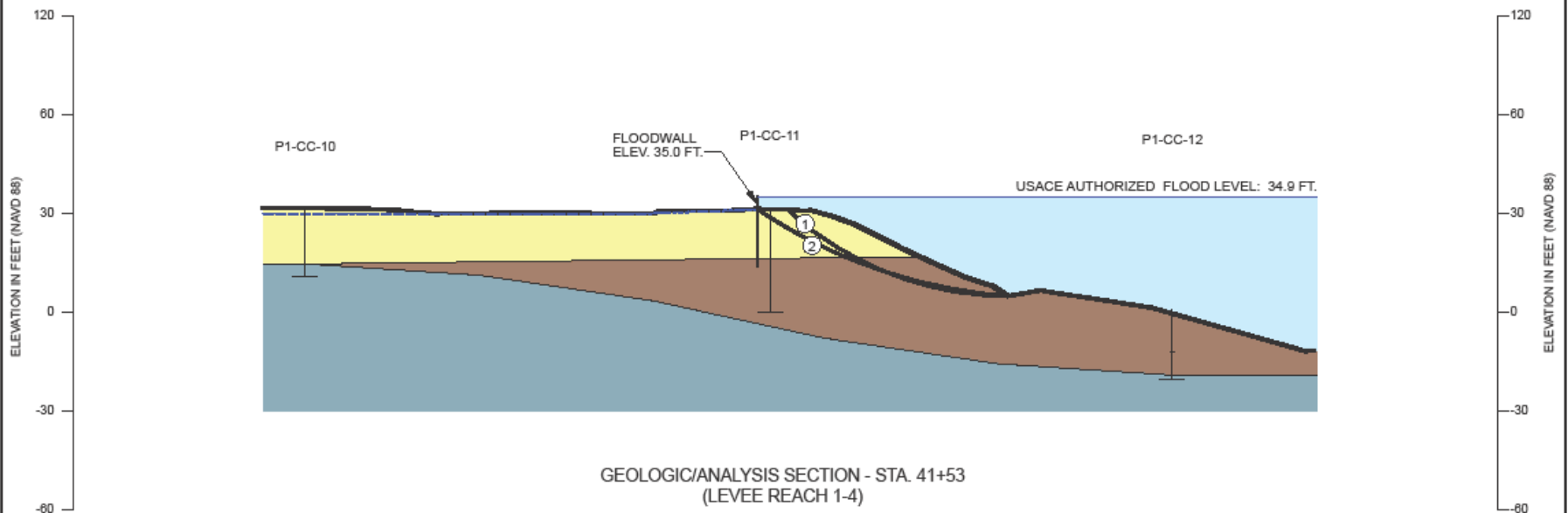
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.73	YES
2	1.88	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: NO REVERSE ANALYSIS PERFORMED DUE TO FLOODWALL OVERTOPPING.



GEOLOGIC/ANALYSIS SECTION - STA. 41+53
(LEEVE REACH 1-4)



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USACE AUTHORIZED FLOOD LEVEL
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 PORTLAND, OREGON

JAN 2015
 PROJ. 2319
 FIG. 4-2

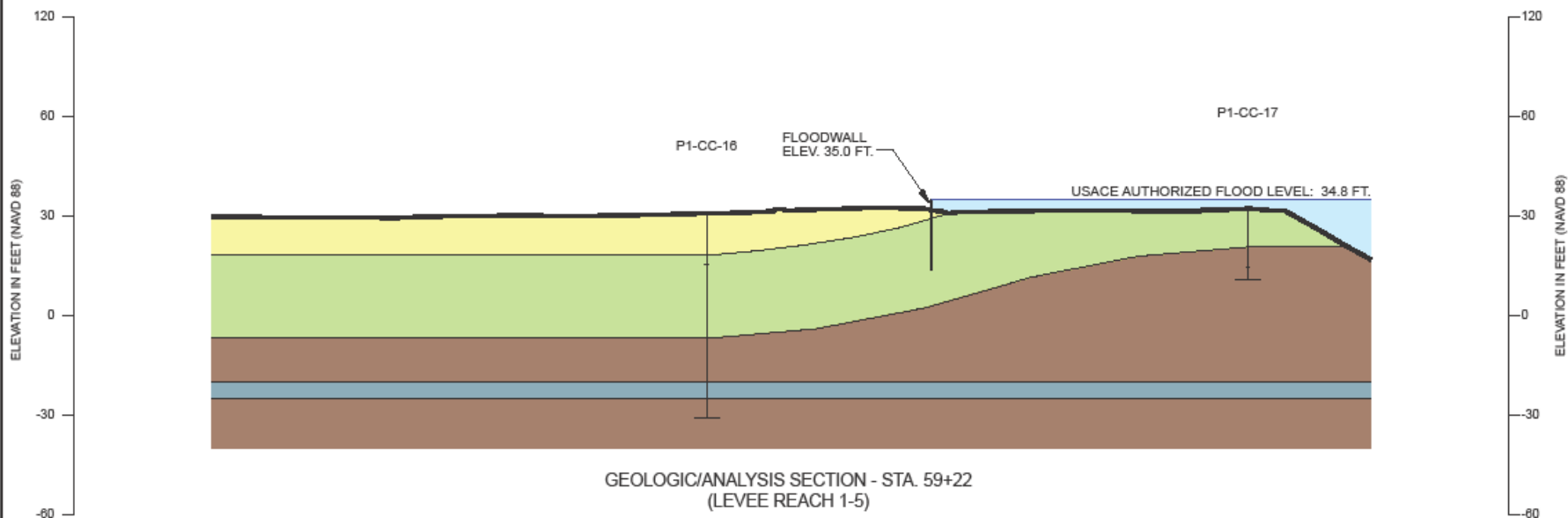
2319\Flood Plan\Sec-41+53-500.AI.NAU

- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.00**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: NO REVERSE ANALYSIS PERFORMED DUE TO FLOODWALL OVER TOPPING.



0 30 60
SCALE IN FEET

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**USACE AUTHORIZED
FLOOD LEVEL**
PENINSULA 1 LEEVE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2319
FIG. 5-1

2319\Flood Plan\Sec-59+22-500.AI.NAU

- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

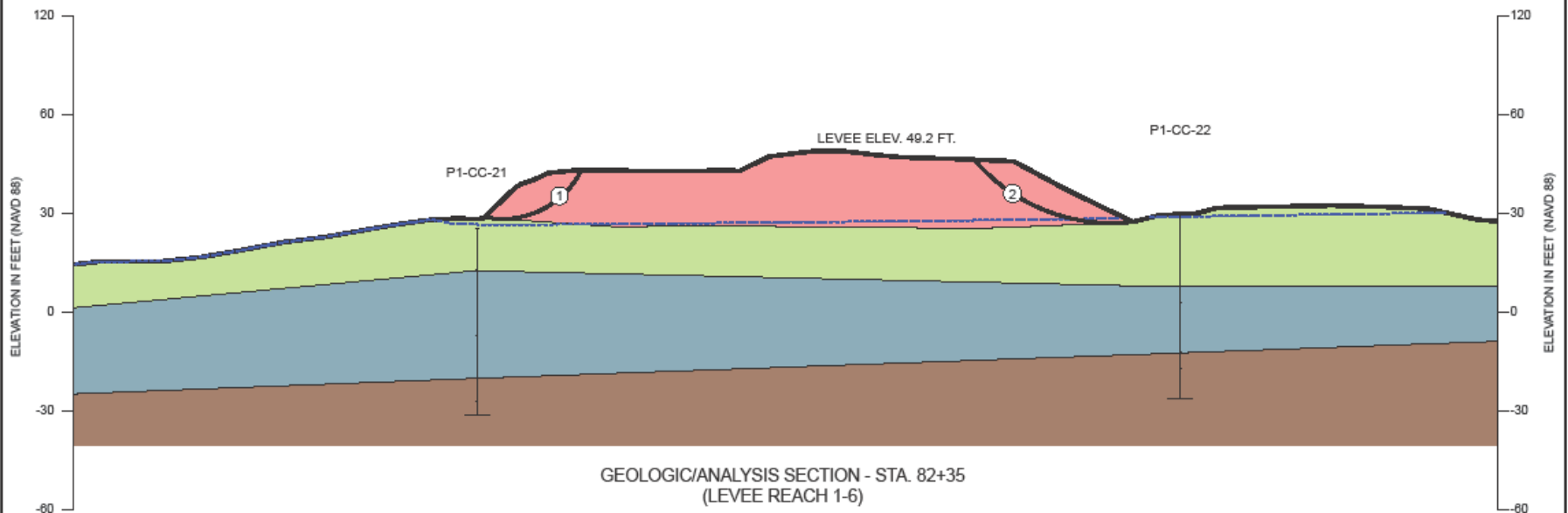
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.29	NO
2	1.26	NO

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: USACE AUTHORIZED FLOOD LEVEL IS THE 100 YEAR FLOOD LEVEL.
REVERSE ANALYSIS WAS NOT EVALUATED.



GEOLOGIC/ANALYSIS SECTION - STA. 82+35
(LEVEE REACH 1-6)



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100 YEAR FLOOD LEVEL
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 PORTLAND, OREGON

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 PROJ. 2319
 FIG. 6-1

- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

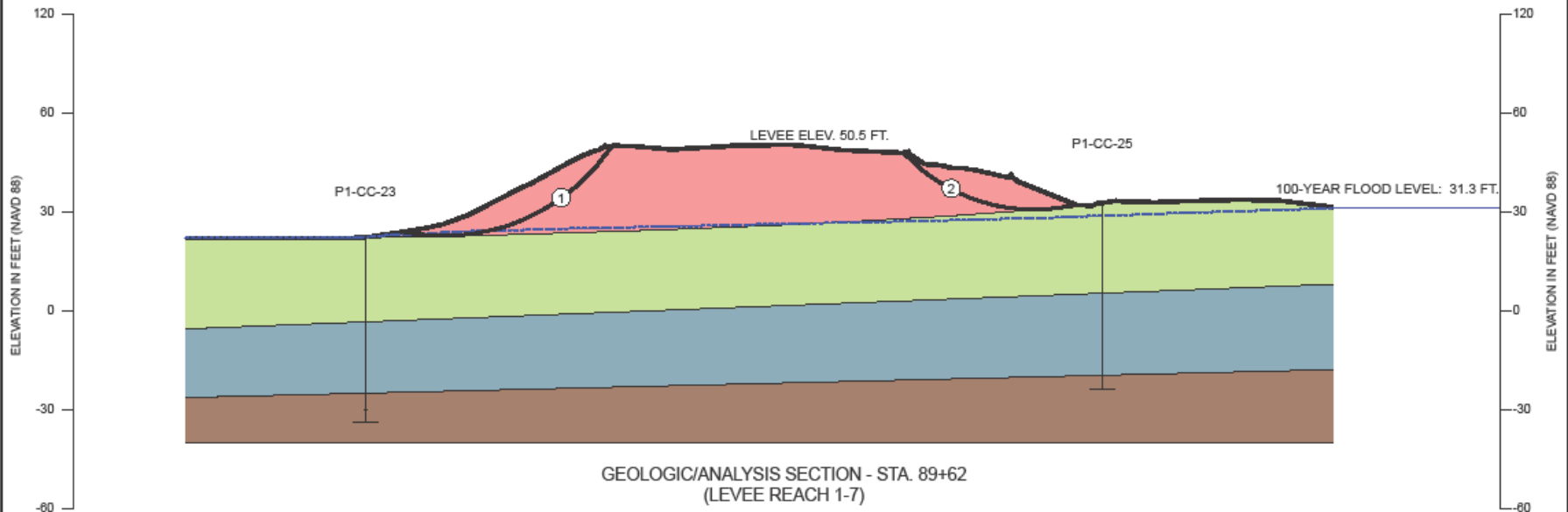
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.15	NO
2	2.04	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1013

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.2**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1013

NOTE: USACE AUTHORIZED FLOOD LEVEL IS THE 100 YEAR FLOOD LEVEL.
REVERSE ANALYSIS WAS NOT EVALUATED.



GEOLOGIC/ANALYSIS SECTION - STA. 89+62
(LEVEE REACH 1-7)

0 30 60
SCALE IN FEET



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100 YEAR
FLOOD LEVEL

PENINSULA 1 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2319

FIG. 7-1

- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

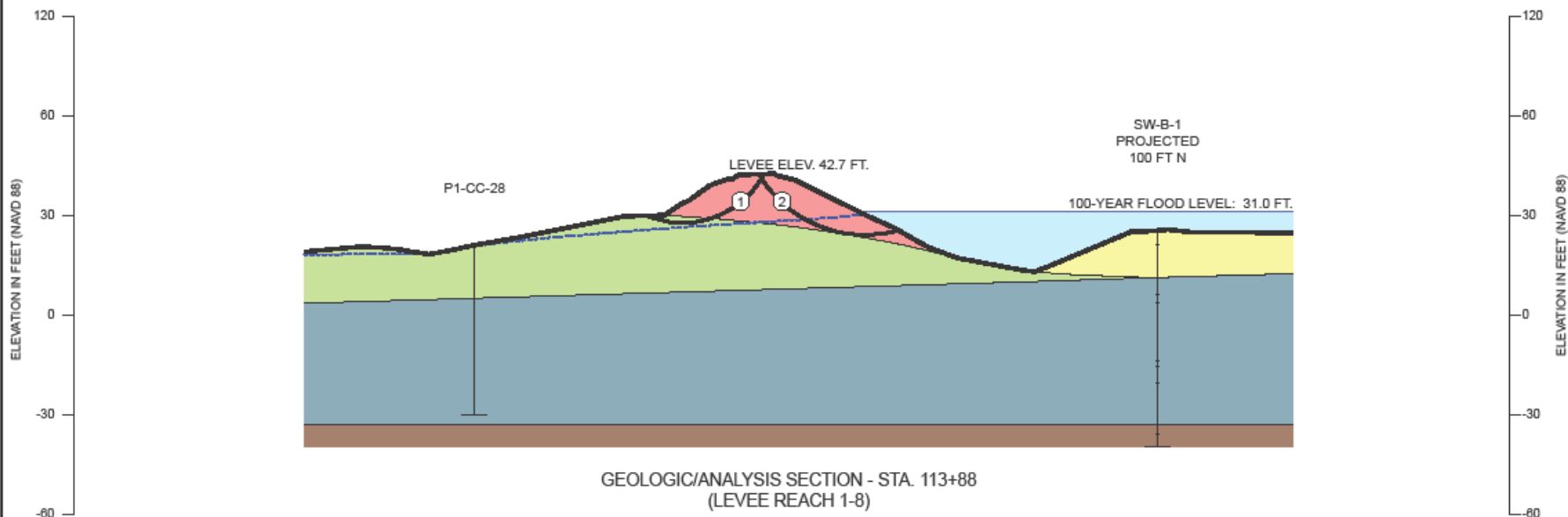
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.71	YES
2	1.28	NO

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: USACE AUTHORIZED FLOOD LEVEL IS THE 100 YEAR FLOOD LEVEL.
REVERSE ANALYSIS WAS NOT EVALUATED.



GEOLOGIC/ANALYSIS SECTION - STA. 113+88
(LEVEE REACH 1-8)

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100 YEAR FLOOD LEVEL
 PENINSULA 1 LEVEE ASSESSMENT
 PORTLAND, OREGON

JAN 2015
 PROJ. 2319
 FIG. 8-1

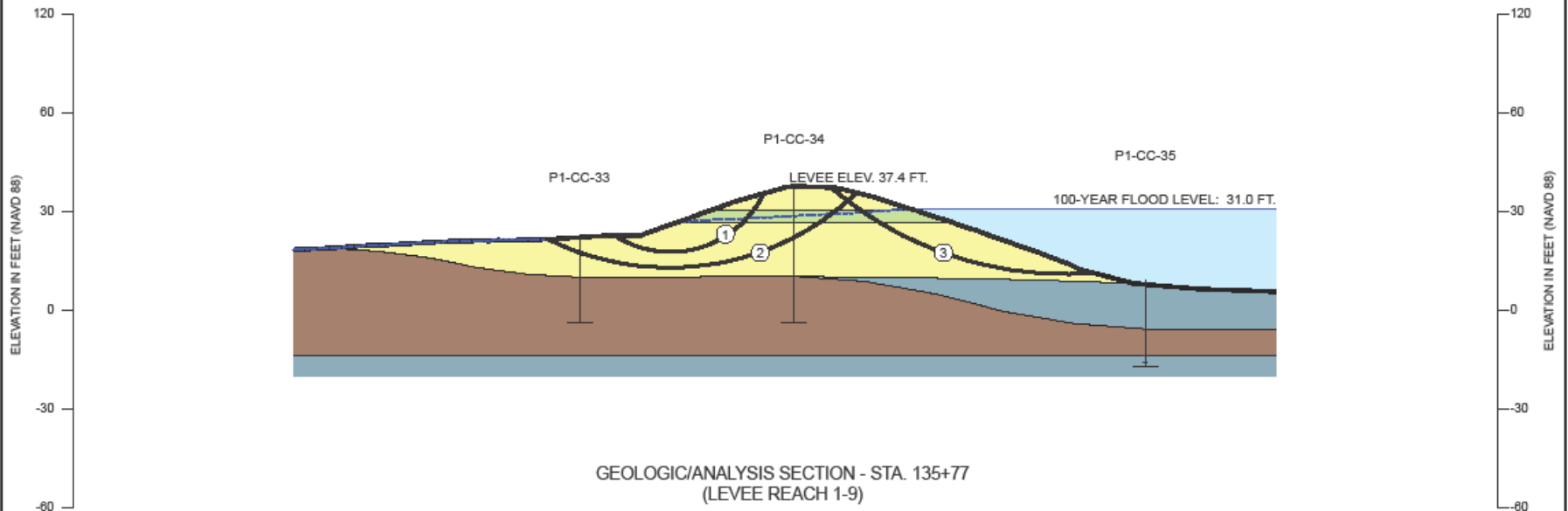
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.82	YES
2	2.31	YES
3	2.30	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 135+77
(LEVEE REACH 1-9)



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100 YEAR FLOOD LEVEL
 PENINSULA 1 LEVEE ASSESSMENT
 PORTLAND, OREGON

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 PROJ. 2319
 FIG. 9-1

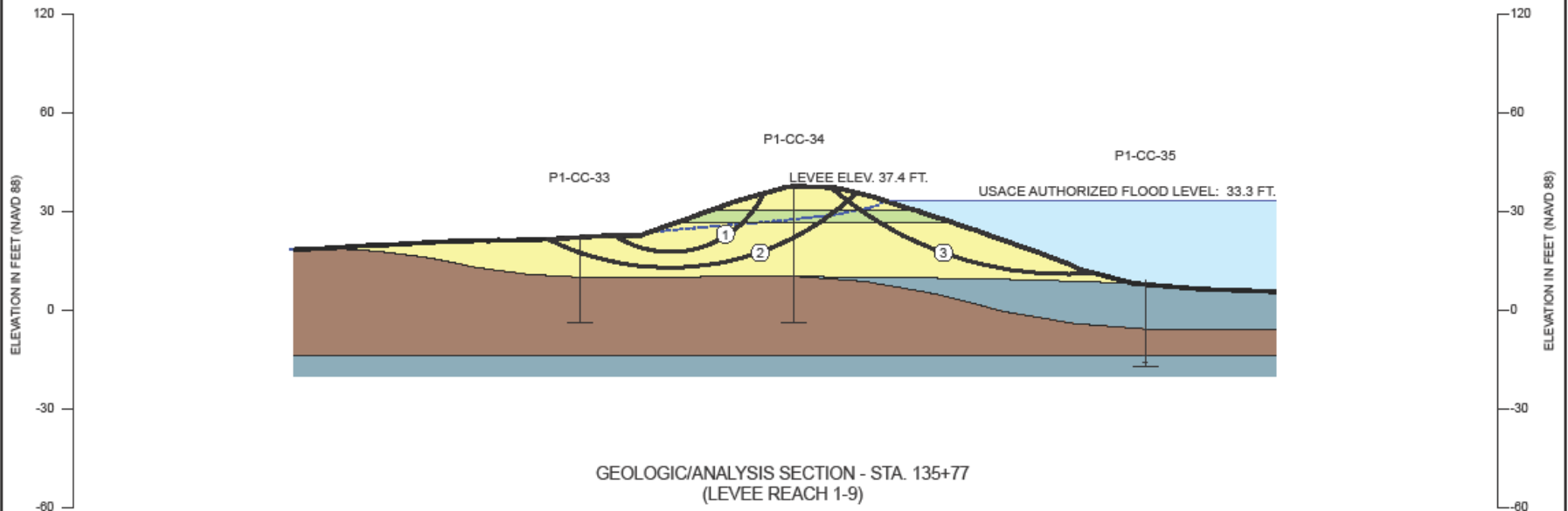
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.72	YES
2	2.22	YES
3	2.55	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.19**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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**USACE AUTHORIZED
FLOOD LEVEL**
PENINSULA 1 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2319
FIG. 9-2

2319\Flood Levee\Sec-135+77-500.AI.NAU

- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

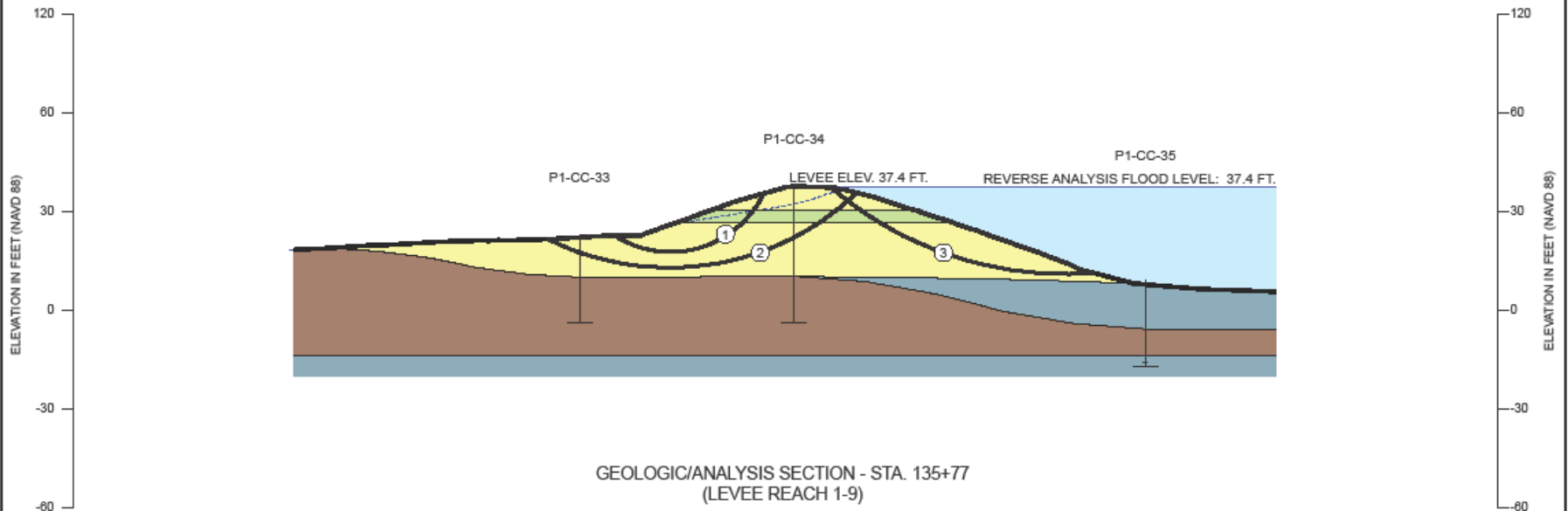
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.46	YES
2	1.87	YES
3	3.01	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.31**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: RAISING THE WATER SURFACE ABOVE 37.4 FEET OVERTOPS THE LEVEE.



