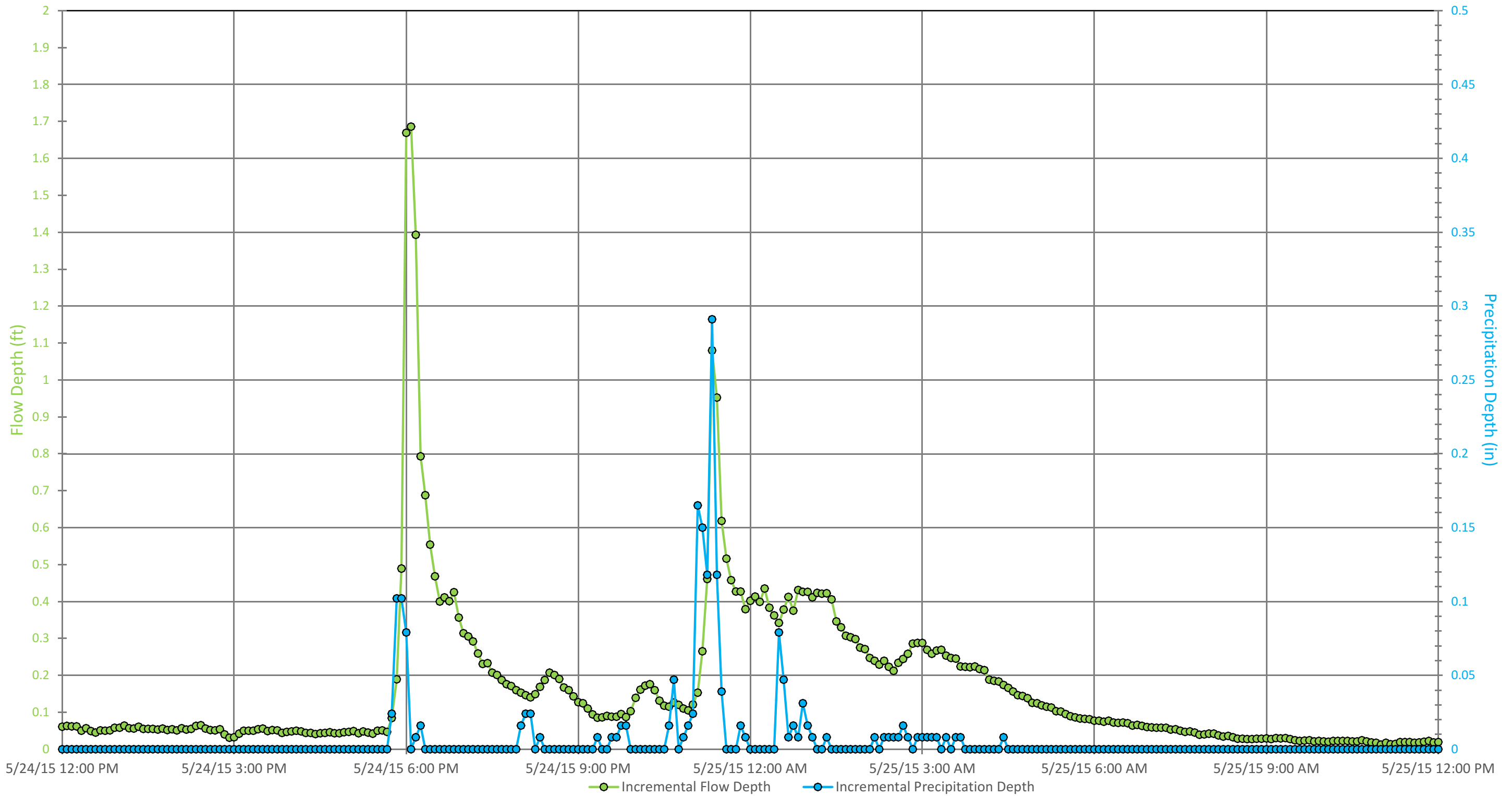

APPENDIX C

CALIBRATION GRAPHS