GEOLOGIC/ANALYSIS SECTION - STA. 135+77
(LEVEE REACH 1-9)

0 30 60
SCALE IN FEET

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**REVERSE ANALYSIS
FLOOD LEVEL**
PENINSULA 1 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2319
FIG. 9-3

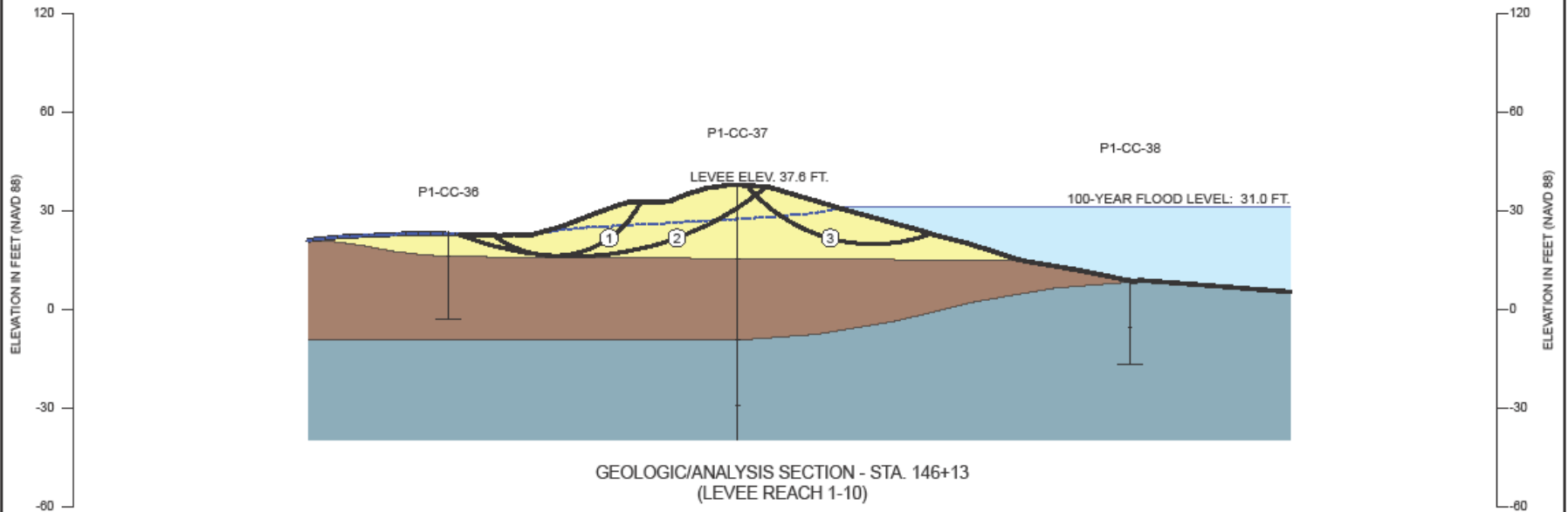
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.75	YES
2	2.29	YES
3	2.51	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.2**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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100 YEAR
FLOOD LEVEL

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JAN 2015

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FIG. 10-1

2319\Flood Levels\Sec-146+12.94.AI.NAU

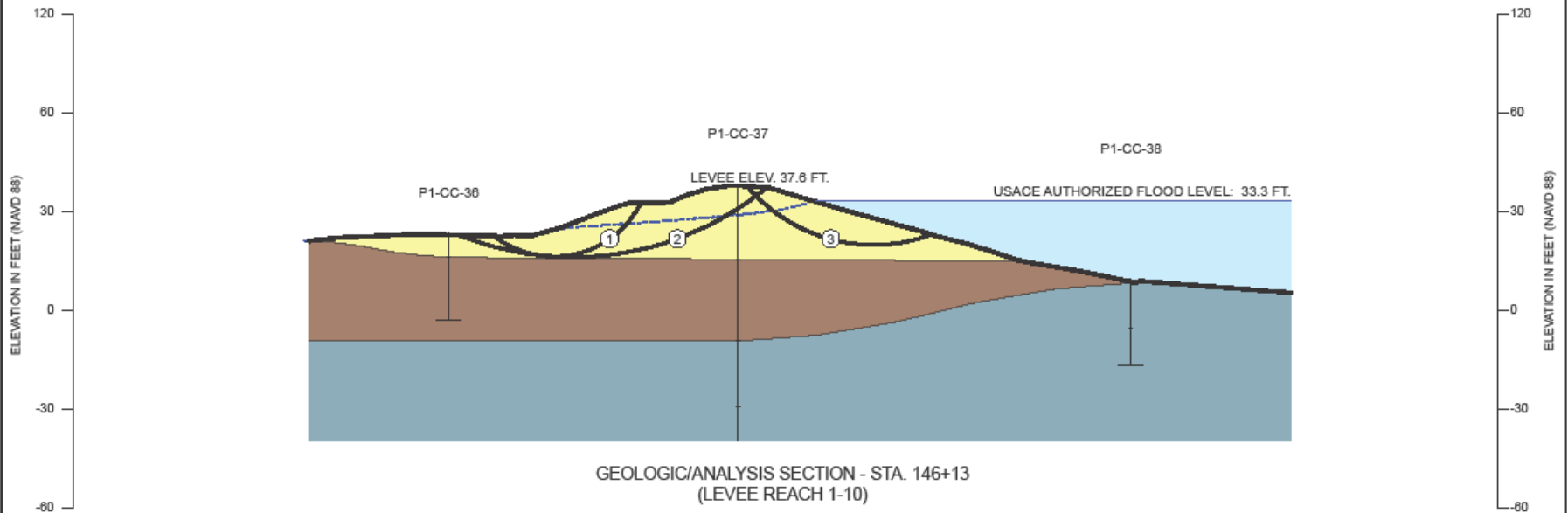
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.83	YES
2	2.19	YES
3	2.87	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.31**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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**USACE AUTHORIZED
FLOOD LEVEL**

PENINSULA 1 LEVEE ASSESSMENT
PORTLAND, OREGON

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FIG. 10-2

2319\Flood Levels\Sec-146+13-500.AI.NAU

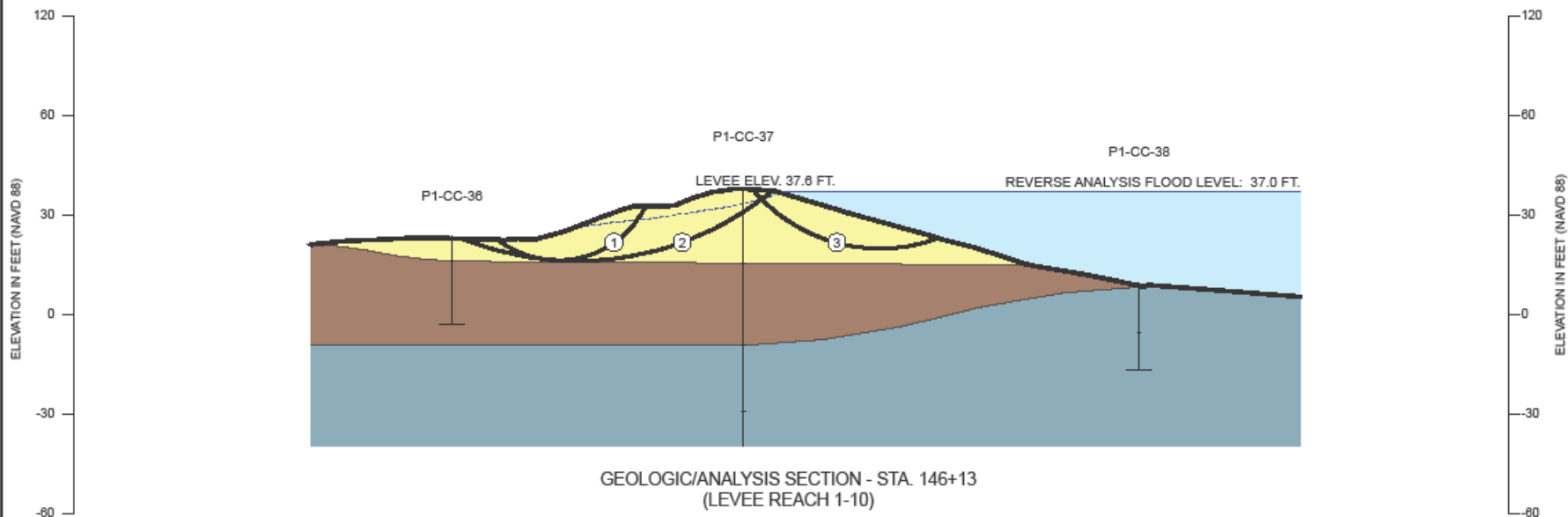
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.41	YES
2	1.01	YES
3	3.89	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.45**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 146+13
(LEVEE REACH 1-10)



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REVERSE ANALYSIS FLOOD LEVEL
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 PROJ. 2319
 FIG. 10-3

2319\Flood Levels\Sec-146+13-1.4.AI.NAU

- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

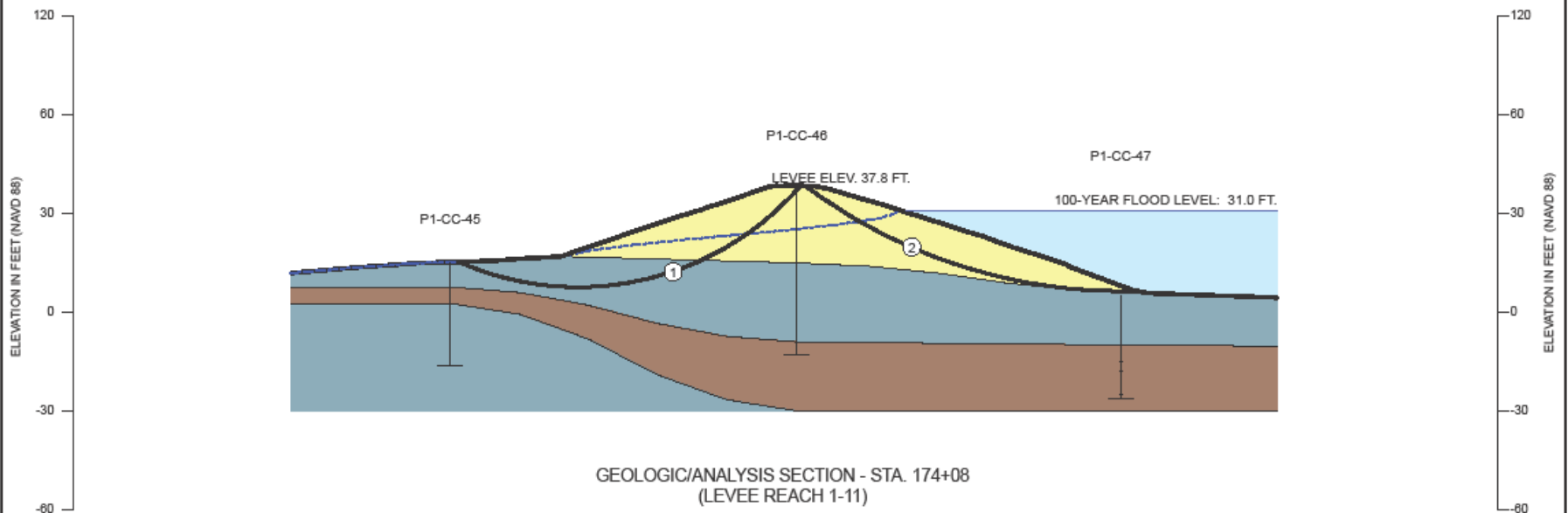
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.40	YES
2	2.12	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1013

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.3**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1013

NOTE: THIS ANALYSIS ALSO SERVES AS THE REVERSE ANALYSIS (SEE FS ABOVE).



GEOLOGIC/ANALYSIS SECTION - STA. 174+08
(LEVEE REACH 1-11)



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100 YEAR FLOOD LEVEL
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 PORTLAND, OREGON

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 PROJ. 2319
 FIG. 11-1

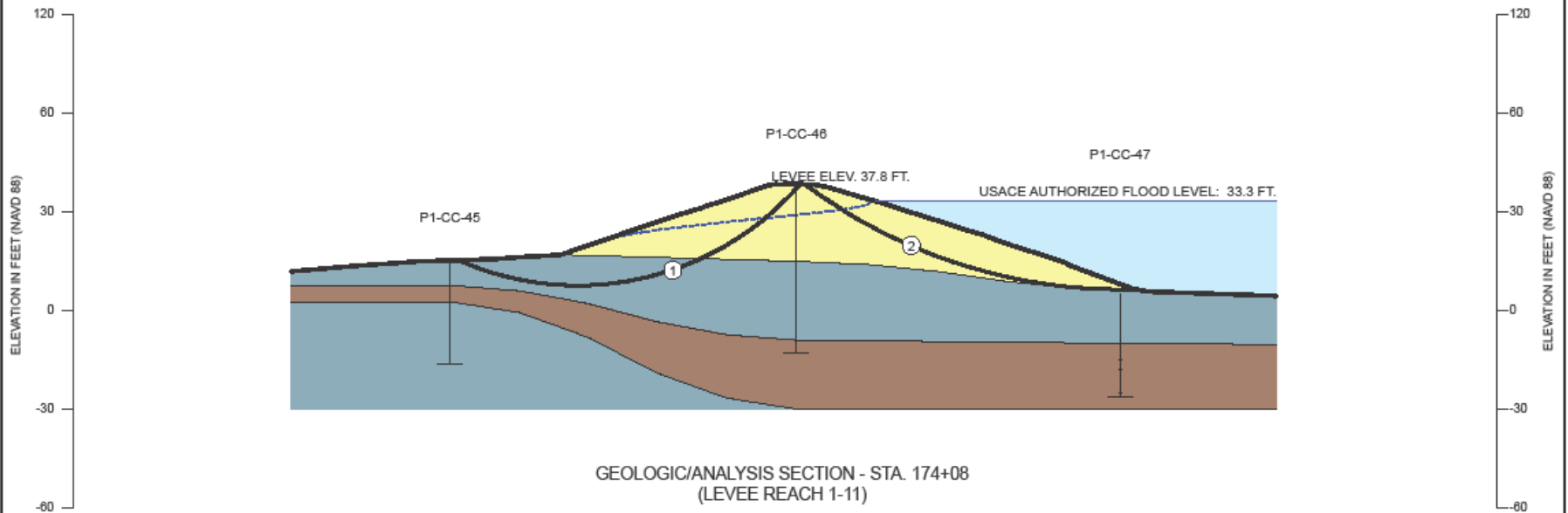
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.27	NO
2	2.27	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.46**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



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USACE AUTHORIZED FLOOD LEVEL
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 PORTLAND, OREGON

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 PROJ. 2319

FIG. 11-2

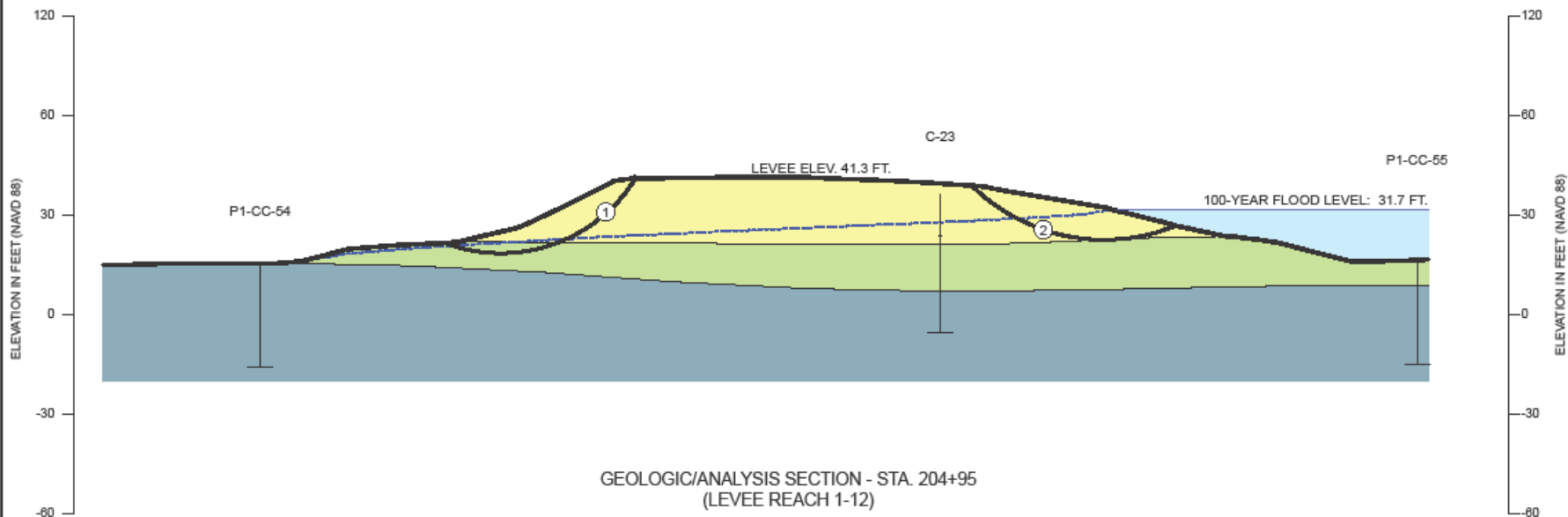
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.72	YES
2	3.00	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.2**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 204+95
(LEVEE REACH 1-12)

0 30 60
SCALE IN FEET

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100 YEAR FLOOD LEVEL
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PORTLAND, OREGON

JAN 2015
PROJ. 2319
FIG. 12-1

2319\Flood Levels\Sec-204+94.84.AI.NAU

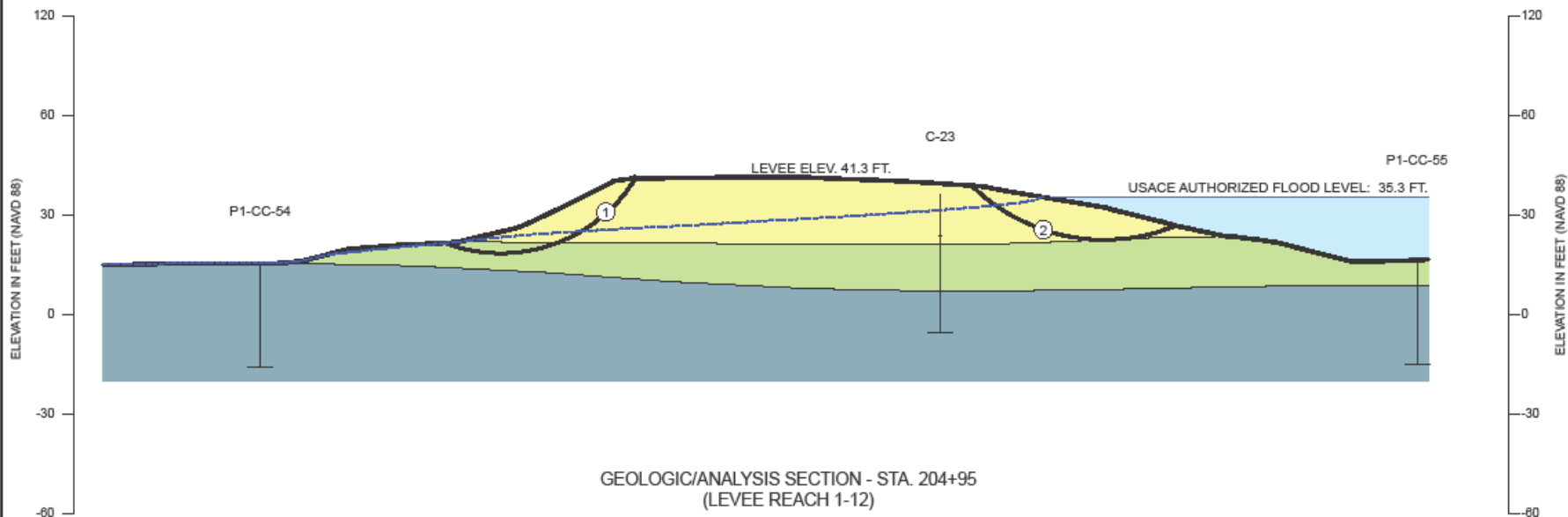
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.54	YES
2	3.07	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1013

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.27**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1013



GEOLOGIC/ANALYSIS SECTION - STA. 204+95
(LEVEE REACH 1-12)

0 30 60
SCALE IN FEET

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USACE AUTHORIZED FLOOD LEVEL
 PENINSULA 1 LEVEE ASSESSMENT
 PORTLAND, OREGON

JAN 2015
 PROJ. 2319
 FIG. 12-2

2319\Flood Levee\Sec-204+95-500.AI.NAU

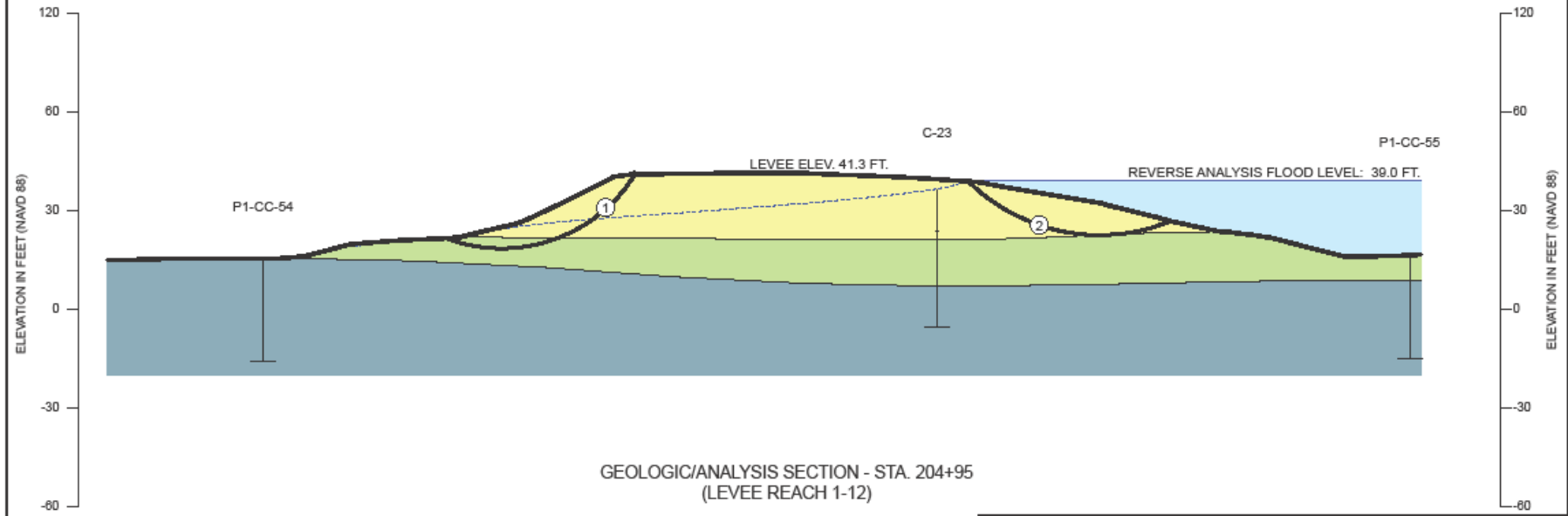
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.40	YES
2	4.27	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.29**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 204+95
(LEVEE REACH 1-12)

0 30 60
SCALE IN FEET

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**REVERSE ANALYSIS
FLOOD LEVEL**
PENINSULA 1 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2319
FIG. 12-3

2319\Flood Level\Sec-204+95-1.4.AI.NAU

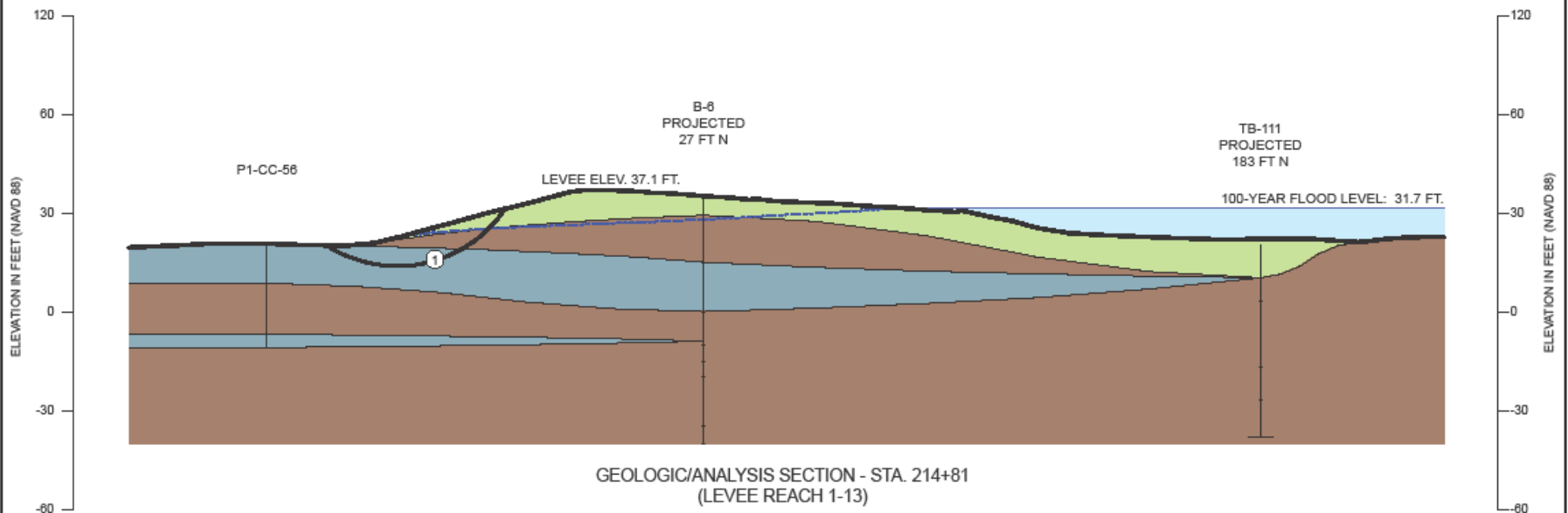
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.83	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.2**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 214+81
(LEVEE REACH 1-13)

0 30 60
SCALE IN FEET

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100 YEAR FLOOD LEVEL
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 PORTLAND, OREGON

JAN 2015
 PROJ. 2319
 FIG. 13-1

2319\Flood Levels\Sec-214+80.88.AI.NAU

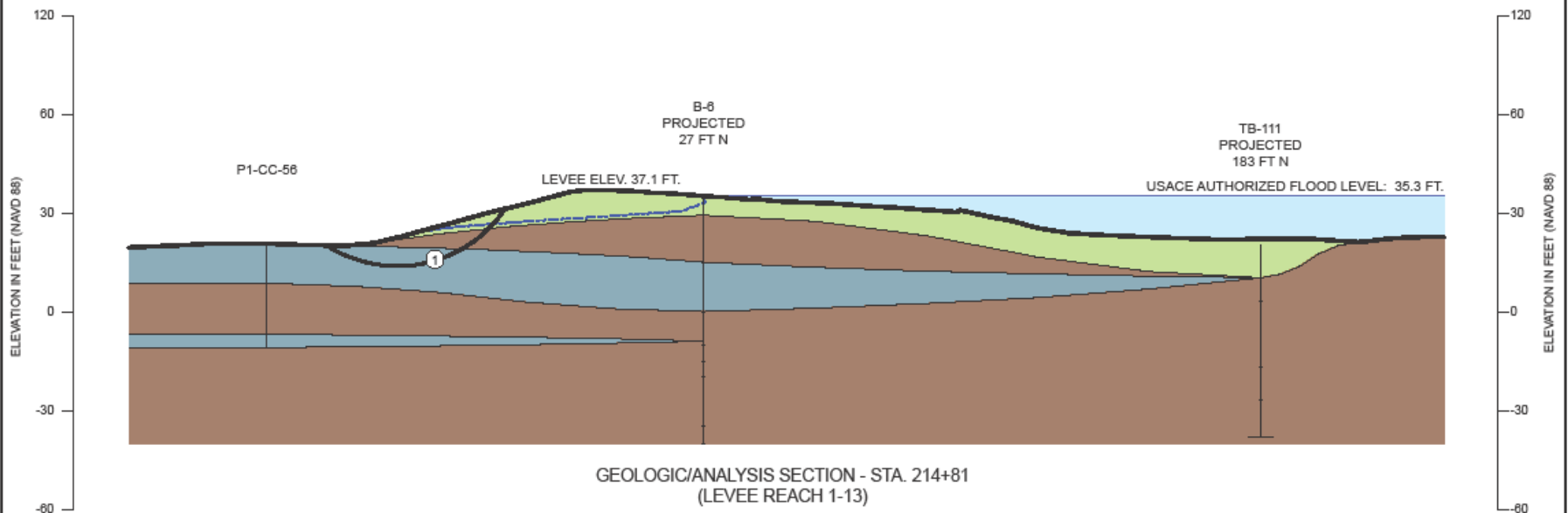
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.53	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.27**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



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USACE AUTHORIZED FLOOD LEVEL

PENINSULA 1 LEVEE ASSESSMENT
 PORTLAND, OREGON

JAN 2015
 PROJ. 2319
 FIG. 13-2

2319\Flood Levels\Sec-214+81-500.AI.NAU

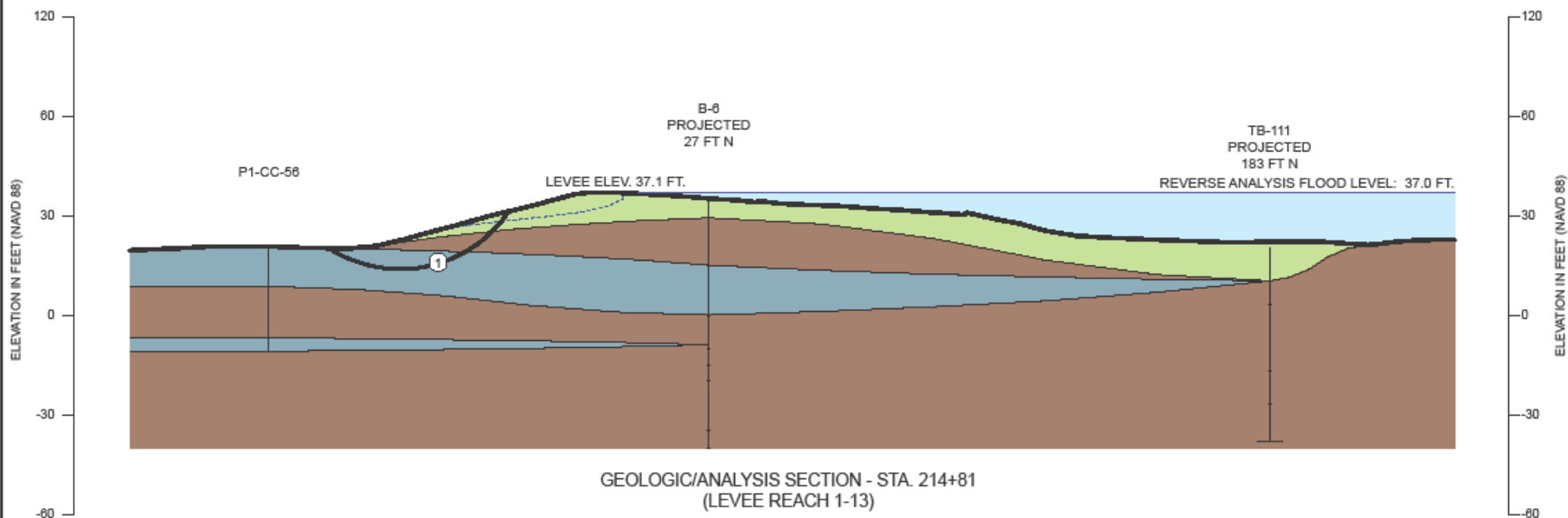
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.40	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.51**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



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REVERSE ANALYSIS FLOOD LEVEL

PENINSULA 1 LEVEE ASSESSMENT
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 PROJ. 2319

FIG. 13-3

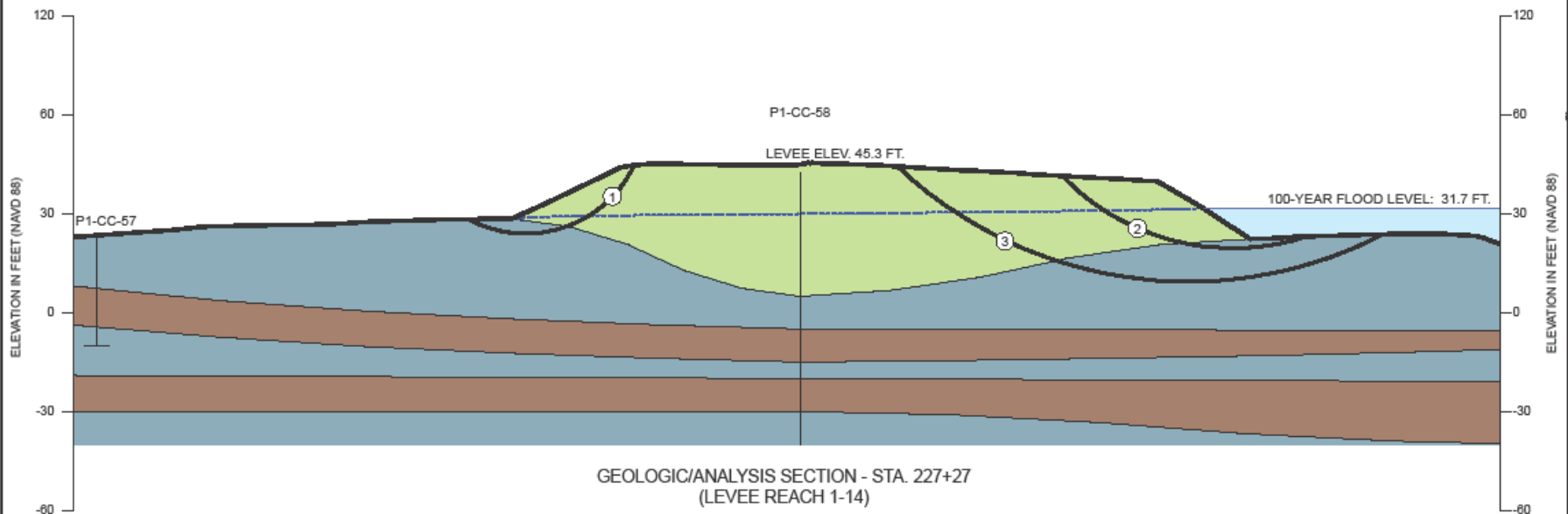
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.87	YES
2	1.93	YES
3	3.11	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 227+27
(LEVEE REACH 1-14)



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100 YEAR FLOOD LEVEL
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JAN 2015
 PROJ. 2319
 FIG. 14-1

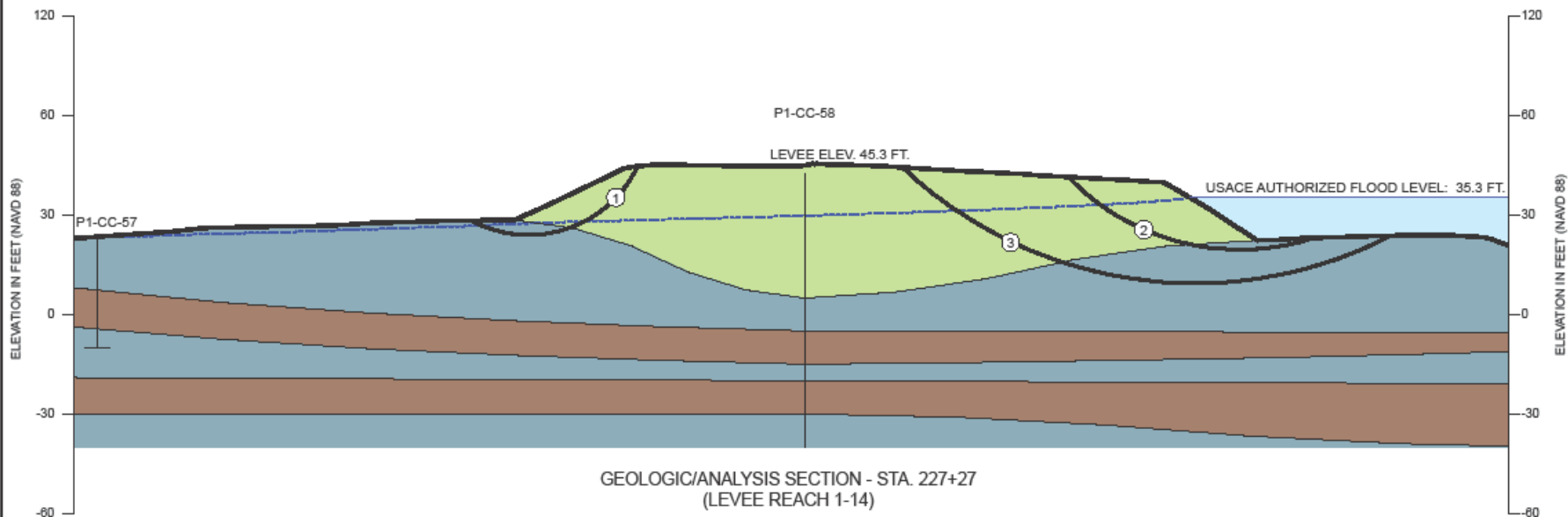
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.73	YES
2	2.06	YES
3	3.26	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 227+27
(LEVEE REACH 1-14)



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USACE AUTHORIZED FLOOD LEVEL
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JAN 2015
 PROJ. 2319
 FIG. 14-2

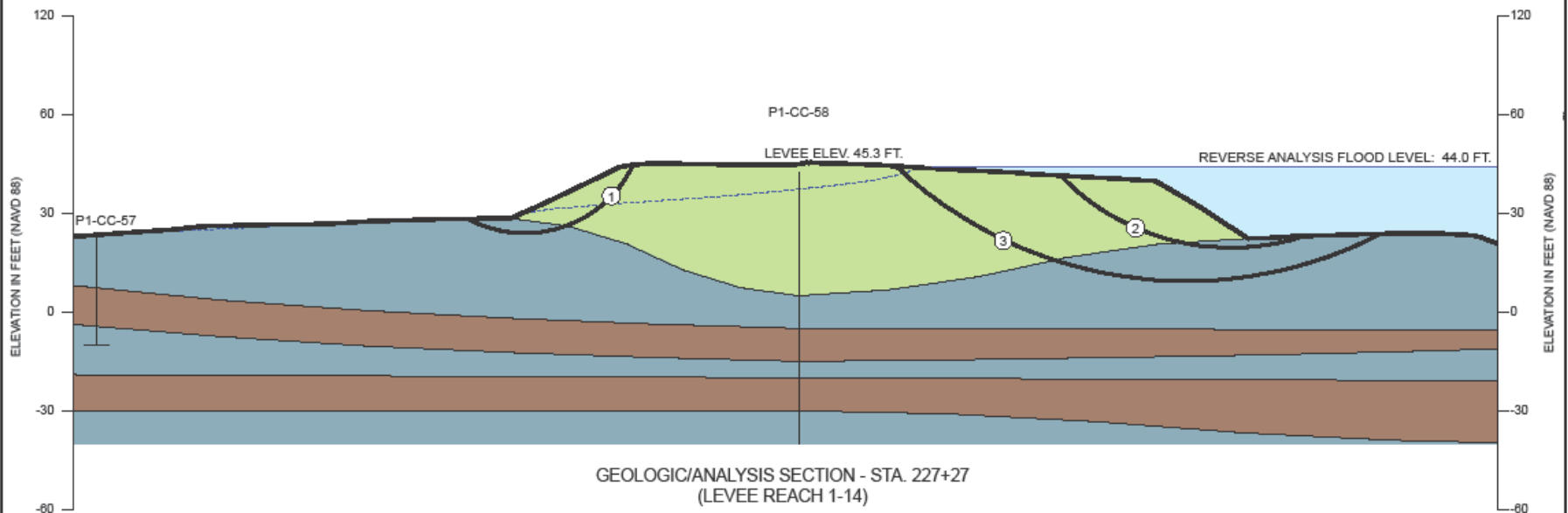
- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.40	YES
2	2.41	YES
3	4.18	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.23**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 227+27
(LEVEE REACH 1-14)



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REVERSE ANALYSIS FLOOD LEVEL
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JAN 2015
 PROJ. 2319
 FIG. 14-3

2319\Flood Levels\Sec-227+27-1.4.AI.NAU

- Railroad Embankment Mixed sand and silt with timber remnants
- Fill Soft, slightly clayey to clayey SILT
- Fill Loose, silty SAND to sandy SILT
- Foundation Soft, clayey SILT (Alluvium)
- Foundation Loose, silty SAND (Alluvium)

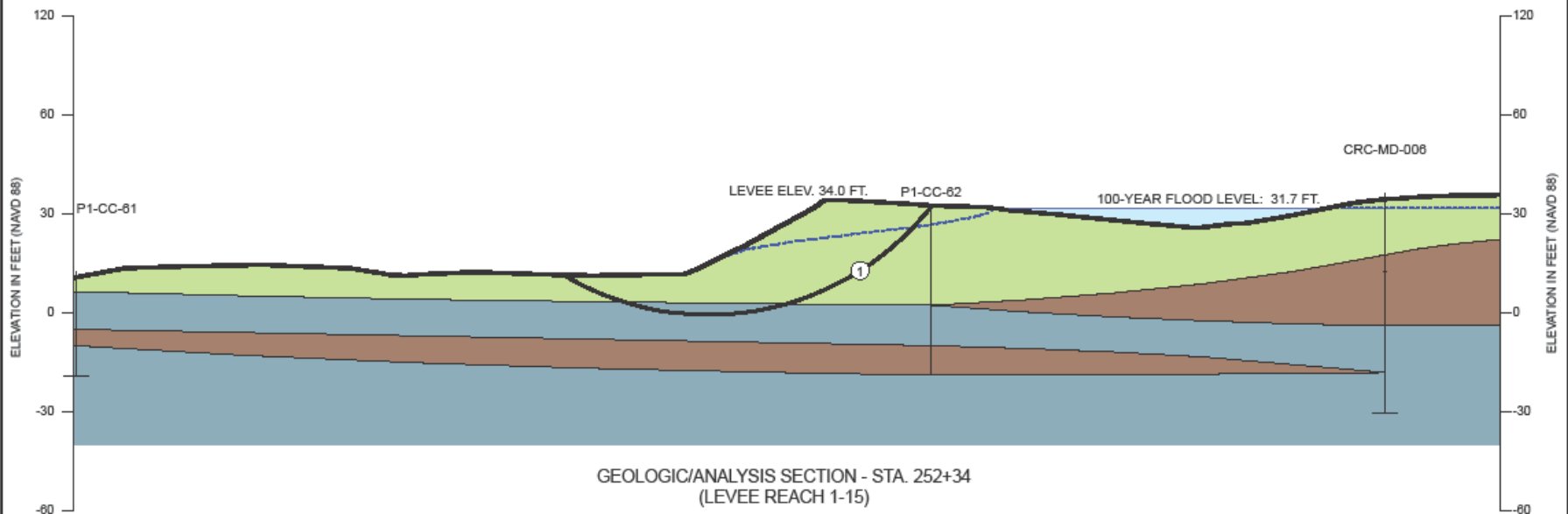
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.41	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.5**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: USACE AUTHORIZED WATER SURFACE (35.3 FEET) WAS NOT EVALUATED DUE TO OVERTOPPING AT 34.0 FEET. THIS ANALYSIS ALSO SERVES AS THE REVERSE ANALYSIS (SEE FS ABOVE).



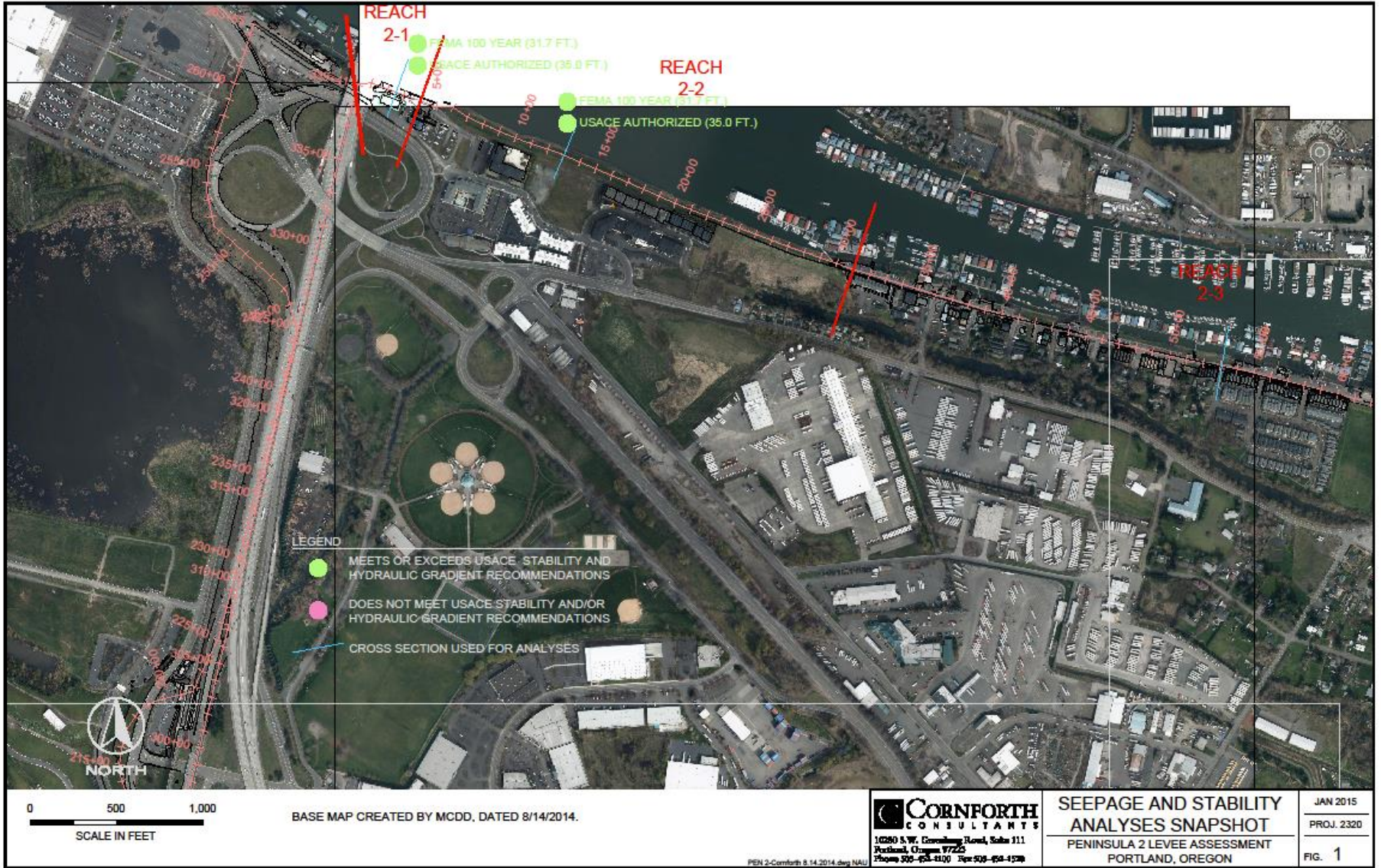
GEOLOGIC/ANALYSIS SECTION - STA. 252+34
(LEVEE REACH 1-15)

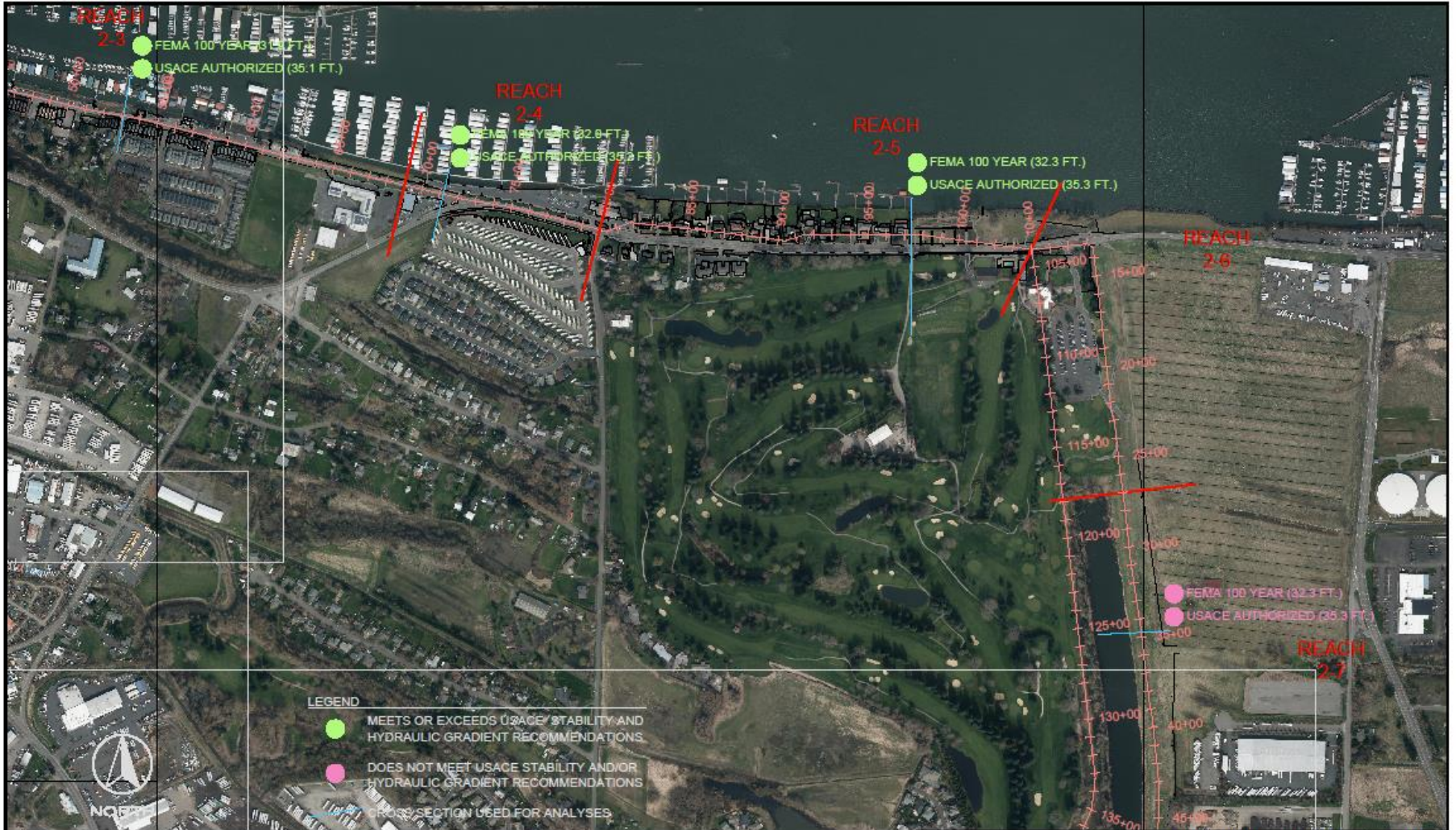


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100 YEAR FLOOD LEVEL
 PENINSULA 1 LEVEE ASSESSMENT
 PORTLAND, OREGON

JAN 2015
 PROJ. 2319
 FIG. 15-1





PEN 2-Cornforth 8.14.2014.dwg NAU





BASE MAP CREATED BY MCDD, DATED 8/14/2014.

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**SEEPAGE AND STABILITY
ANALYSES SNAPSHOT**
PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320
FIG. 4

PEN 2-Cornforth 8.14.2014.dwg NAU

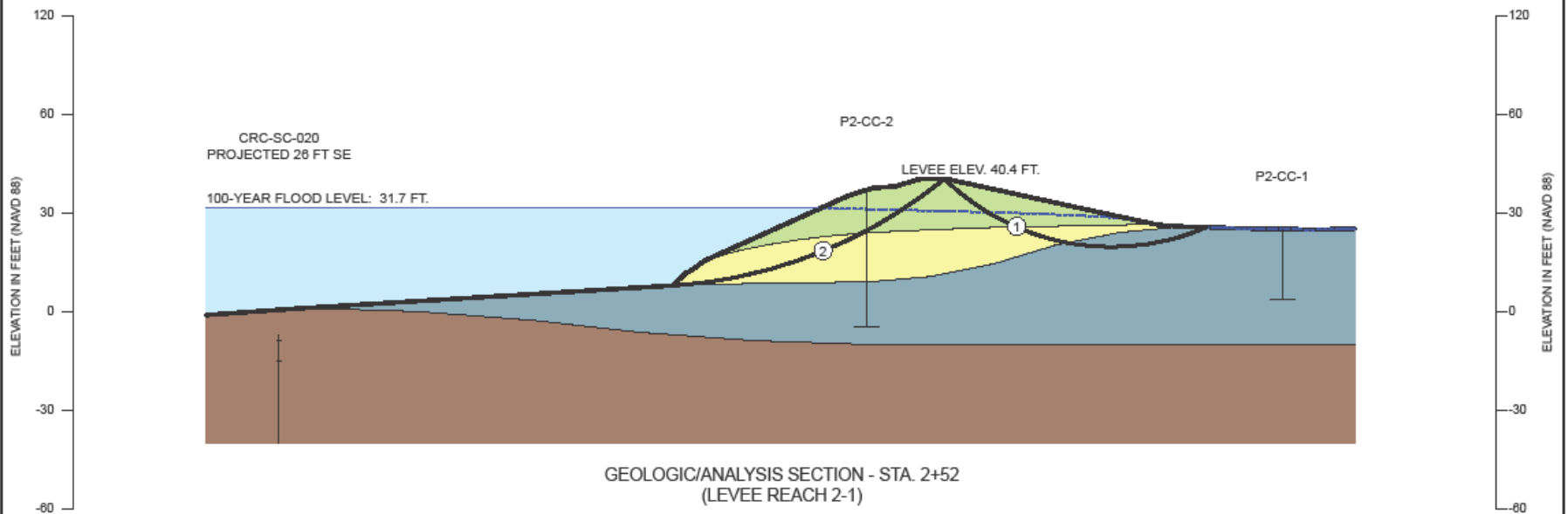
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	2.17	YES
2	1.56	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.1**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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**100 YEAR
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PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320
FIG. 1-1

2320\Flood Levels\Sec-2+51.87.AI.NAU

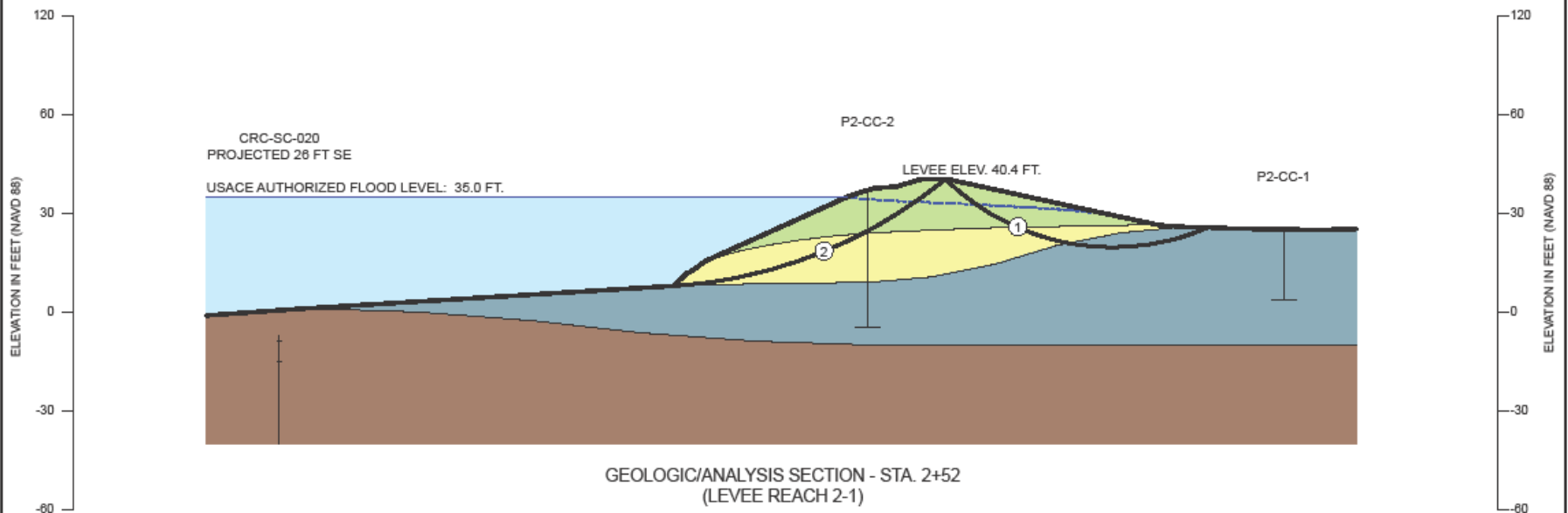
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.89	YES
2	1.68	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.3**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 2+52
(LEVEE REACH 2-1)

0 30 60
SCALE IN FEET

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USACE AUTHORIZED
FLOOD LEVEL

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320

FIG. 1-2

2320\Flood Levels\Sec-2\02-500.AI.NAU

- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

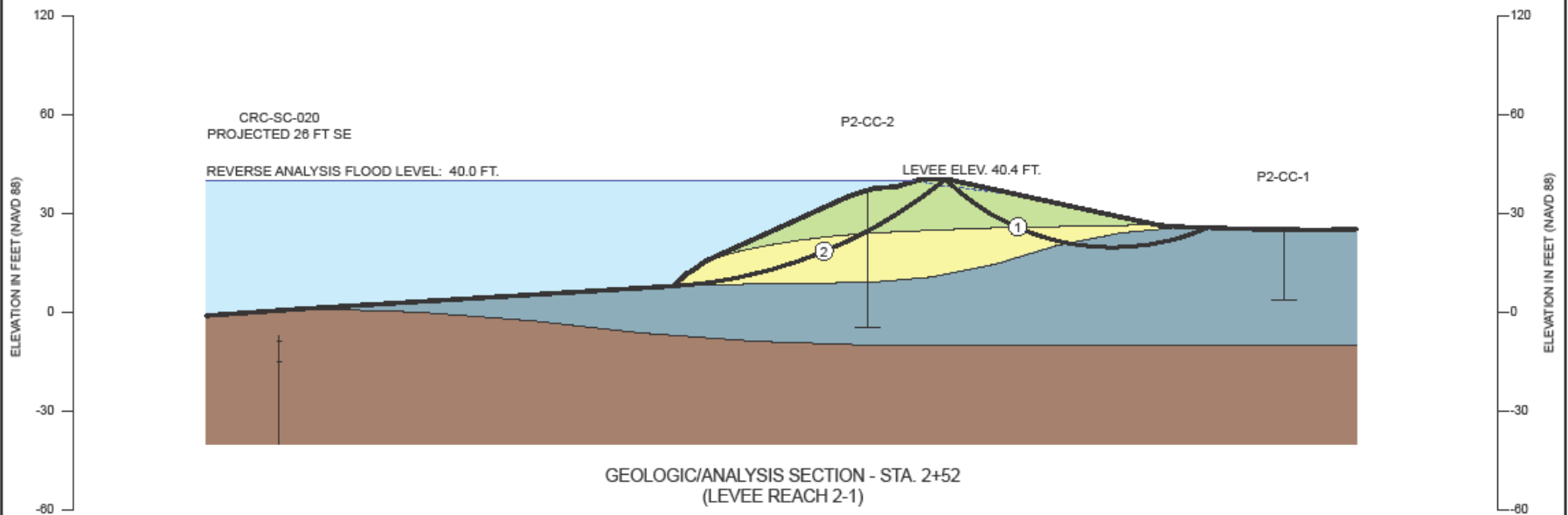
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.45	YES
2	1.88	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.3**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: RAISING FLOOD ELEVATION ABOVE 40.4 FT. OVERTOPS THE LEVEE.



0 30 60
SCALE IN FEET

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REVERSE ANALYSIS
FLOOD LEVEL

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320

FIG. 1-3

2320\Flood Levels\Sec-2+52-RAI\NAU

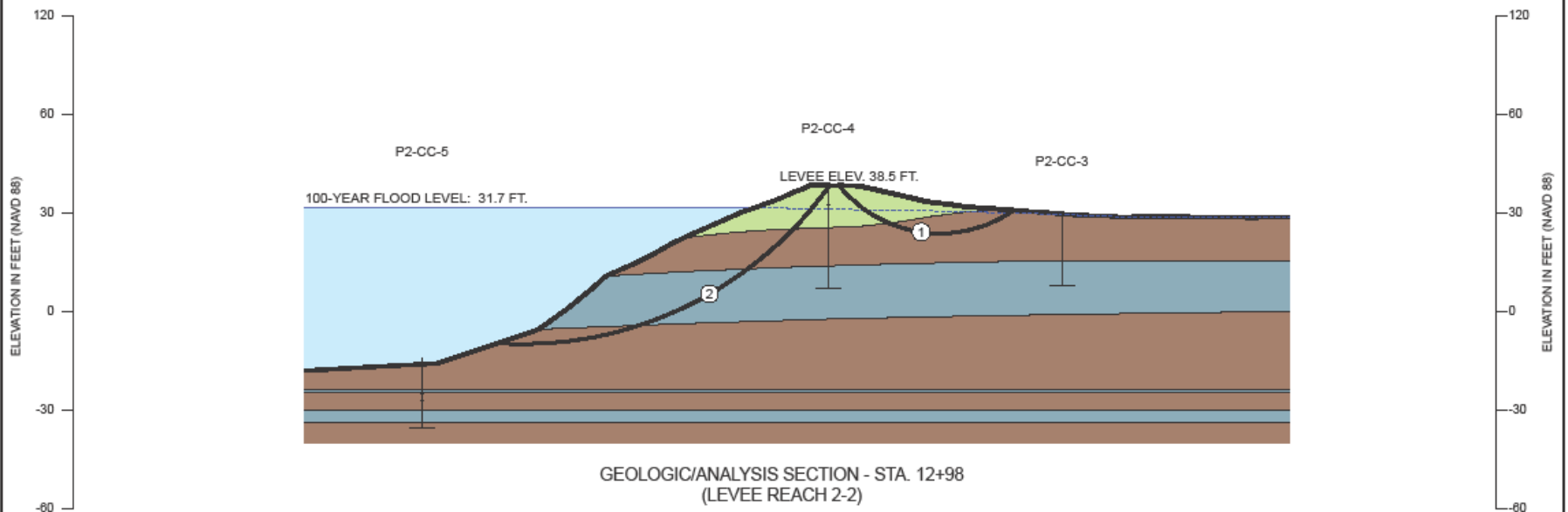
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	3.41	YES
2	1.41	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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**100 YEAR
FLOOD LEVEL**
PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

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FIG. 2-1

2320\Flood Levels\Sec-12+98.37.AI.NAU

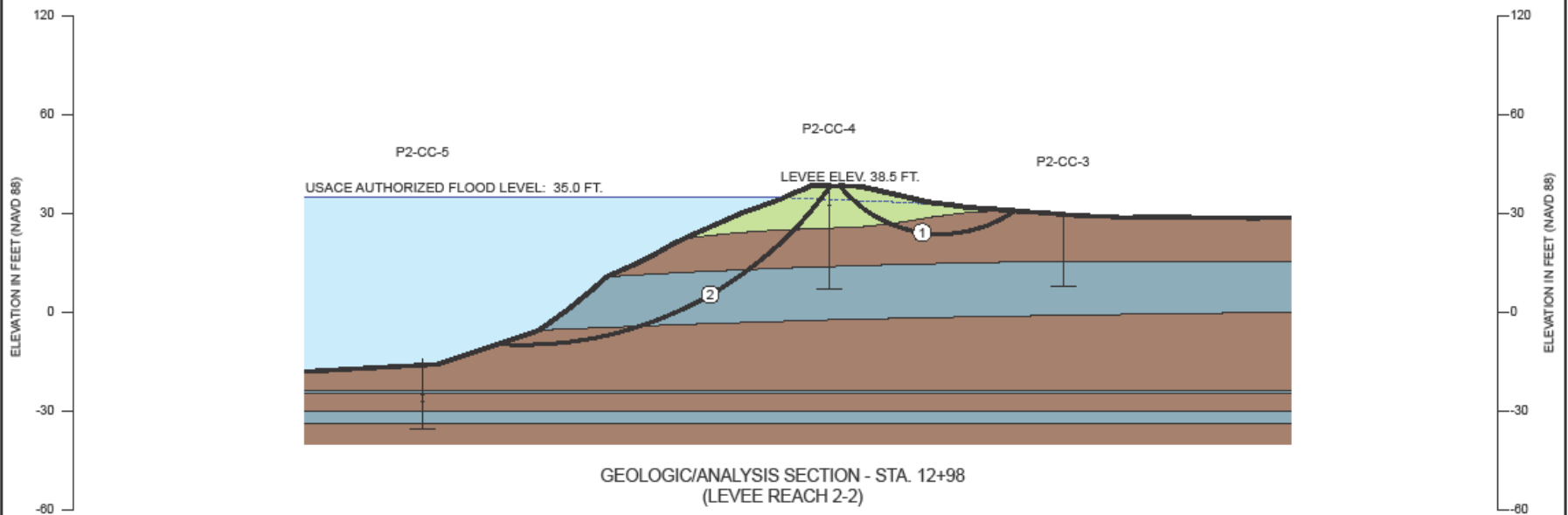
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	2.76	YES
2	1.48	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.2**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 12+98
(LEVEE REACH 2-2)

0 30 60
SCALE IN FEET

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USACE AUTHORIZED
FLOOD LEVEL

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320

FIG. 2-2

2320\Flood Levee\Sec-12+98-500.AI.NAU

- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

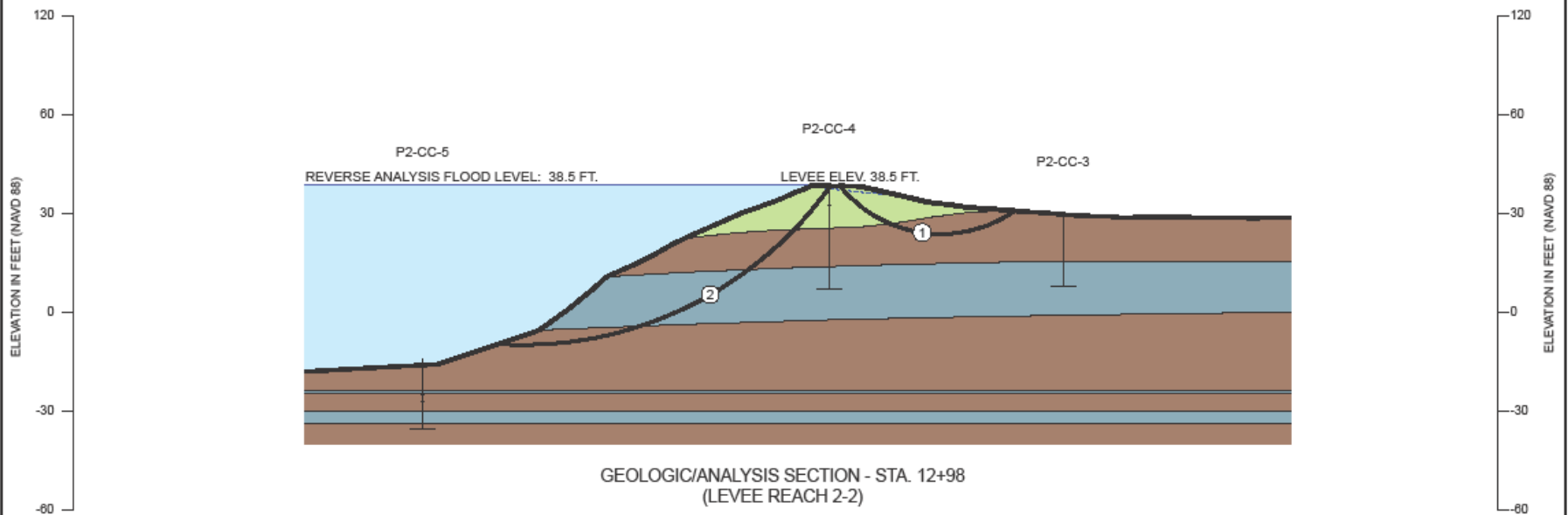
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	2.27	YES
2	1.57	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1013

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.2**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1013

NOTE: RAISING FLOOD ELEVATION ABOVE 38.5 FT. OVERTOPS THE LEVEE.



GEOLOGIC/ANALYSIS SECTION - STA. 12+98
(LEVEE REACH 2-2)

0 30 60
SCALE IN FEET

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REVERSE ANALYSIS
FLOOD LEVEL

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320

FIG. 2-3

2320\Flood Levels\Sec-12+98-RA\AI\NAU

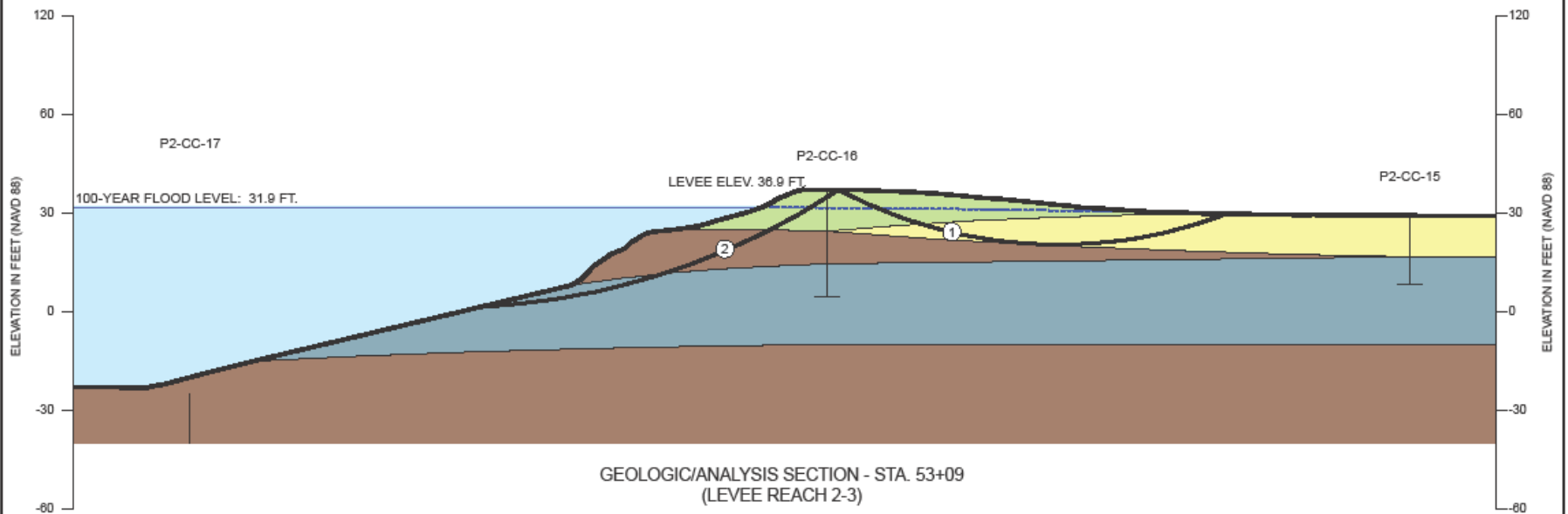
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	5.39	YES
2	1.79	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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**100 YEAR
FLOOD LEVEL**

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320
FIG. 3-1

2320\Flood Levels\Sec-53+08.72.AI.NAU

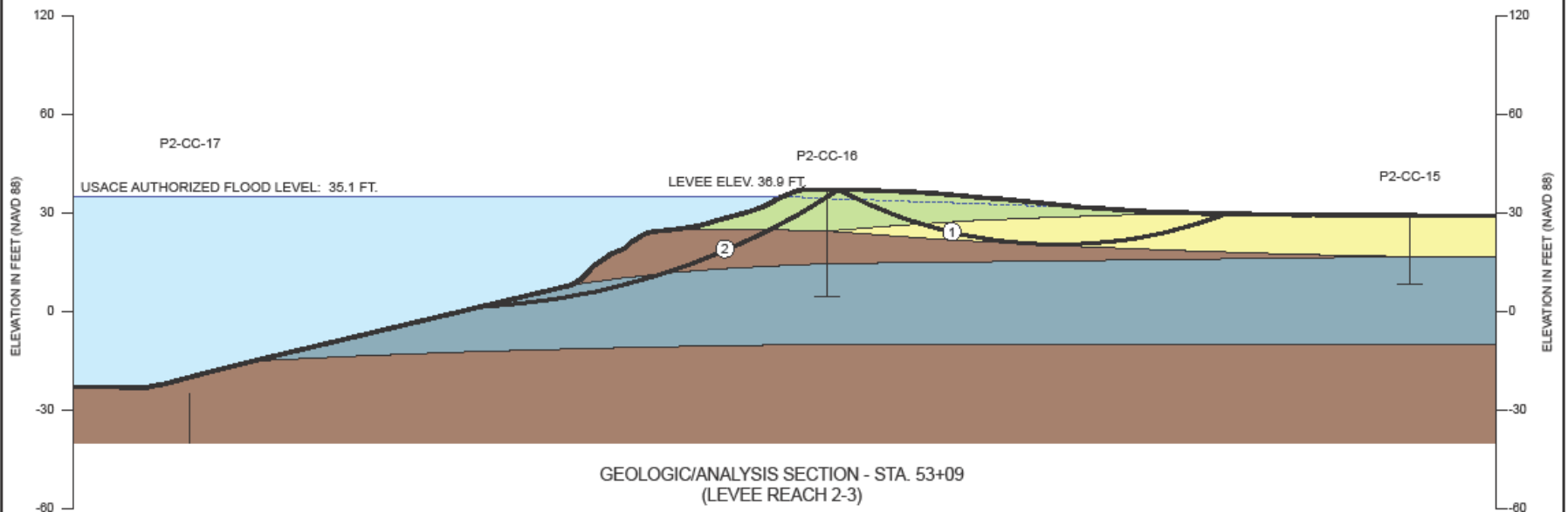
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	4.87	YES
2	1.90	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.1**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 53+09
(LEVEE REACH 2-3)

0 30 60
SCALE IN FEET

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USACE AUTHORIZED
FLOOD LEVEL
PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320
FIG. 3-2

2320\Flood Levee\Sec-03\08-500.AI.NAU

- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

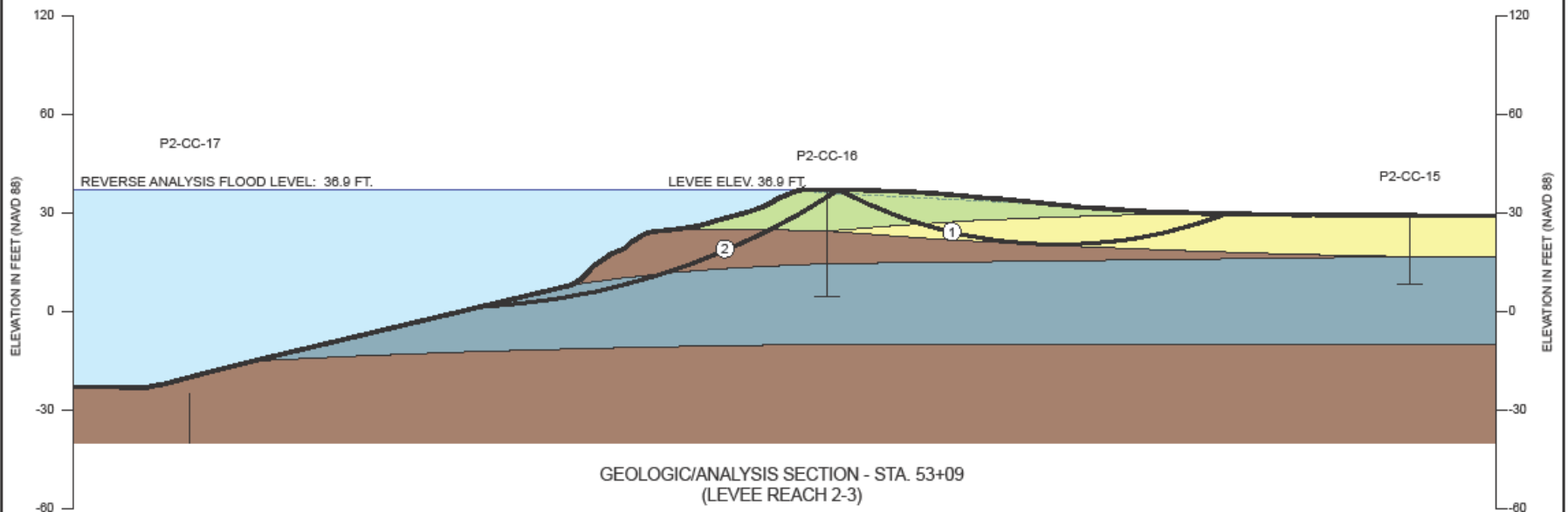
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	4.27	YES
2	1.97	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.1**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: RAISING FLOOD ELEVATION ABOVE 389 FT. OVERTOPS THE LEVEE.



GEOLOGIC/ANALYSIS SECTION - STA. 53+09
(LEVEE REACH 2-3)

0 30 60
SCALE IN FEET

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REVERSE ANALYSIS
FLOOD LEVEL

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320

FIG. 3-3

2320\Flood Levels\Sec-53+09-RA, AI, NAU

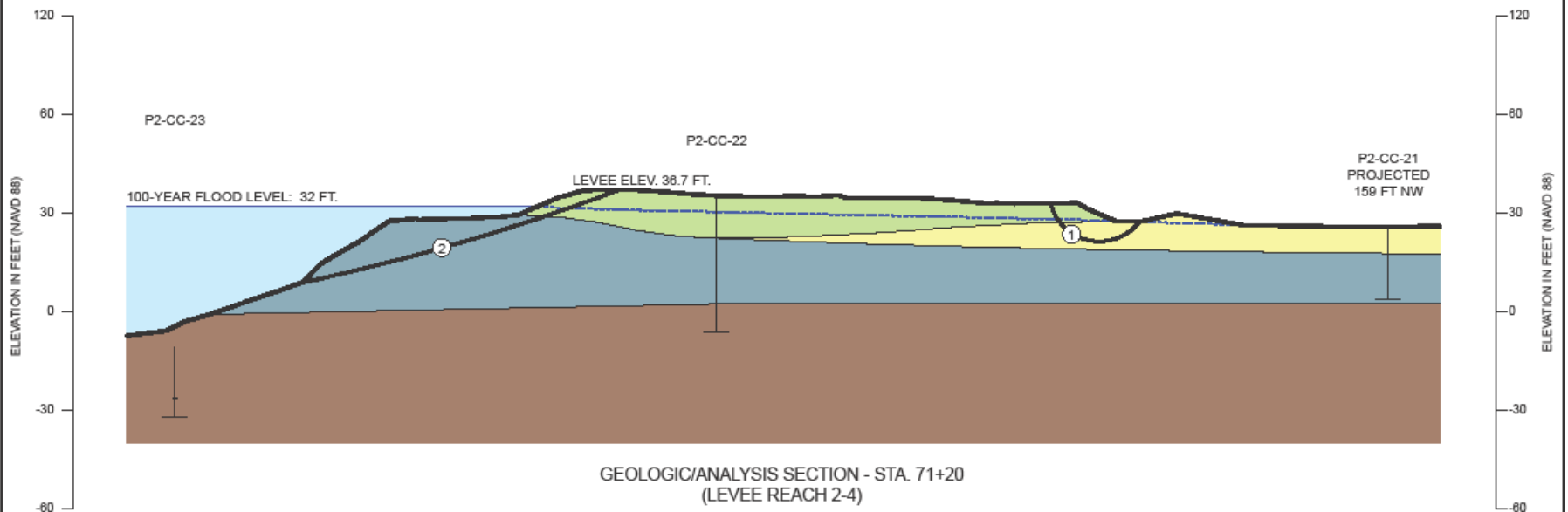
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	2.38	YES
2	2.30	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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100 YEAR
FLOOD LEVEL

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320

FIG. 4-1

2320/Flood Levels/Sec-71+19.84.AI.NAU

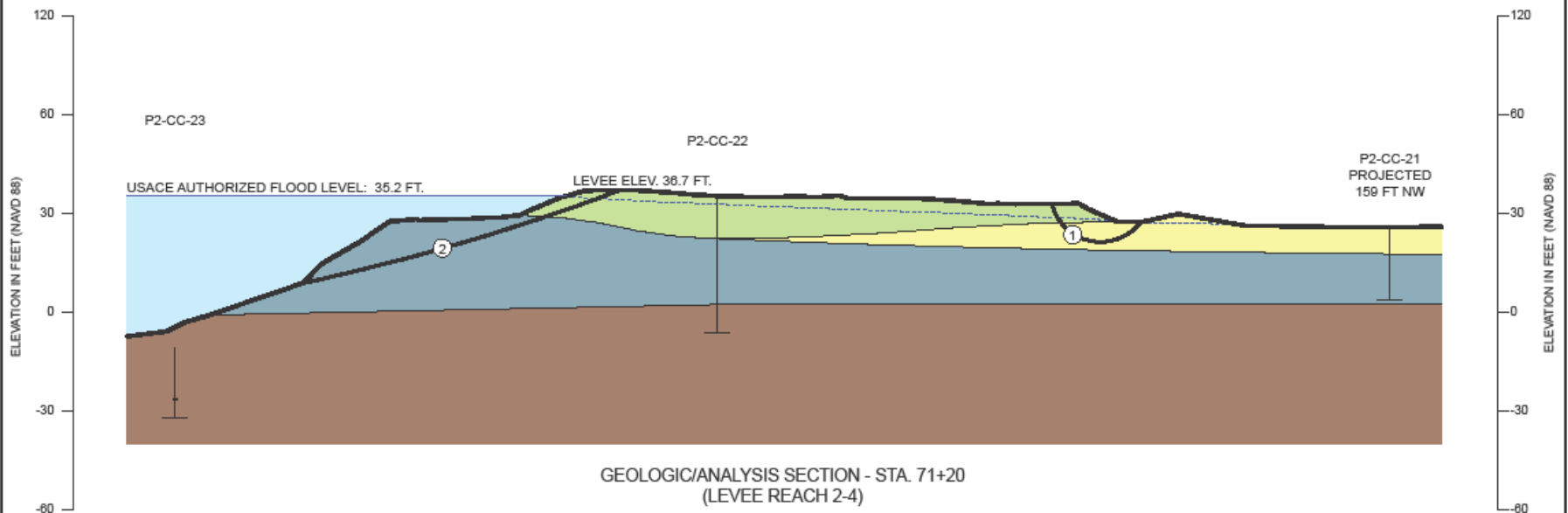
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	2.26	YES
2	2.42	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.1**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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PORTLAND, OREGON

JAN 2015
PROJ. 2320
FIG. 4-2

2320\Flood Levee\Sec-71+20-500.AI.NAU

- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

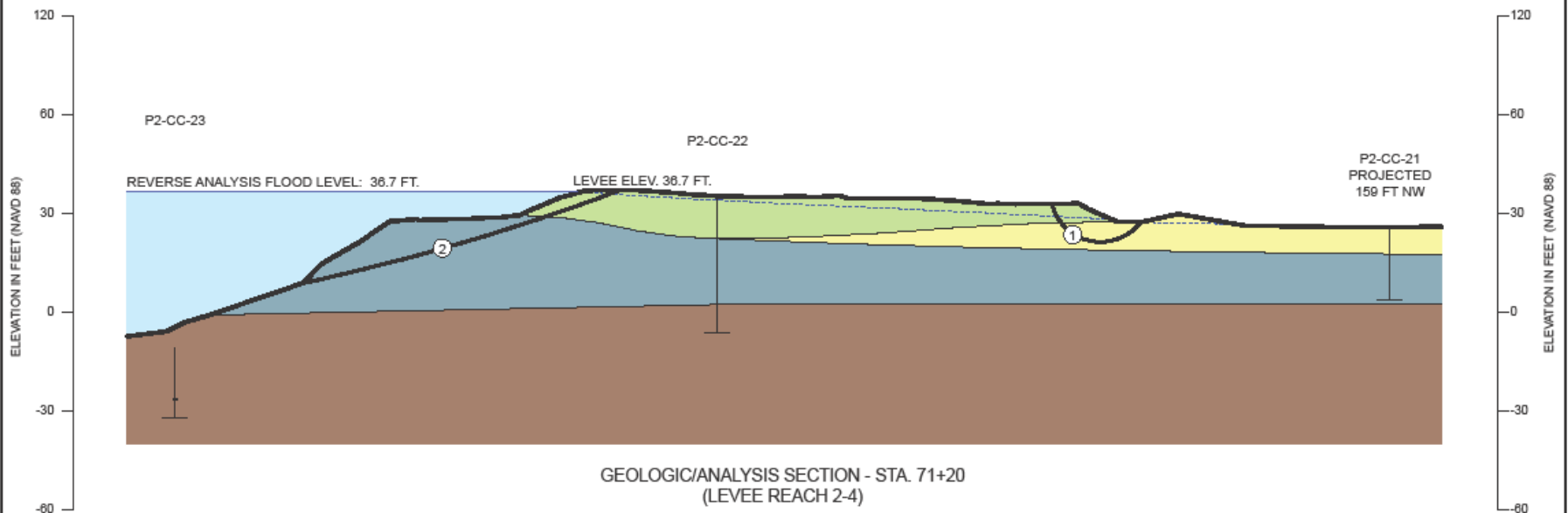
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	2.20	YES
2	2.47	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1013

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.1**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1013

NOTE: RAISING FLOOD ELEVATION ABOVE 36.7 FT. OVERTOPS THE LEVEE.



0 30 60
SCALE IN FEET

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REVERSE ANALYSIS
FLOOD LEVEL
PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320
FIG. 4-3

2320\Flood Levels\Sec-71+20-RA.A1.NAU

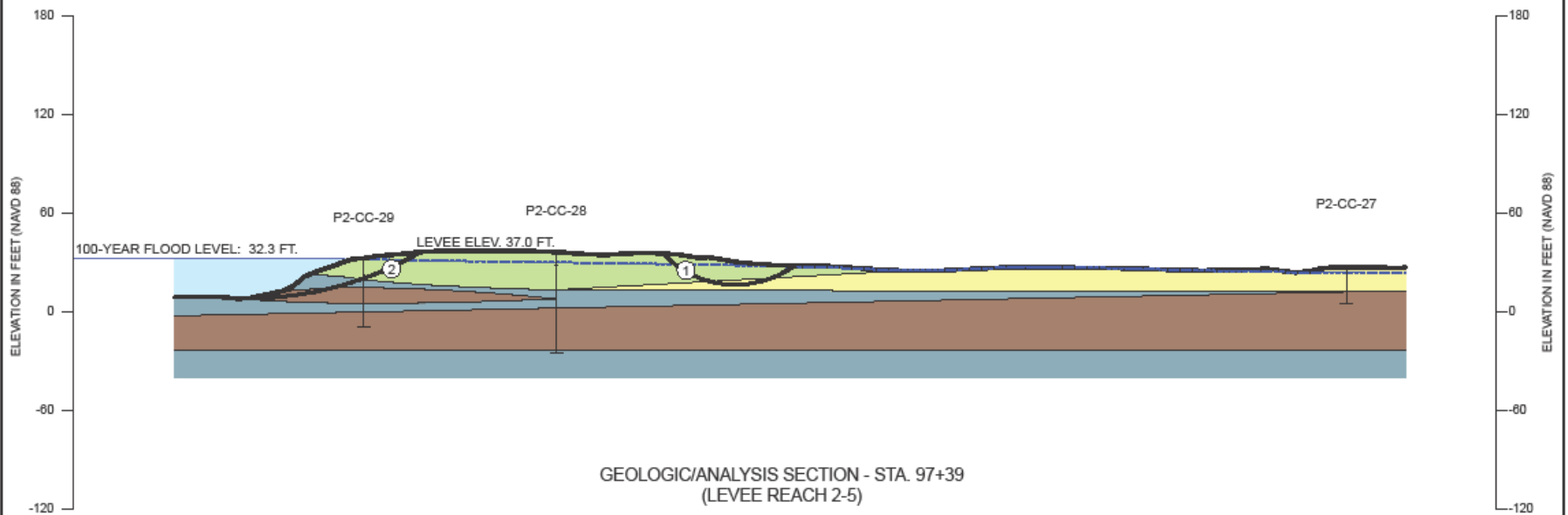
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	4.35	YES
2	2.29	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.1**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 97+39
(LEVEE REACH 2-5)

0 60 120
SCALE IN FEET

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100 YEAR FLOOD LEVEL
PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320
FIG. 5-1

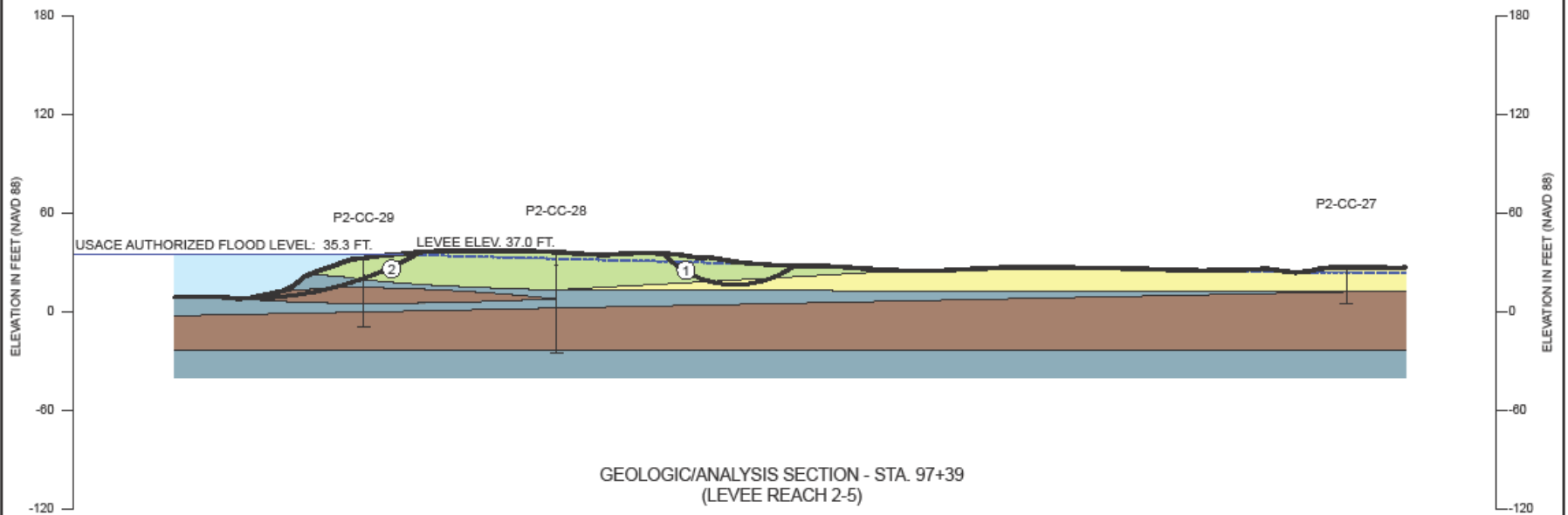
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	4.12	YES
2	2.76	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.1**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 97+39
(LEVEE REACH 2-5)

0 60 120
SCALE IN FEET

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USACE AUTHORIZED
FLOOD LEVEL

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320

FIG. 5-2

2320\Flood Levels\Sec-07\38-500.AI.NAU

- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

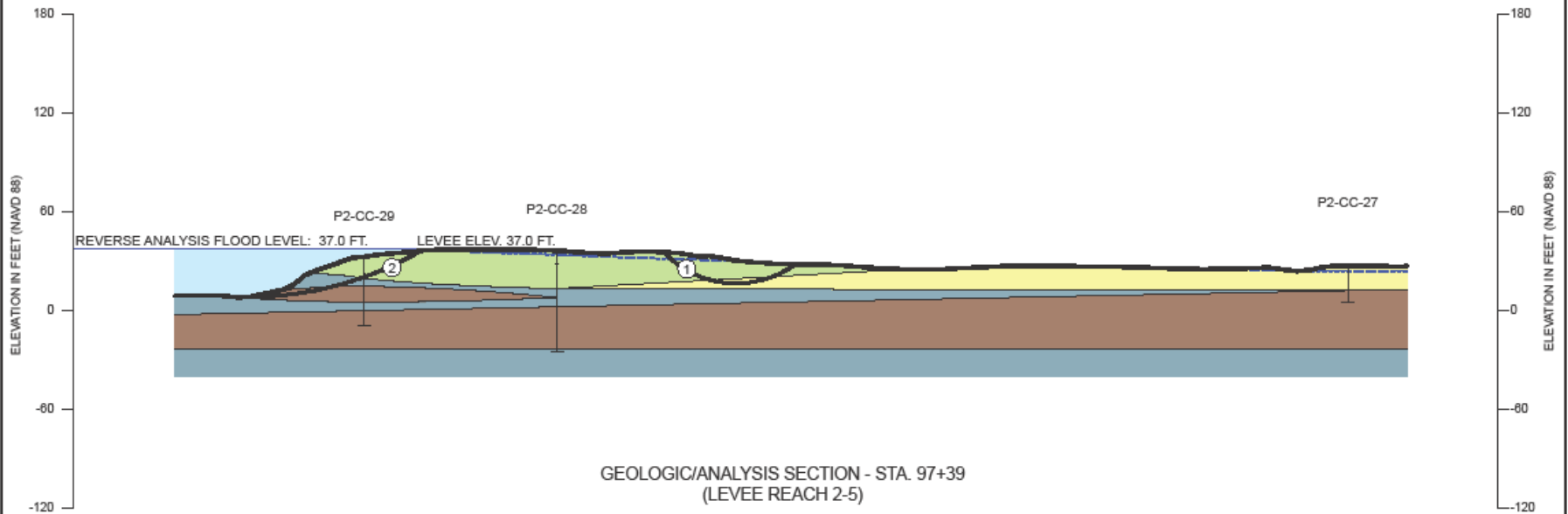
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	3.91	YES
2	2.79	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.1**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: RAISING FLOOD ELEVATION ABOVE 37.0 FT. OVERTOPS THE LEVEE.



0 60 120
SCALE IN FEET

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REVERSE ANALYSIS
FLOOD LEVEL
PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320
FIG. 5-3

2320\Flood Levels\Sec-97+39-RA, AI NAU

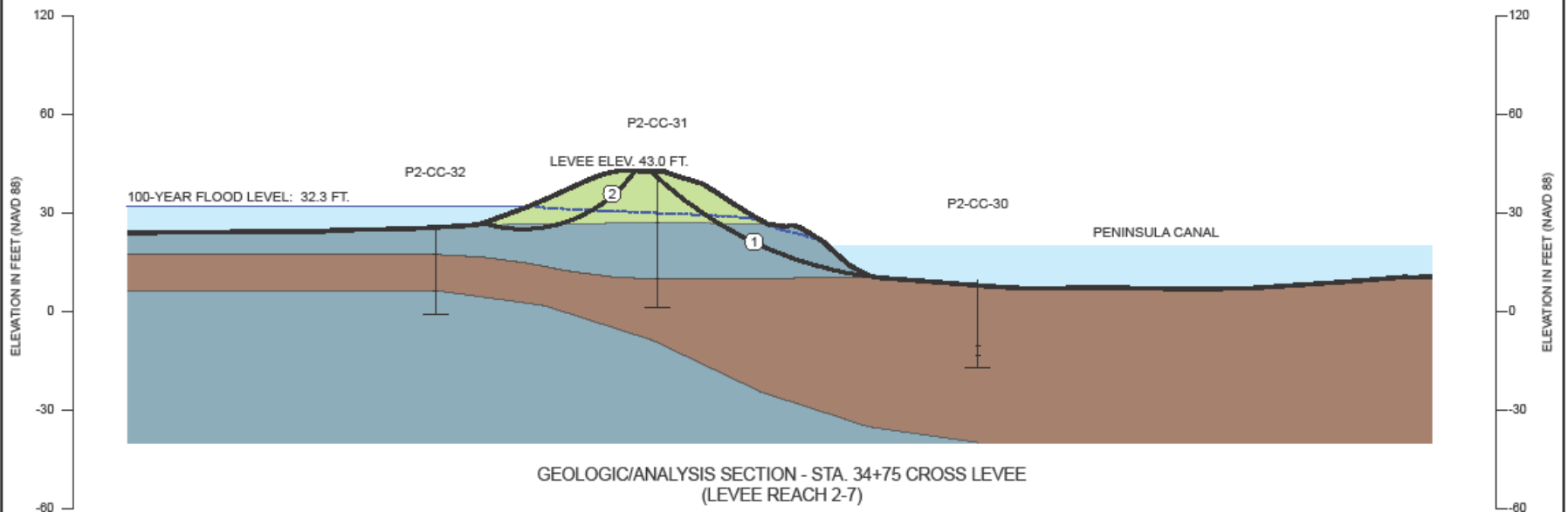
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	0.99	NO
2	1.75	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.1**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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**100 YEAR
FLOOD LEVEL**

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320
FIG. 6-1

2320\Flood Levels\Sec-125+38.89 AI.NAU

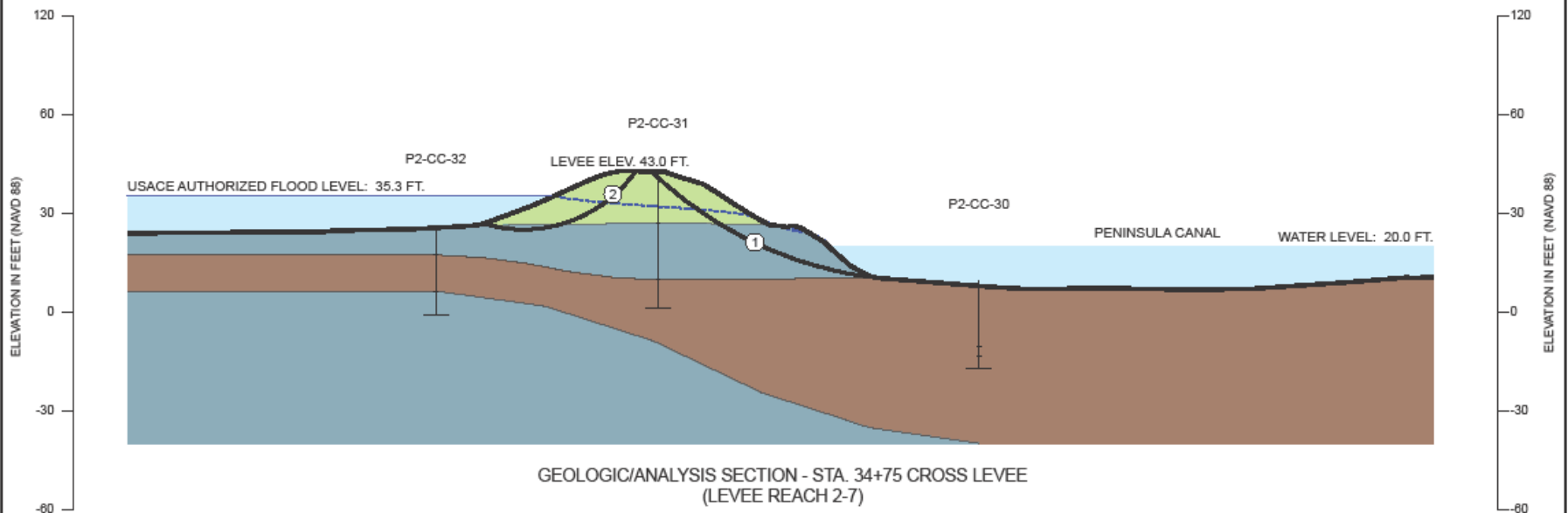
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	0.91	NO
2	1.85	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.5**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 34+75 CROSS LEVEE (LEVEE REACH 2-7)

0 30 60
SCALE IN FEET

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USACE AUTHORIZED
FLOOD LEVEL

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

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FIG. 6-2

- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

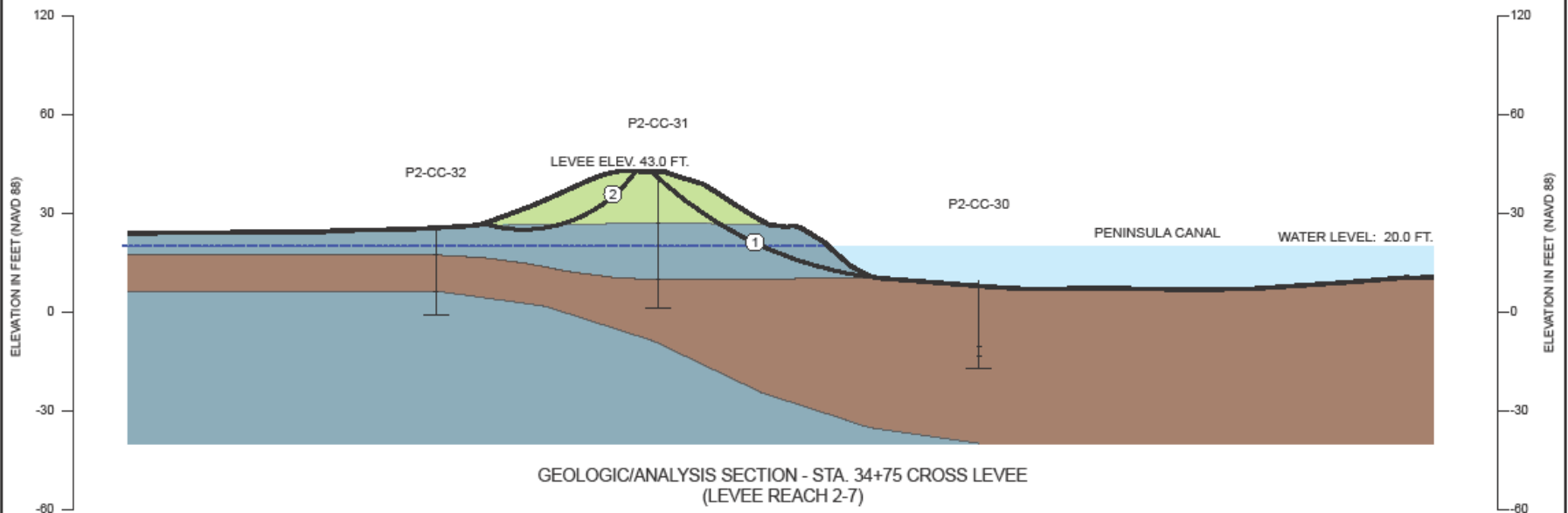
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.28	NO
2	2.03	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: REVERSE ANALYSIS OF LEVEE REACH UNDER NON-FLOOD CONDITIONS



GEOLOGIC/ANALYSIS SECTION - STA. 34+75 CROSS LEVEE (LEVEE REACH 2-7)

0 30 60
SCALE IN FEET

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REVERSE ANALYSIS
FLOOD LEVEL

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320

FIG. 6-3

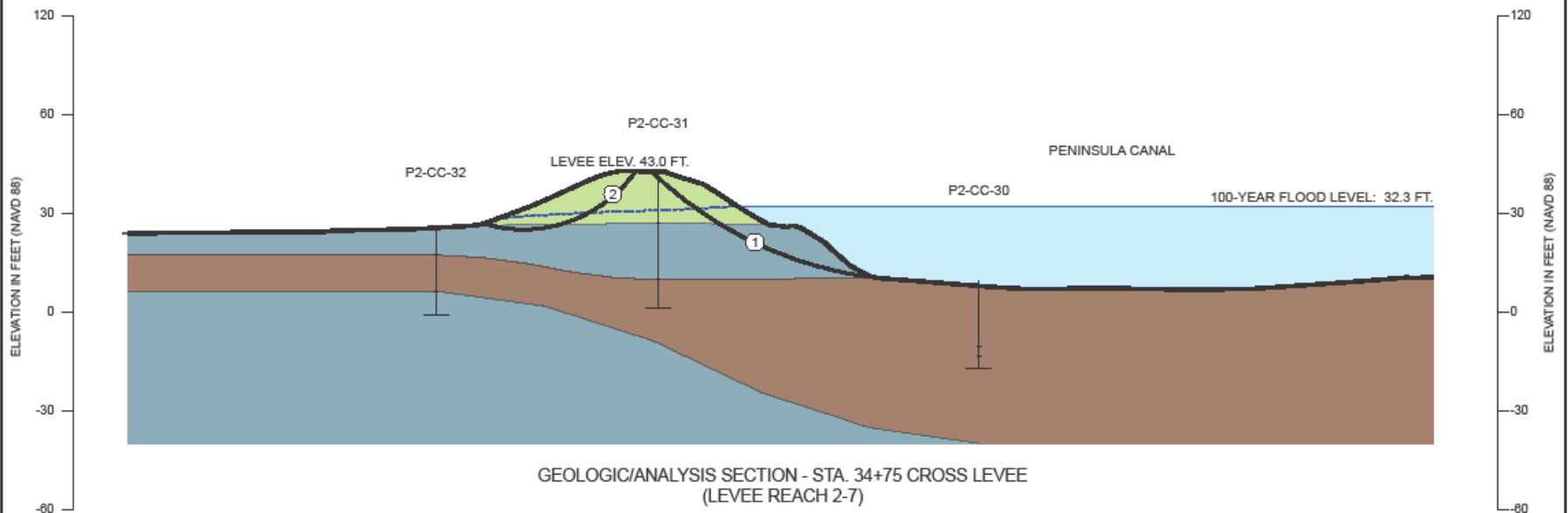
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.34	NO
2	1.87	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.1**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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**100 YEAR FLOOD
ALTERNATE ANALYSIS**

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320

FIG. 6-4

2320\Flood Levels\Sec-125+39_6-4.AI.NAU

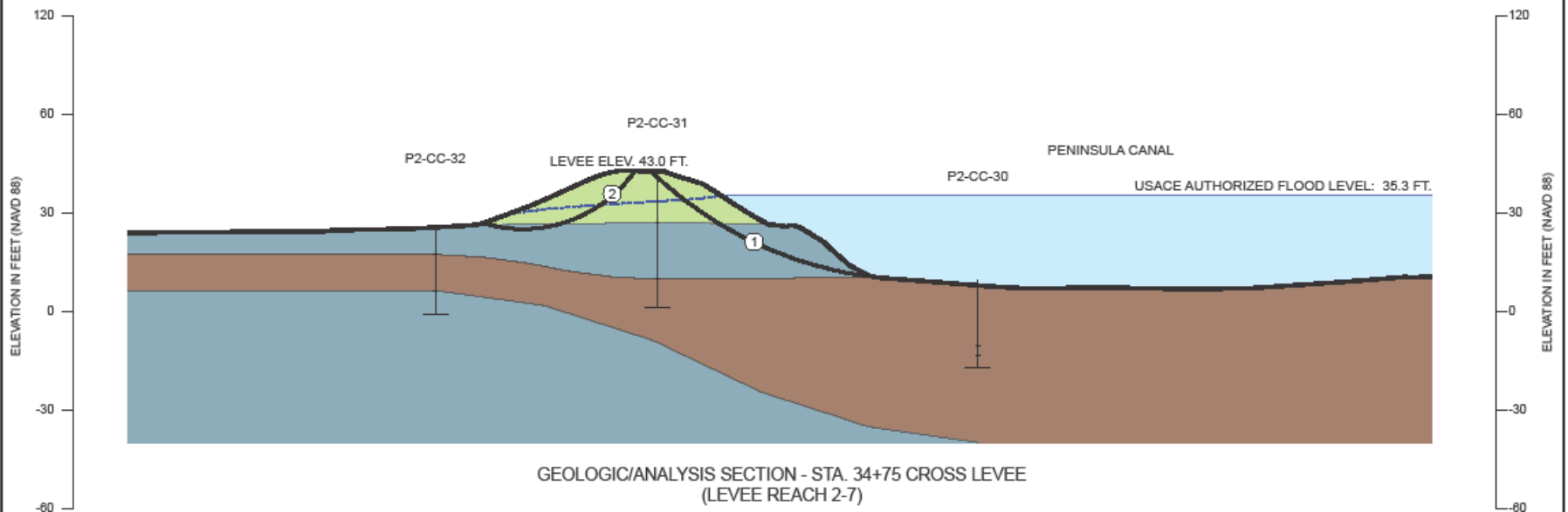
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.43	YES
2	1.50	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1013

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.3**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1013



0 30 60
SCALE IN FEET

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**USACE AUTHORIZED
ALTERNATE ANALYSIS**

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320

FIG. 6-5

- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

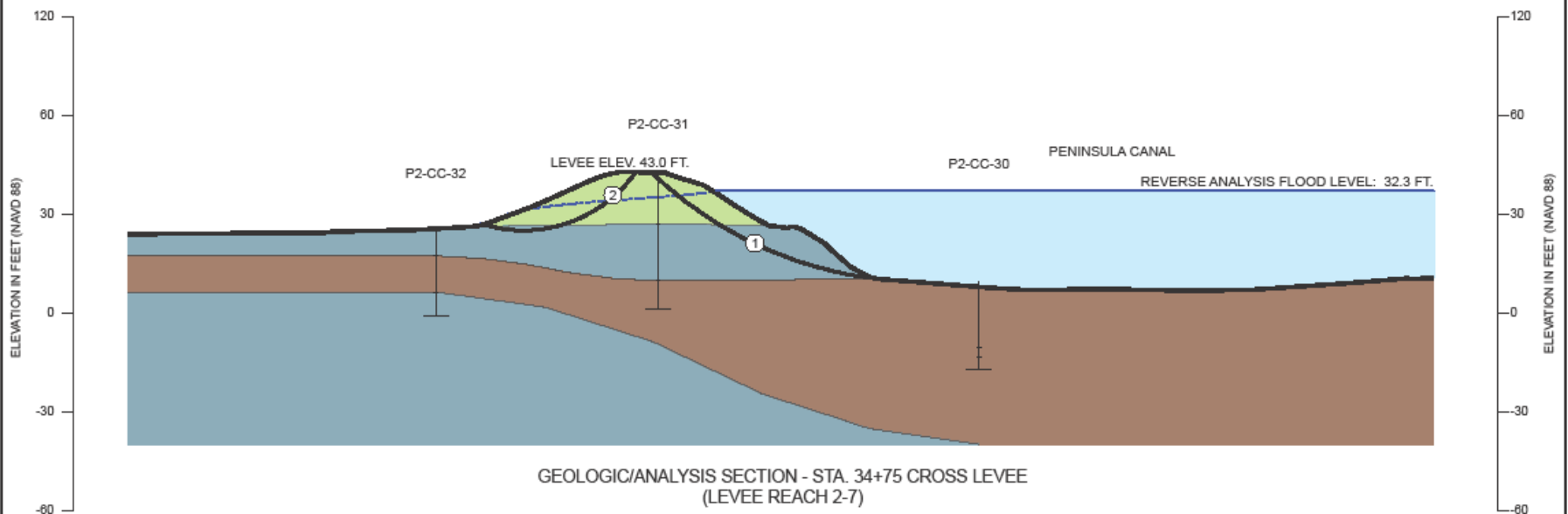
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.50	YES
2	1.40	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.3**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: REVERSE ANALYSIS OF LEVEE REACH UNDER NON-FLOOD CONDITIONS



0 30 60
SCALE IN FEET

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**REVERSE ANALYSIS
ALTERNATE ANALYSIS**

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320

FIG. 6-6

2320\Flood Levels\Sec-125+39_6.6.AI.NAU

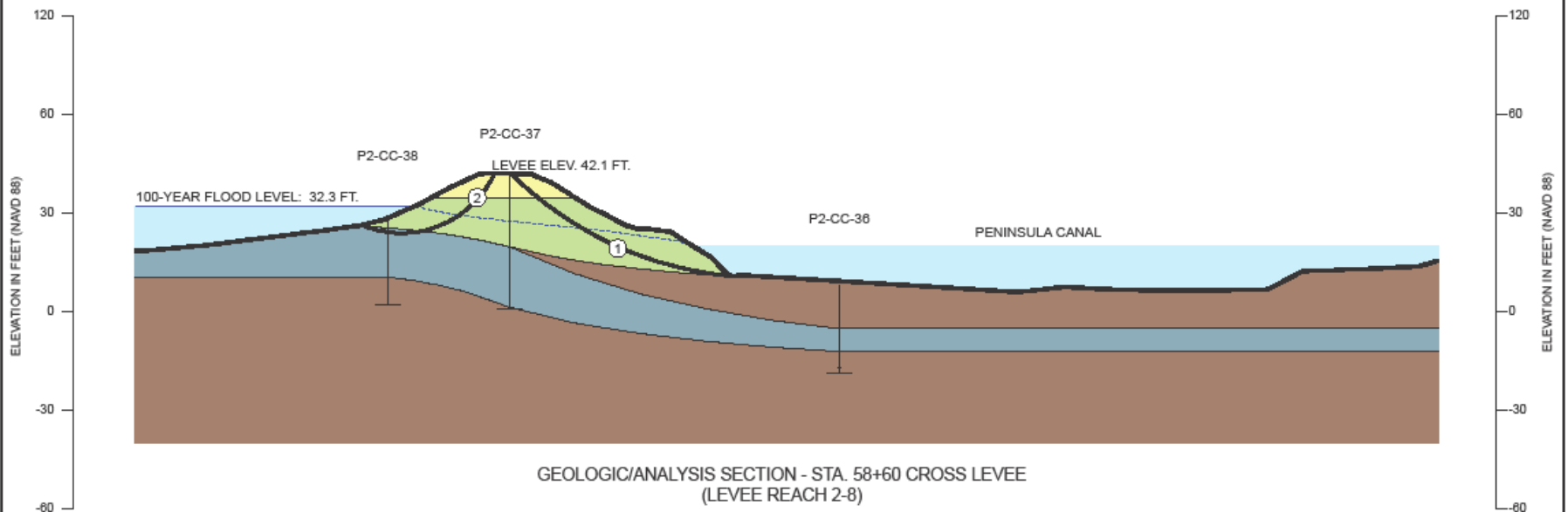
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.09	NO
2	1.61	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.1**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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**100 YEAR
FLOOD LEVEL**

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320
FIG. 7-1

2320\Flood Levels\Sec-146+09.05.AI.NAU

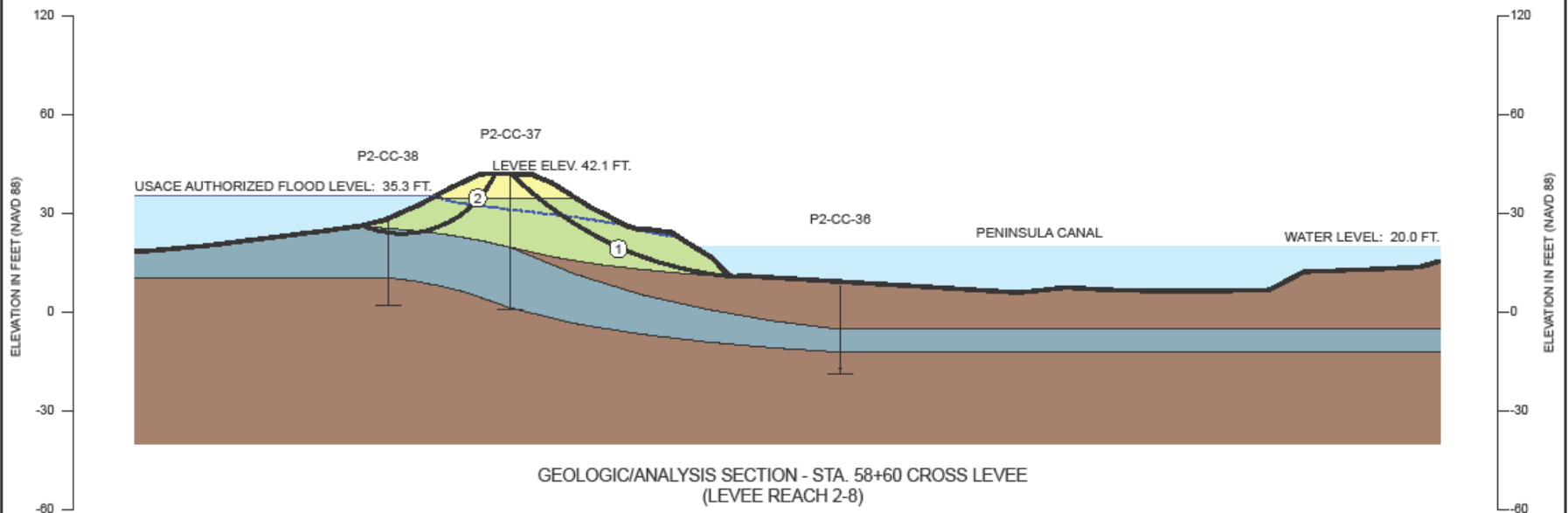
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.00	NO
2	1.74	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.5**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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USACE AUTHORIZED
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JAN 2015
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FIG. 7-2

2320\Flood Levels\Sec-146\08-500.AI.NAU

- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

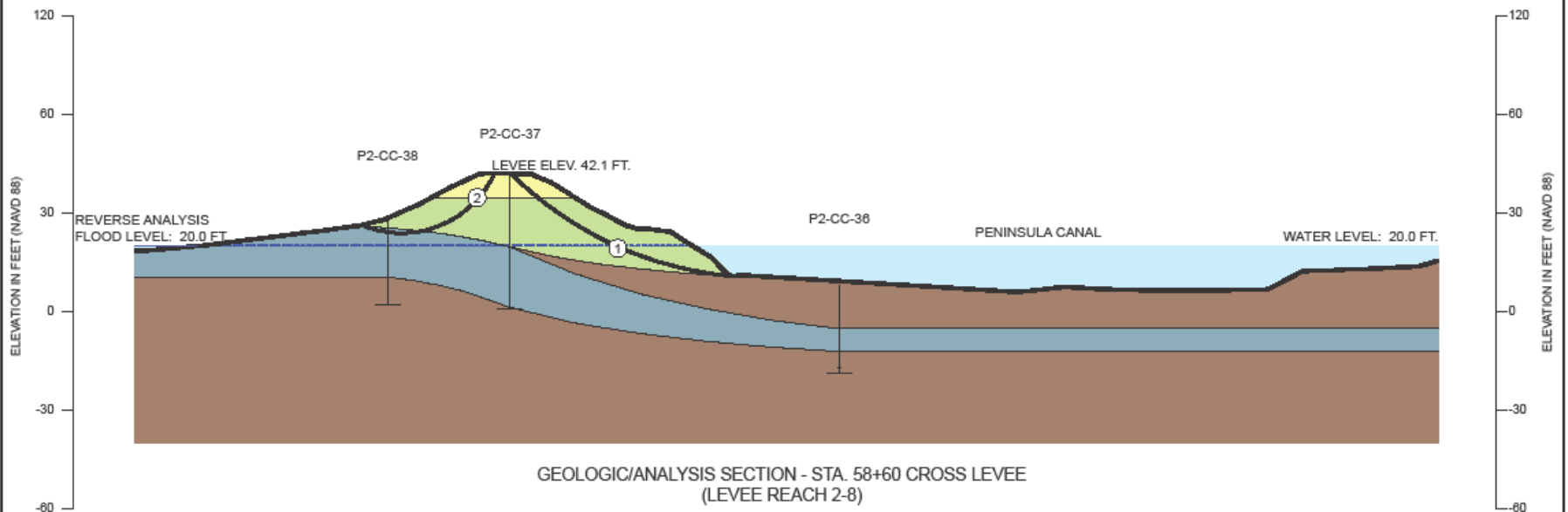
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.30	NO
2	1.79	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0*

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: REVERSE ANALYSIS OF LEVEE REACH UNDER NON-FLOOD CONDITIONS



0 30 60
SCALE IN FEET

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REVERSE ANALYSIS
FLOOD LEVEL

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PORTLAND, OREGON

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FIG. 7-3

2320\Flood Levels\Sec-146+09-RA, AI, NAU

- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

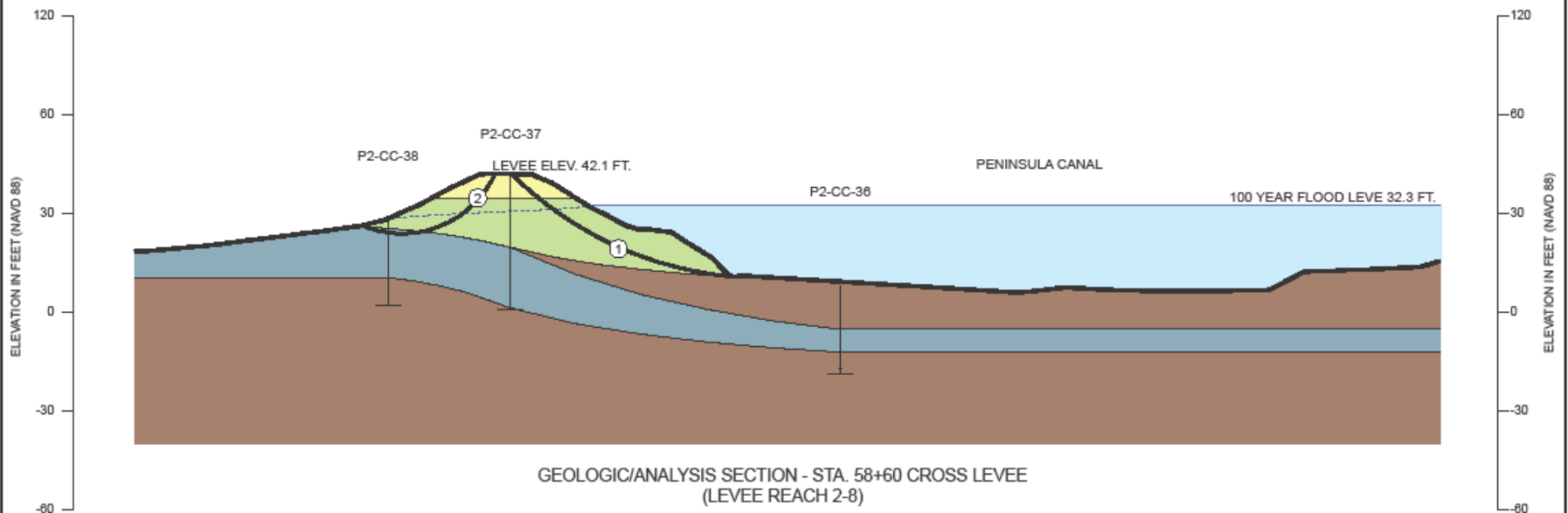
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.35	NO
2	1.40	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.2**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: NO REVERSE ANALYSIS AS INBOARD FS = 1.4 AT 100-YEAR FLOOD.



0 30 60
SCALE IN FEET

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**100 YEAR FLOOD
ALTERNATE ANALYSIS**

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

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FIG. 7-4

2320\Flood Levels\Sec-146\09_7-4.AI.NAU

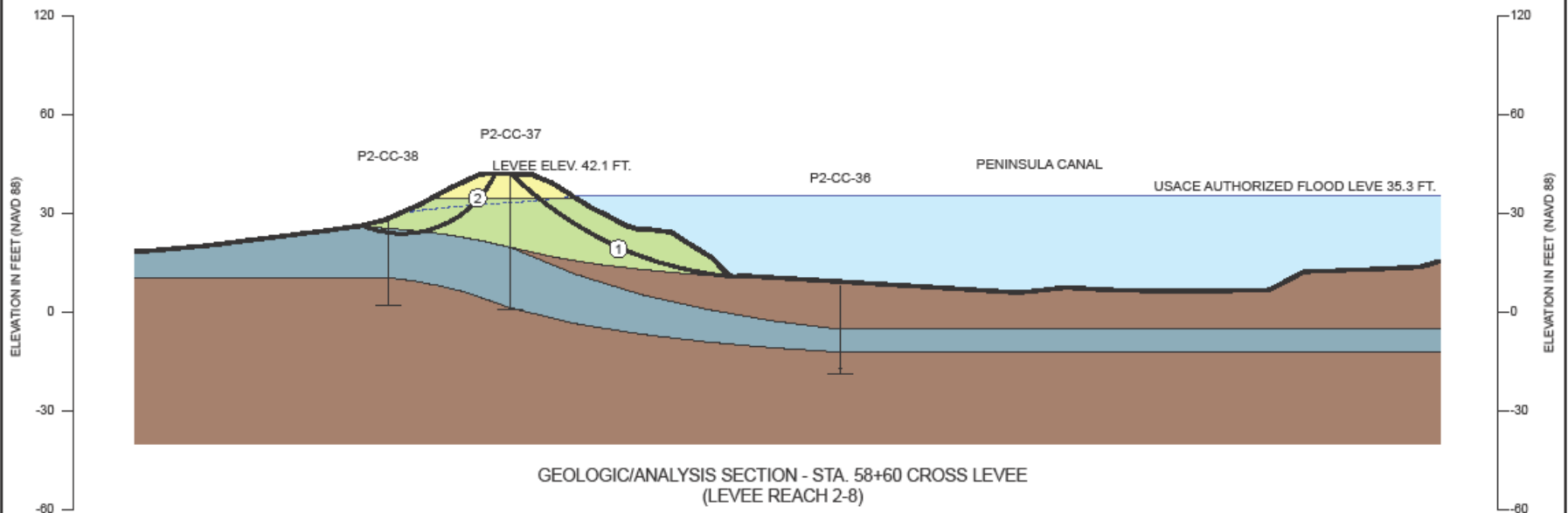
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.43	YES
2	1.26	NO

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.3**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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**USACE AUTHORIZED
ALTERNATE ANALYSIS**

PENINSULA 2 LEVEE ASSESSMENT
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FIG. 7-5

2320\Flood Levels\Sec-146\09_7-5-AI.NAU

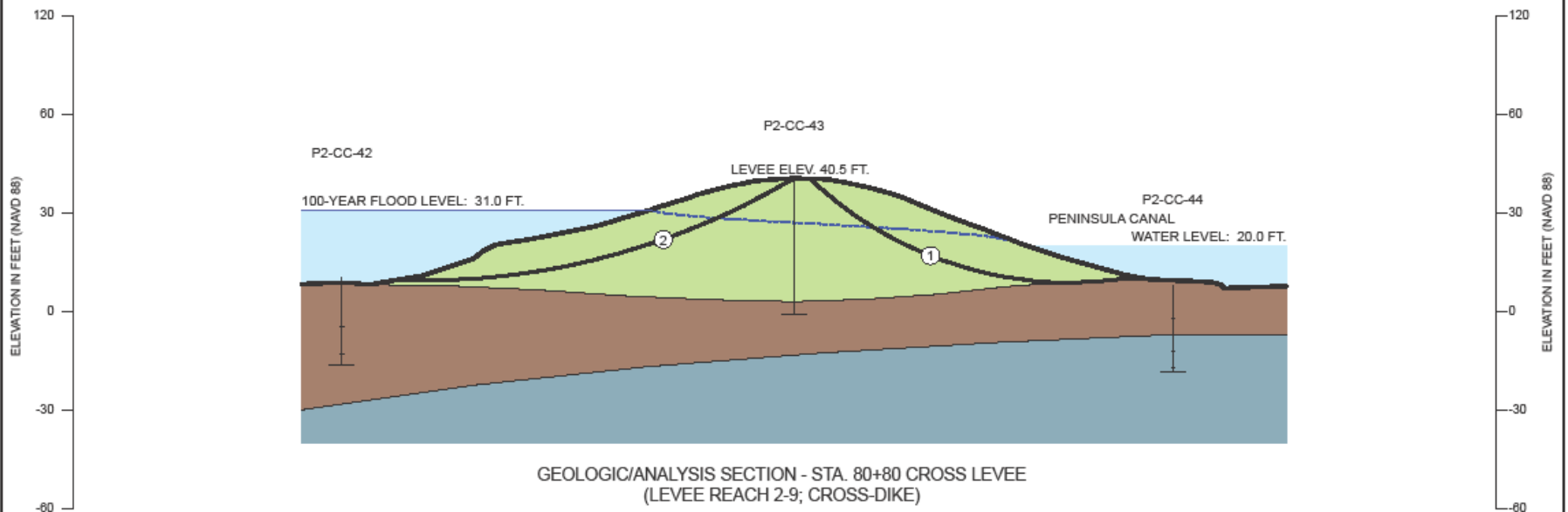
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.50	YES
2	2.42	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.2**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 80+80 CROSS LEVEE
(LEVEE REACH 2-9; CROSS-DIKE)

0 30 60
SCALE IN FEET

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100 YEAR
FLOOD LEVEL

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

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FIG. 8-1

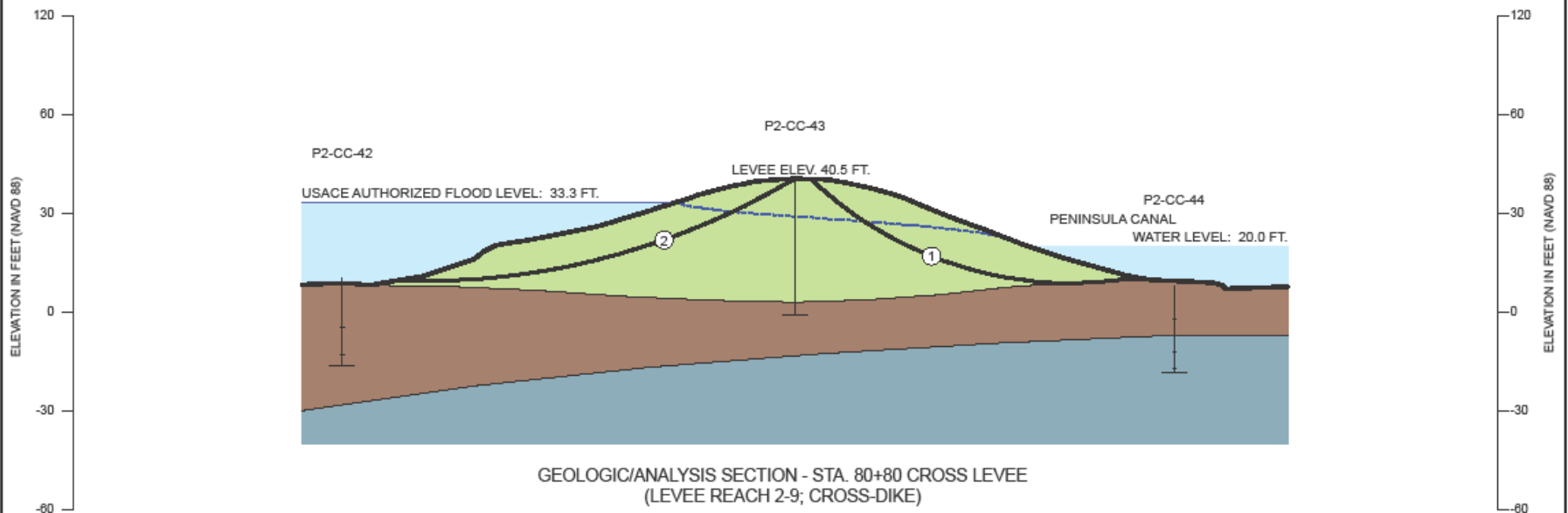
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.42	YES
2	2.54	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.4**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 80+80 CROSS LEVEE
(LEVEE REACH 2-9; CROSS-DIKE)

0 30 60
SCALE IN FEET

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USACE AUTHORIZED
FLOOD LEVEL

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PORTLAND, OREGON

JAN 2015
PROJ. 2320

FIG. 8-2

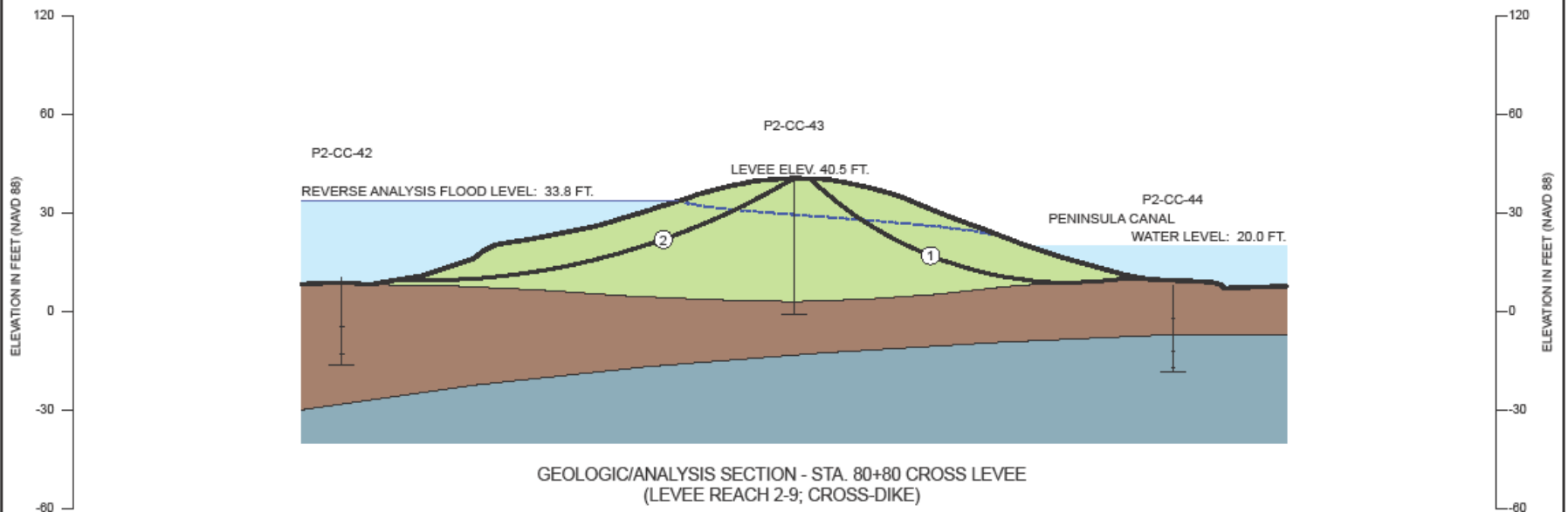
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.40	YES
2	2.58	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.4**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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REVERSE ANALYSIS
FLOOD LEVEL

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320

FIG. 8-3

2320\Flood Levels\Sec-168+64-RA\AI\NAU

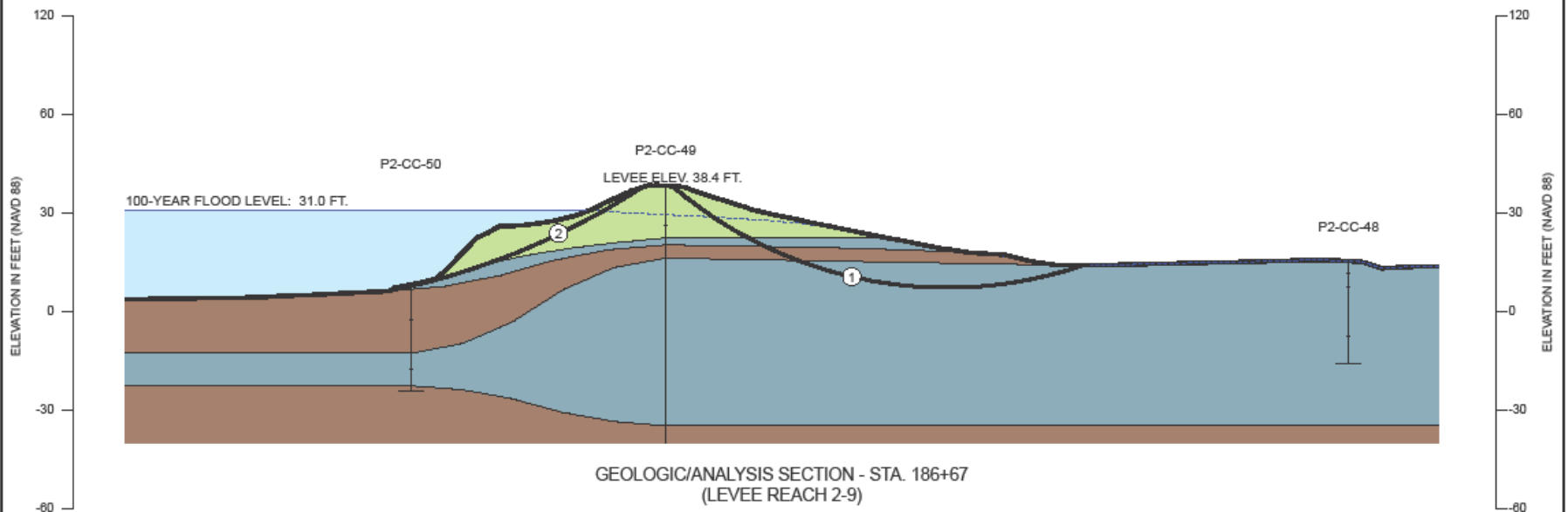
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.73	YES
2	1.63	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.3**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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**100 YEAR FLOOD
FLOOD LEVEL**

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PORTLAND, OREGON

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FIG. 9-1

2320Flood LevelsSec-106+67.36.A1.NAU

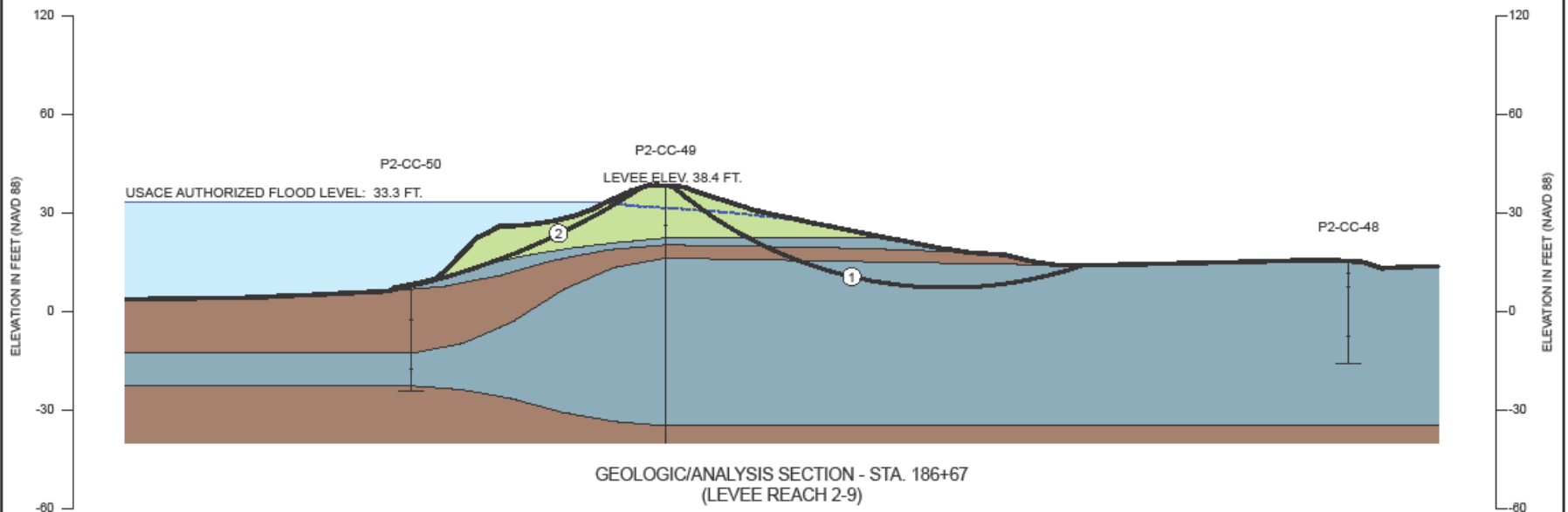
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.81	YES
2	1.68	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.3**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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PORTLAND, OREGON

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FIG. 9-2

2320\Flood Levels\Sec-186+67-500.AI.NAU

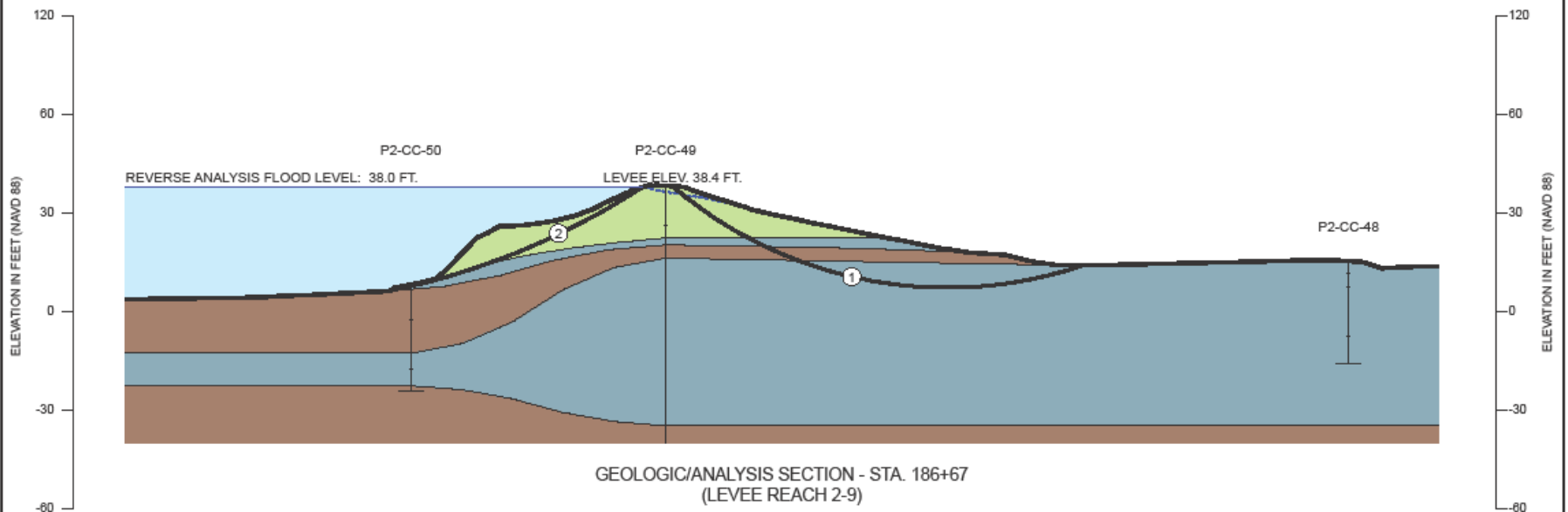
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.40	YES
2	1.79	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.3**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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REVERSE ANALYSIS
FLOOD LEVEL
PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320
FIG. 9-3

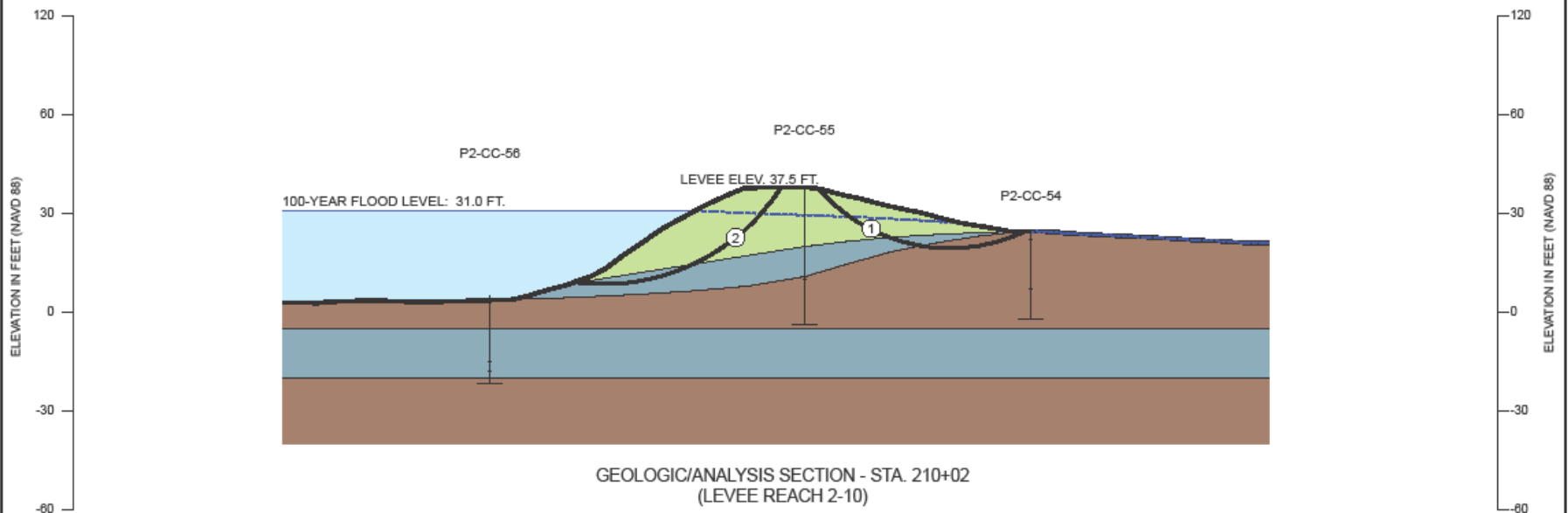
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	2.15	YES
2	1.40	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.1**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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**100 YEAR
FLOOD LEVEL**

PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320

FIG. 10-1

2320\Flood Levels\96c-210+02.47 AI.NAU

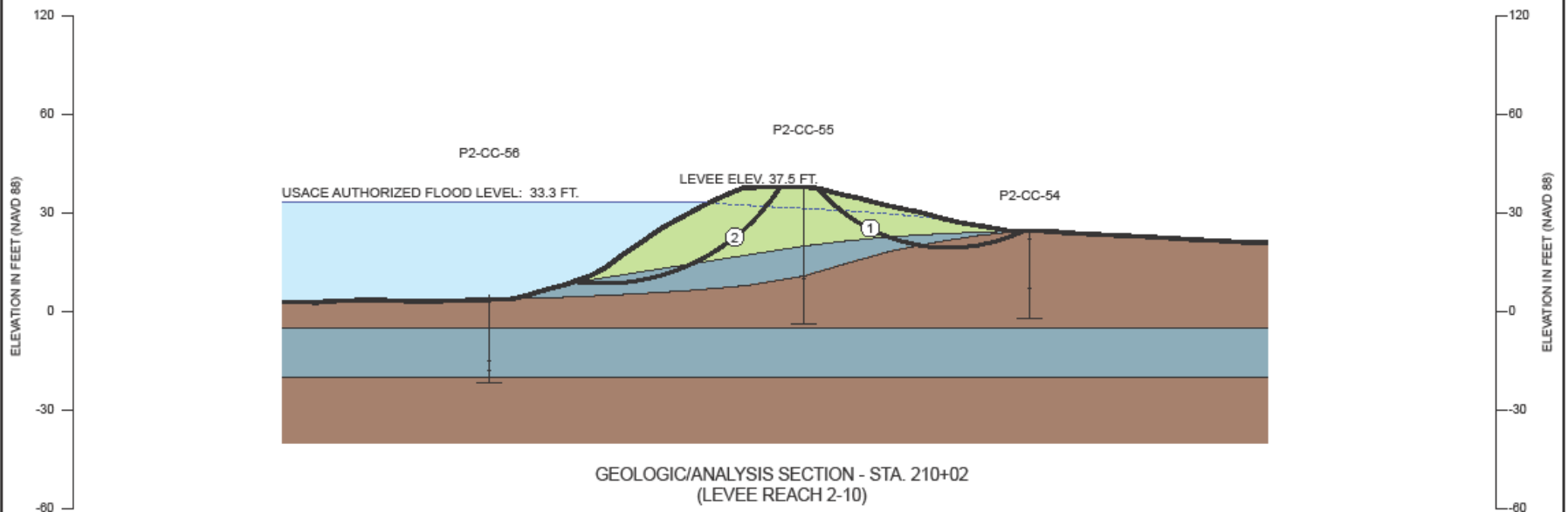
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.95	YES
2	1.47	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.4**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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PORTLAND, OREGON

JAN 2015
PROJ. 2320
FIG. 10-2

2320\Flood Levels\Sec-210+02-500.AI.NAU

- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

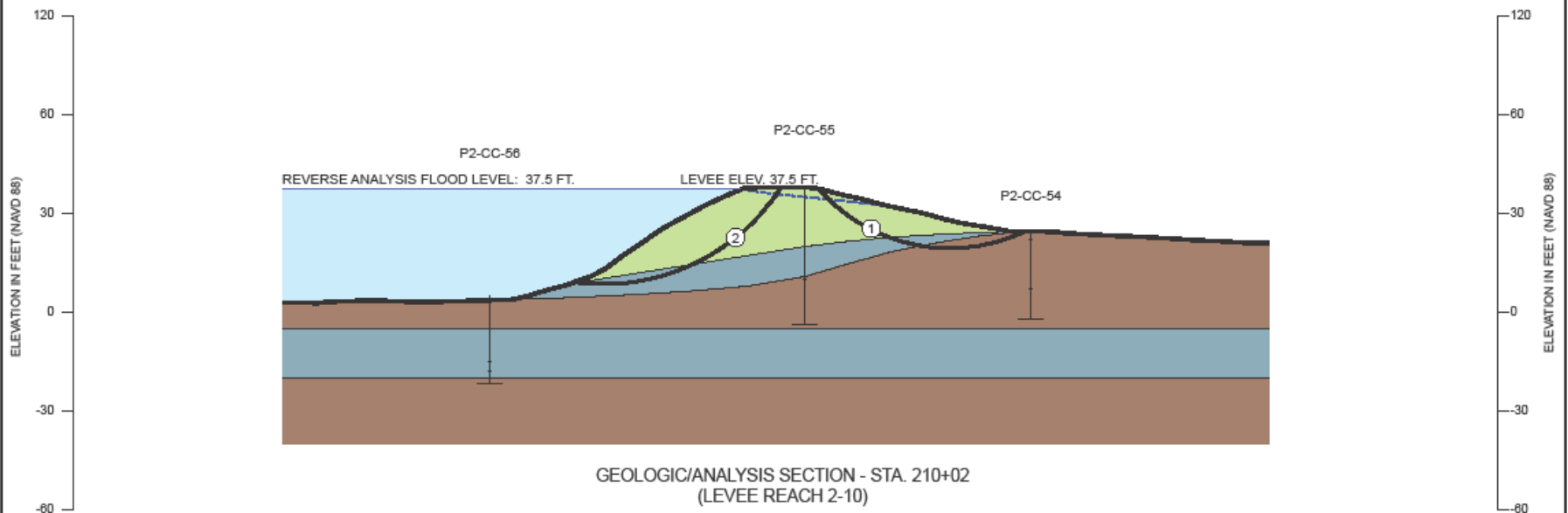
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.59	YES
2	1.56	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.5**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: RAISING FLOOD ELEVATION ABOVE 37.5 FT. OVERTOPS THE LEVEE.



0 30 60
SCALE IN FEET

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REVERSE ANALYSIS
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FIG. 10-3

2320\Flood Levels\Sec-210+02-RAI\NAU

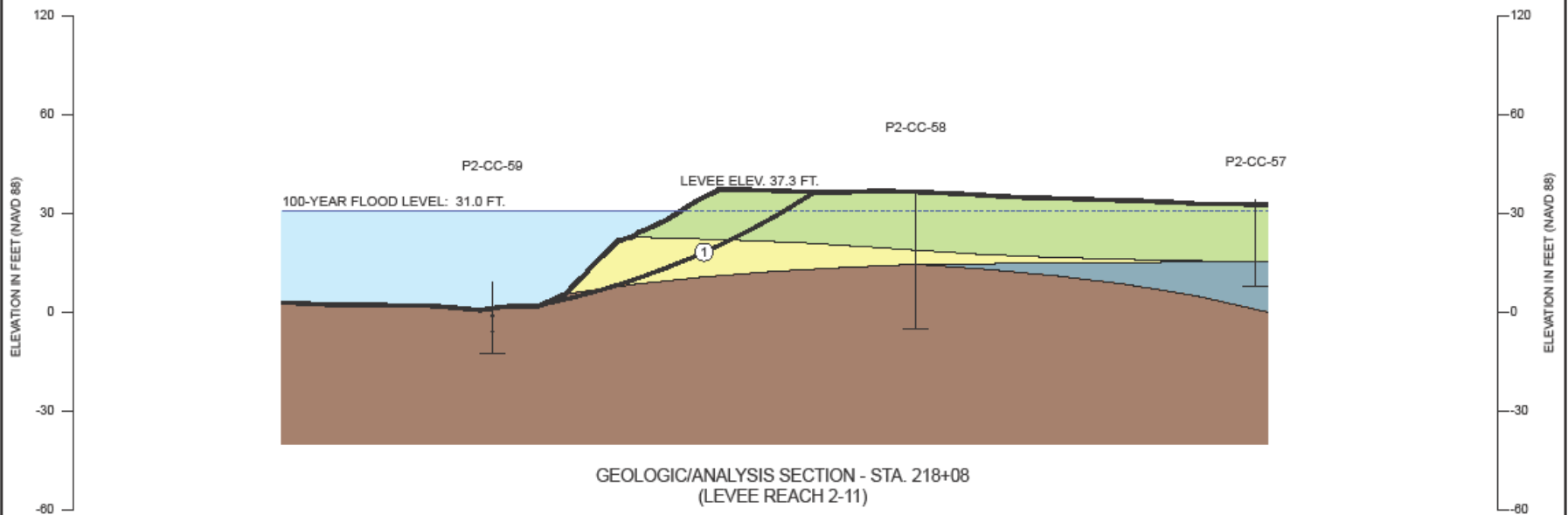
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.44	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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**100 YEAR
FLOOD LEVEL**

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PORTLAND, OREGON

JAN 2015
PROJ. 2320
FIG. 11-1

2320\Flood Levels\96c-218+08.46.AI.NAU

- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

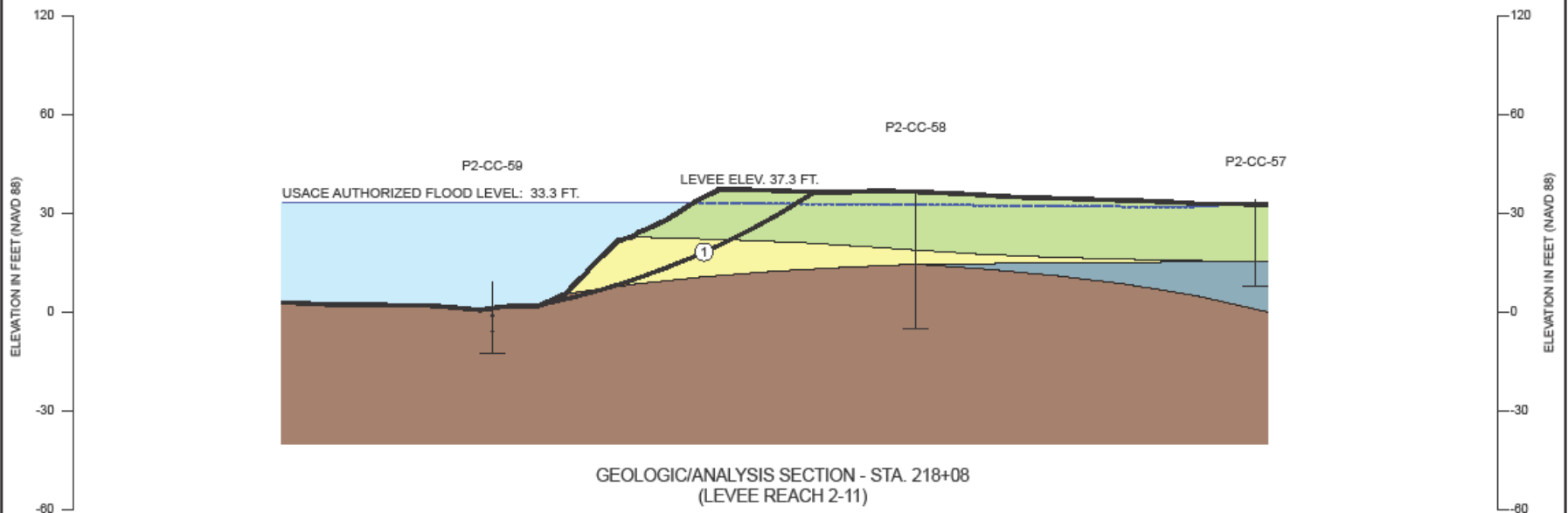
SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.44	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913

NOTE: NO REVERSE ANALYSIS CONDUCTED BECAUSE NO INBOARD SLIP SURFACE WAS ANALYZED.



0 30 60
SCALE IN FEET

GEOLOGIC/ANALYSIS SECTION - STA. 218+08
(LEVEE REACH 2-11)

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PORTLAND, OREGON

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FIG. 11-2

2320\Flood Levels\Sec-218+08-500.AI.NAU

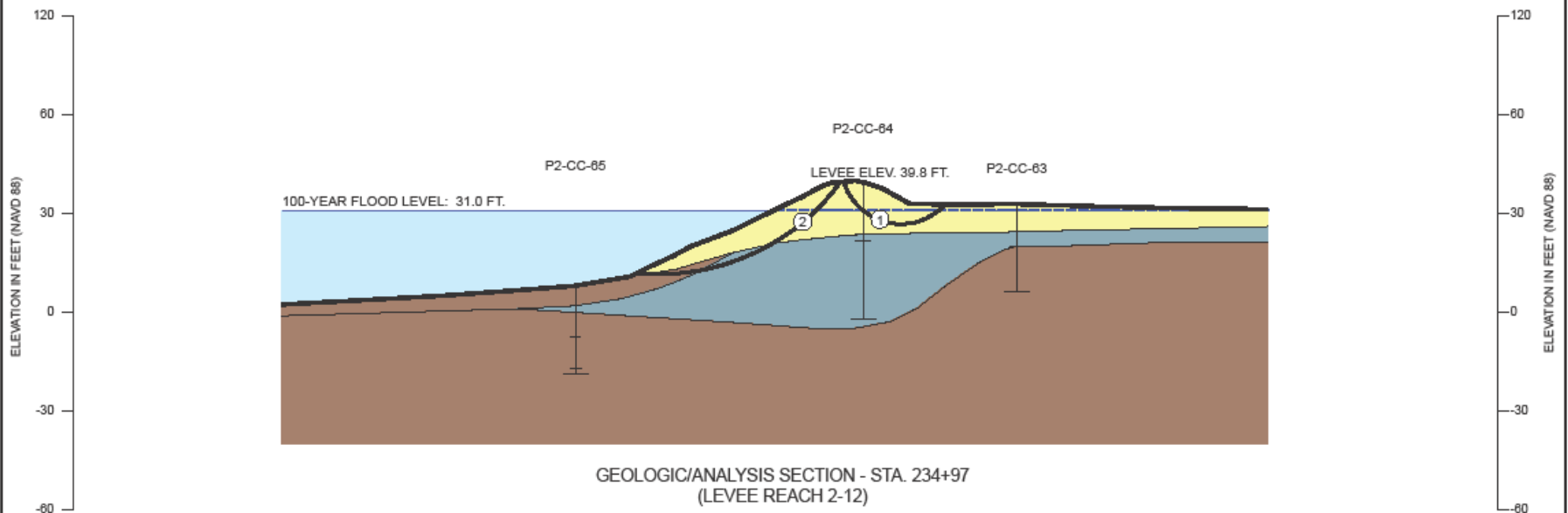
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	2.71	YES
2	1.41	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 234+97
(LEVEE REACH 2-12)

0 30 60
SCALE IN FEET

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100 YEAR FLOOD LEVEL
PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320
FIG. 12-1

2320\Flood Levels\Geo-234+97.30.AI.NAU

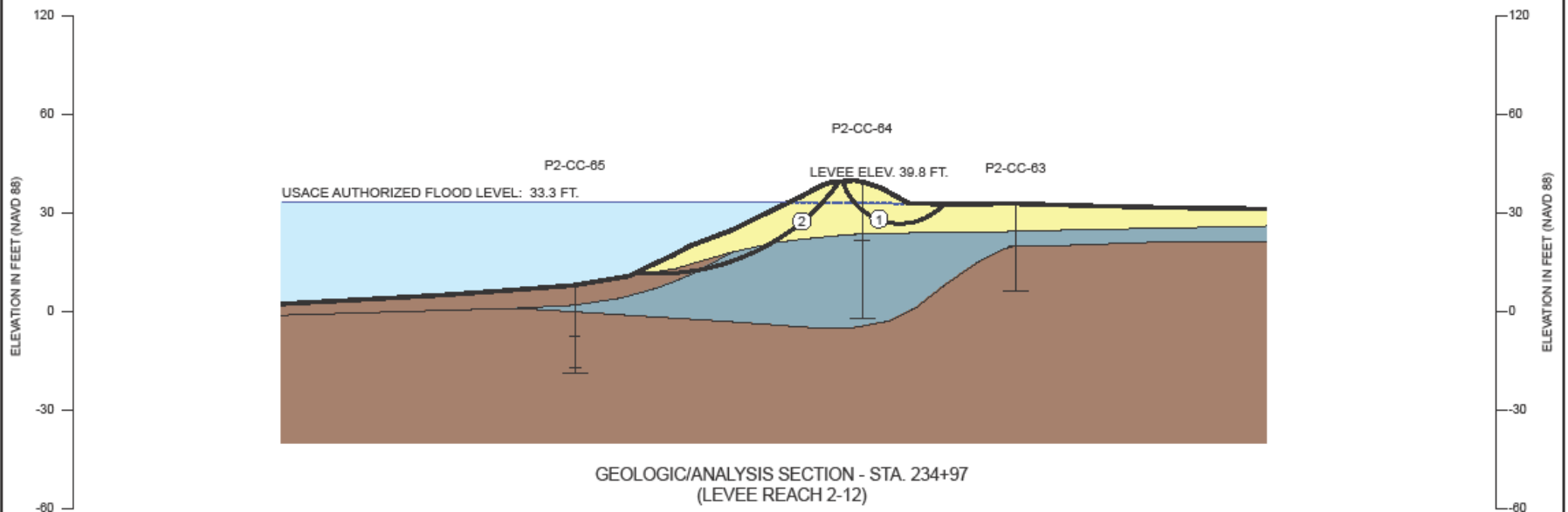
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	2.21	YES
2	1.50	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.1**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 234+97
(LEVEE REACH 2-12)

0 30 60
SCALE IN FEET

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USACE AUTHORIZED
FLOOD LEVEL

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PORTLAND, OREGON

JAN 2015
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FIG. 12-2

2320\Flood Levels\Sec-234+97-500.AI.NAU

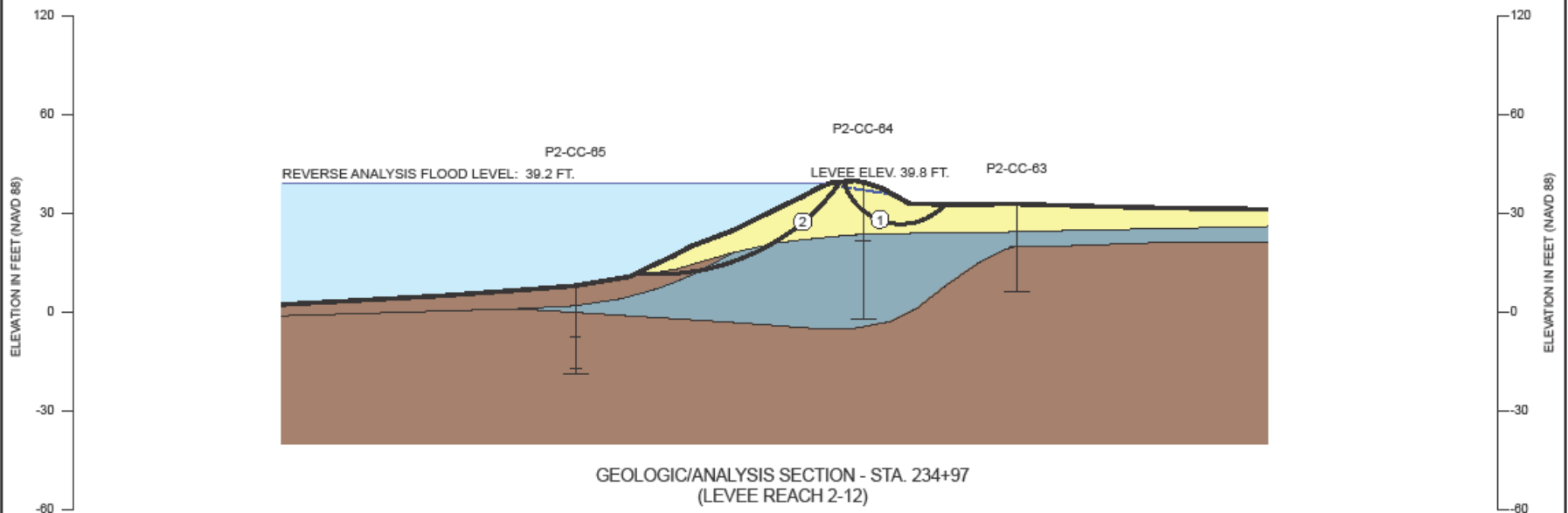
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.06	YES
2	1.83	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1013

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.5**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1013



GEOLOGIC/ANALYSIS SECTION - STA. 234+97
(LEVEE REACH 2-12)

0 30 60
SCALE IN FEET

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REVERSE ANALYSIS
FLOOD LEVEL
PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320
FIG. 12-3

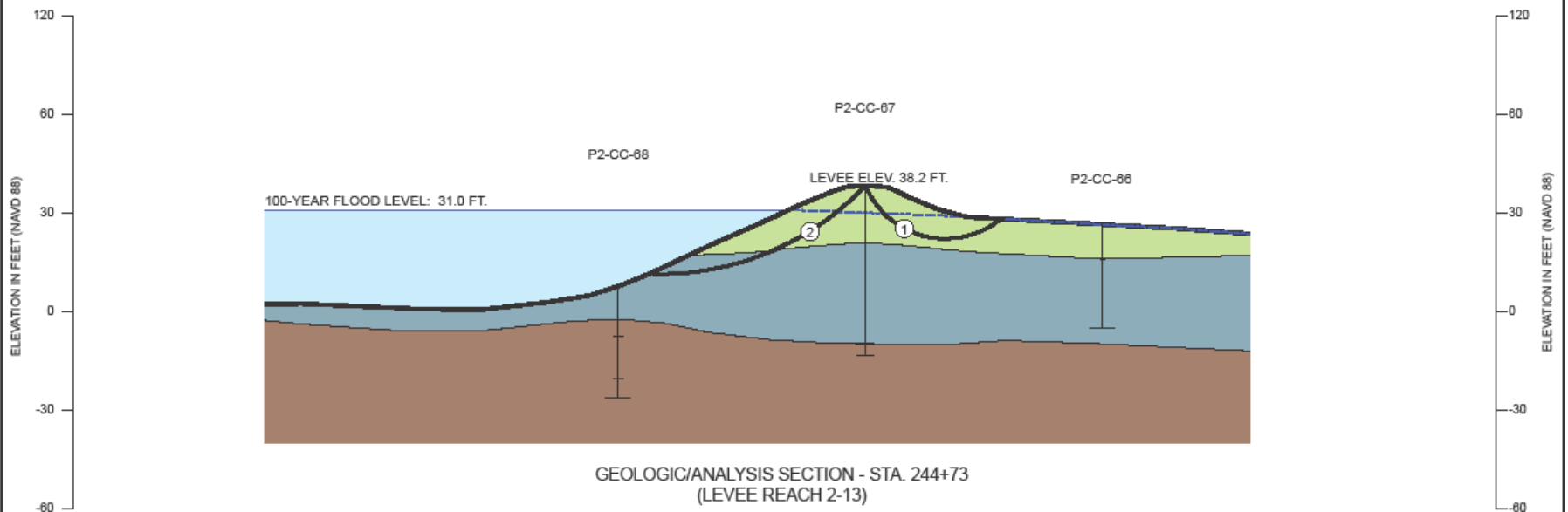
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	2.00	YES
2	1.53	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.0**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 244+73
(LEVEE REACH 2-13)

0 30 60
SCALE IN FEET

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100 YEAR
FLOOD LEVEL

PENINSULA 2 LEVEE ASSESSMENT
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FIG. 13-1

2320\Flood Levels\Sec-244+72.86.AI.NAU

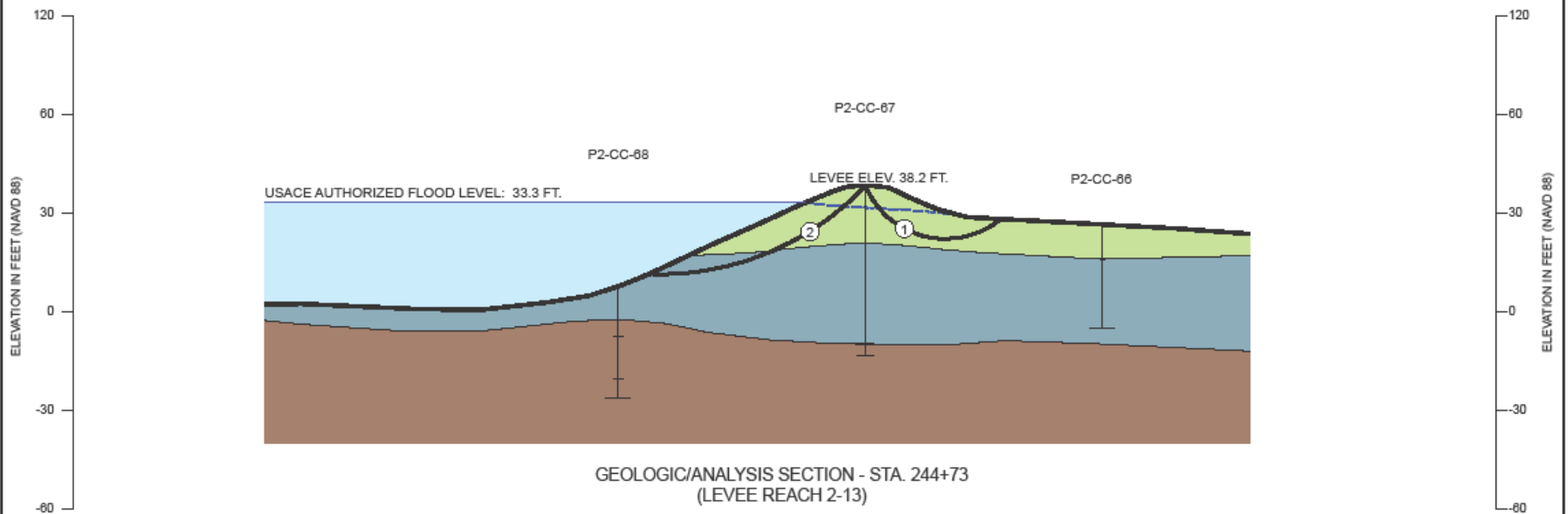
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.62	YES
2	1.62	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.2**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 244+73
(LEVEE REACH 2-13)

0 30 60
SCALE IN FEET

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USACE AUTHORIZED
FLOOD LEVEL

PENINSULA 2 LEVEE ASSESSMENT
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FIG. 13-2

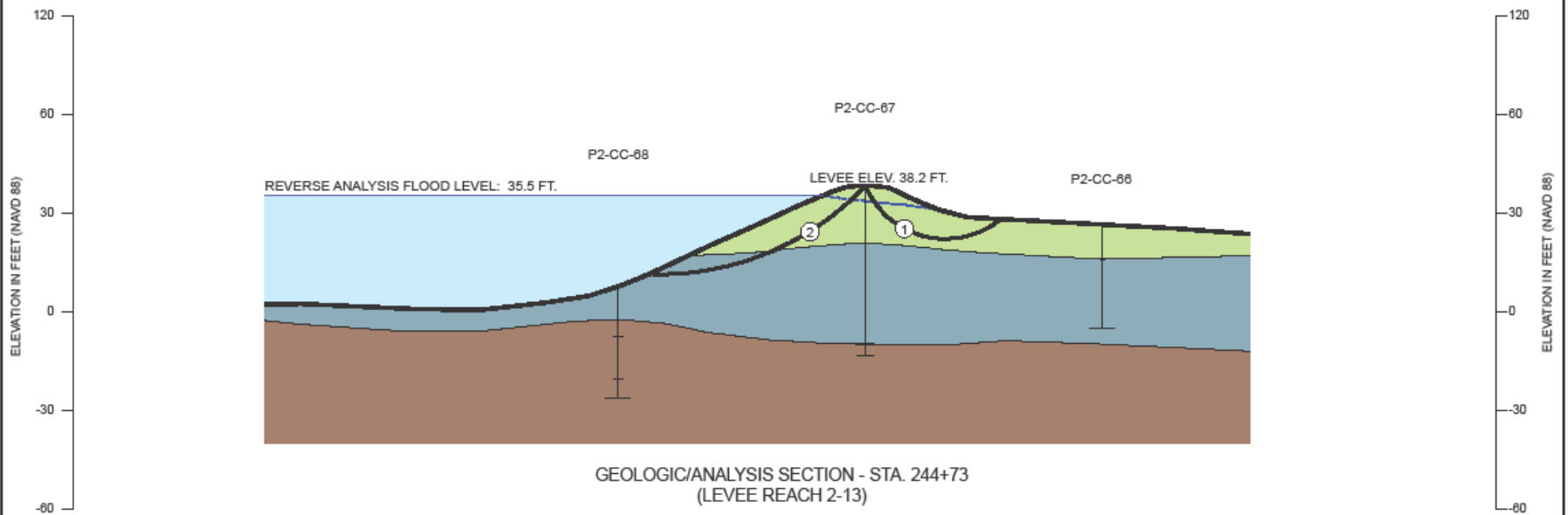
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.40	YES
2	1.75	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.3**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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REVERSE ANALYSIS
FLOOD LEVEL

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FIG. 13-3

2320\Flood Levels\Sec-244+73-RAAI.NAU

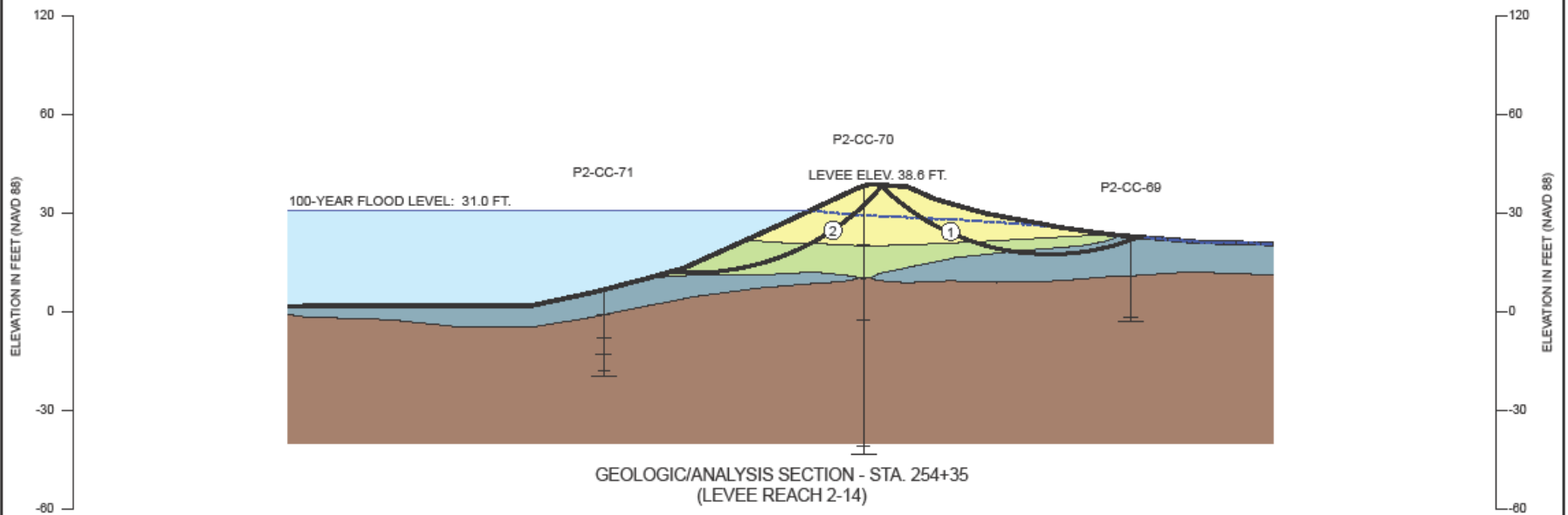
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.88	YES
2	1.49	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.1**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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100 YEAR FLOOD LEVEL
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PORTLAND, OREGON

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FIG. 14-1

2320\Flood Levels\Sec-254+35.37AI.NAU

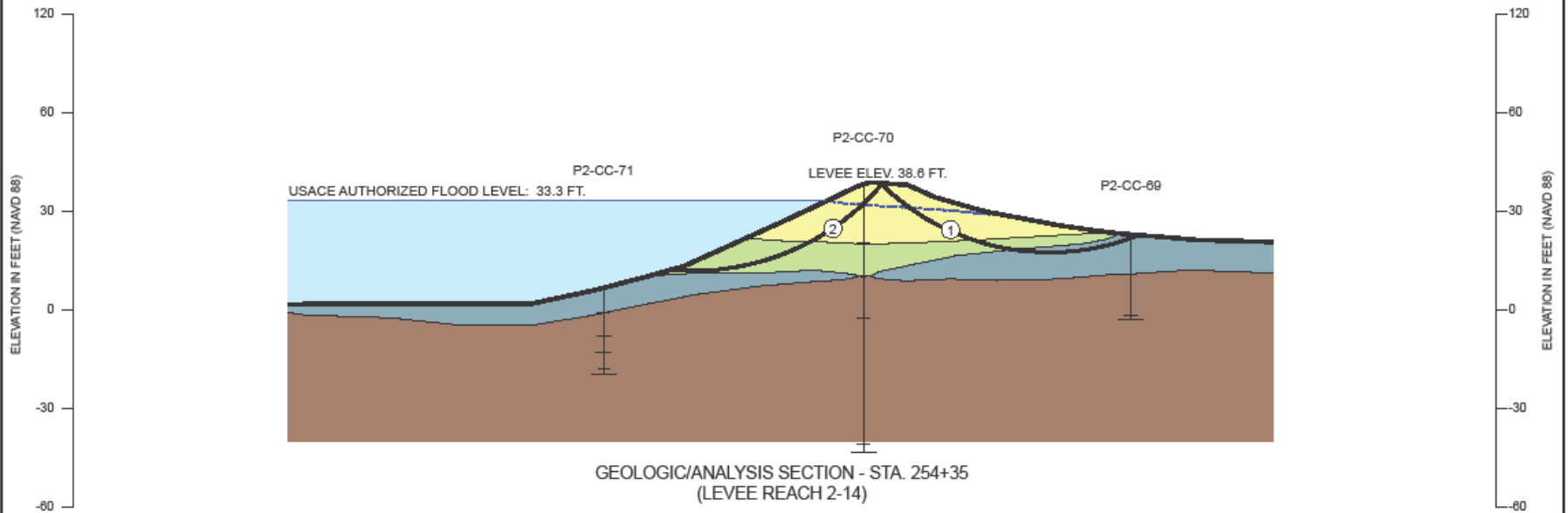
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.87	YES
2	1.59	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.2**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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USACE AUTHORIZED
FLOOD LEVEL
PENINSULA 2 LEVEE ASSESSMENT
PORTLAND, OREGON

JAN 2015
PROJ. 2320
FIG. 14-2

2320\Flood Levels\Sec-254+35-500.AI.NAU

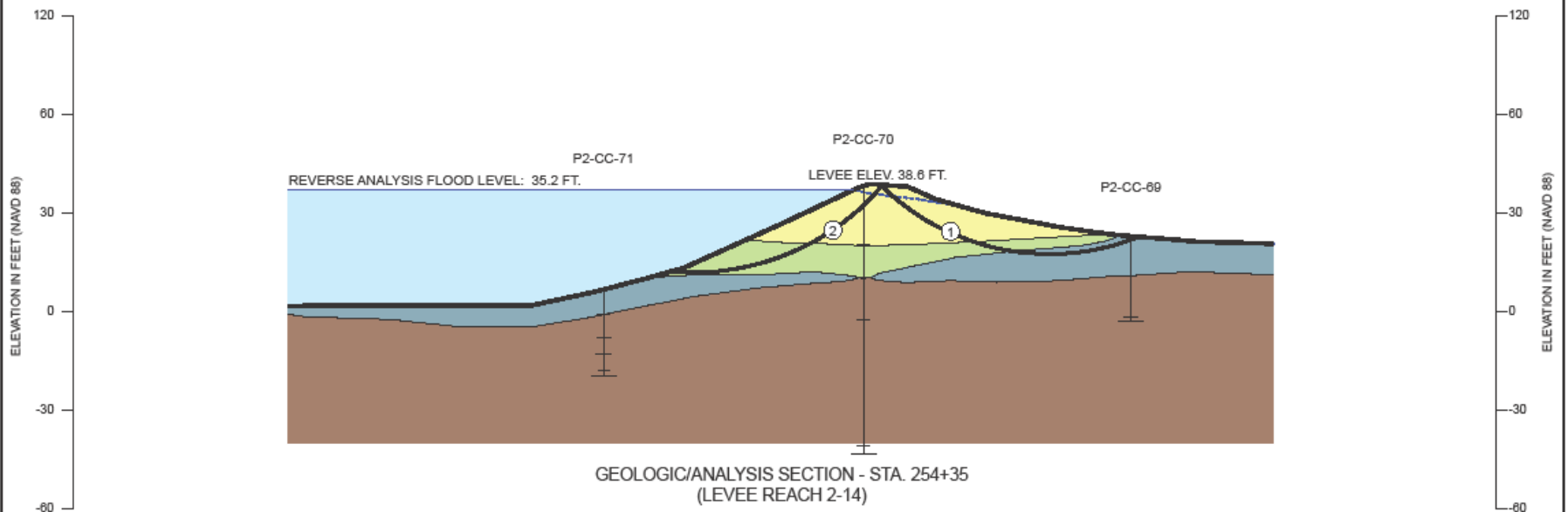
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.40	YES
2	1.85	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.3**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



GEOLOGIC/ANALYSIS SECTION - STA. 254+35
(LEVEE REACH 2-14)

0 30 60
SCALE IN FEET

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FLOOD LEVEL

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PORTLAND, OREGON

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FIG. 14-3

2320\Flood Levels\Sec-254+35-RA\AI\NAU

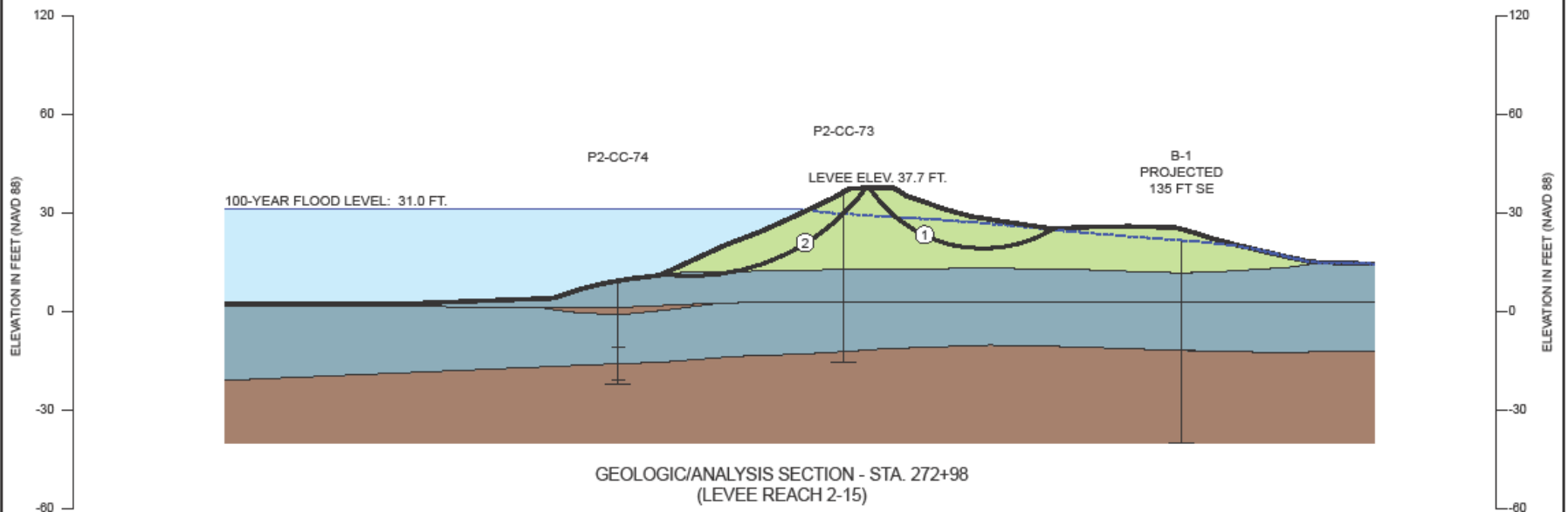
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.97	YES
2	1.71	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.2**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

GEOLOGIC/ANALYSIS SECTION - STA. 272+98
(LEVEE REACH 2-15)

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100 YEAR
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FIG. 15-1

2320\Flood Levels\Sec-272+98.45.A1.NAU

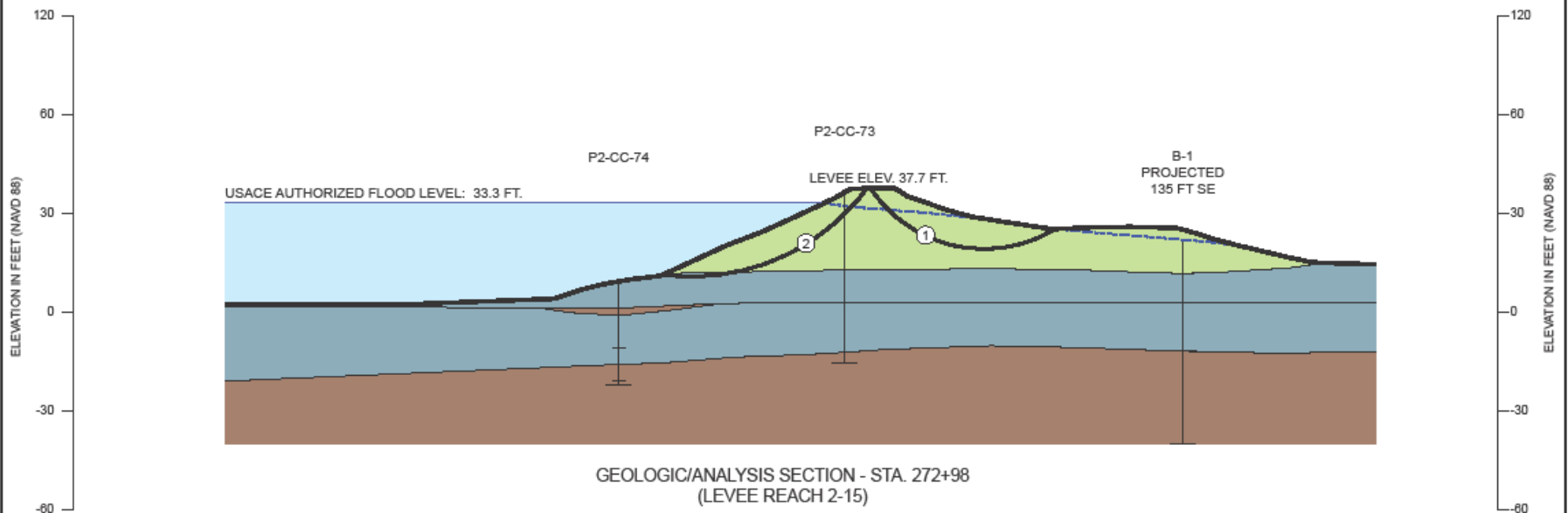
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.87	YES
2	1.85	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.3**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



0 30 60
SCALE IN FEET

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FIG. 15-2

2320\Flood Levels\Sec-272+98-500.AI.NAU

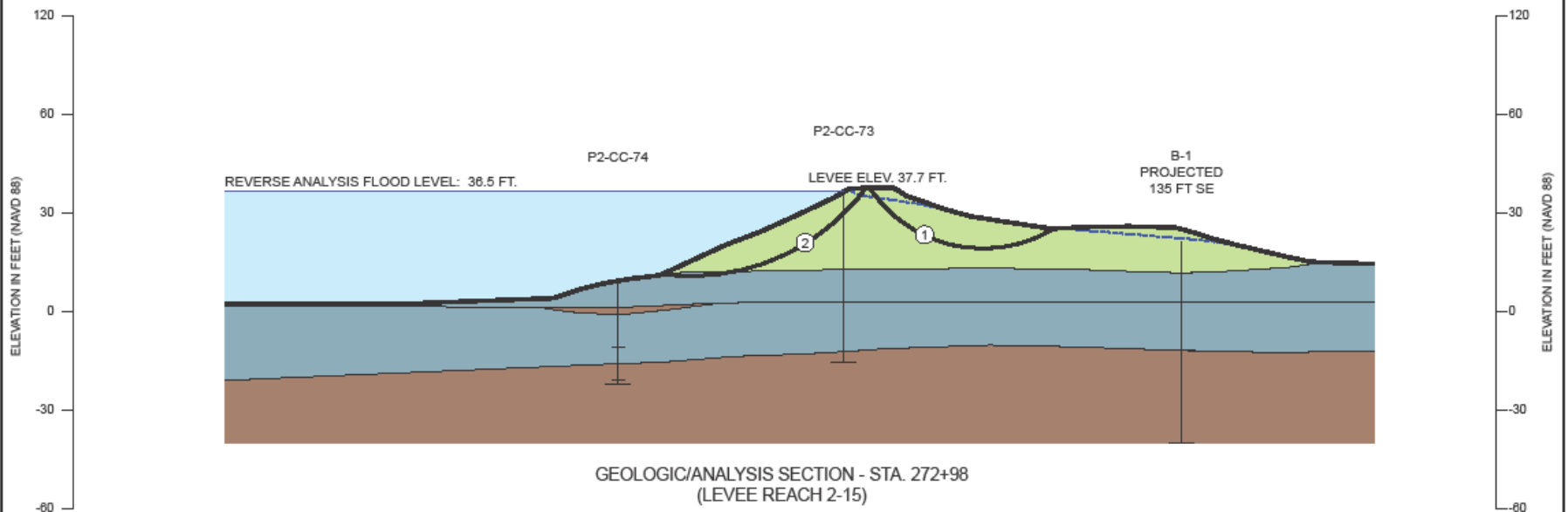
- Embankment Soft, slightly clayey to clayey SILT
- Embankment Loose, silty SAND to sandy SILT
- Foundation Loose, silty SAND and sandy SILT (Alluvium)
- Foundation Soft, clayey SILT to silty CLAY (Alluvium)

SLIP SURFACE	CALCULATED FS	MEETS REQUIRED FS*
1	1.40	YES
2	2.02	YES

*MINIMUM ALLOWABLE FS=1.4, USACE, EM 1110-2-1913

CALCULATED EXIT GRADIENT AT TOE OF LANDWARD SLOPE = 0.3**

**RECOMMENDED MAXIMUM EXIT GRADIENT = 0.5, USACE, EM 1110-2-1913



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FIG. 15-3

2320\Flood Levels\Sec-272+98-RAI\NAU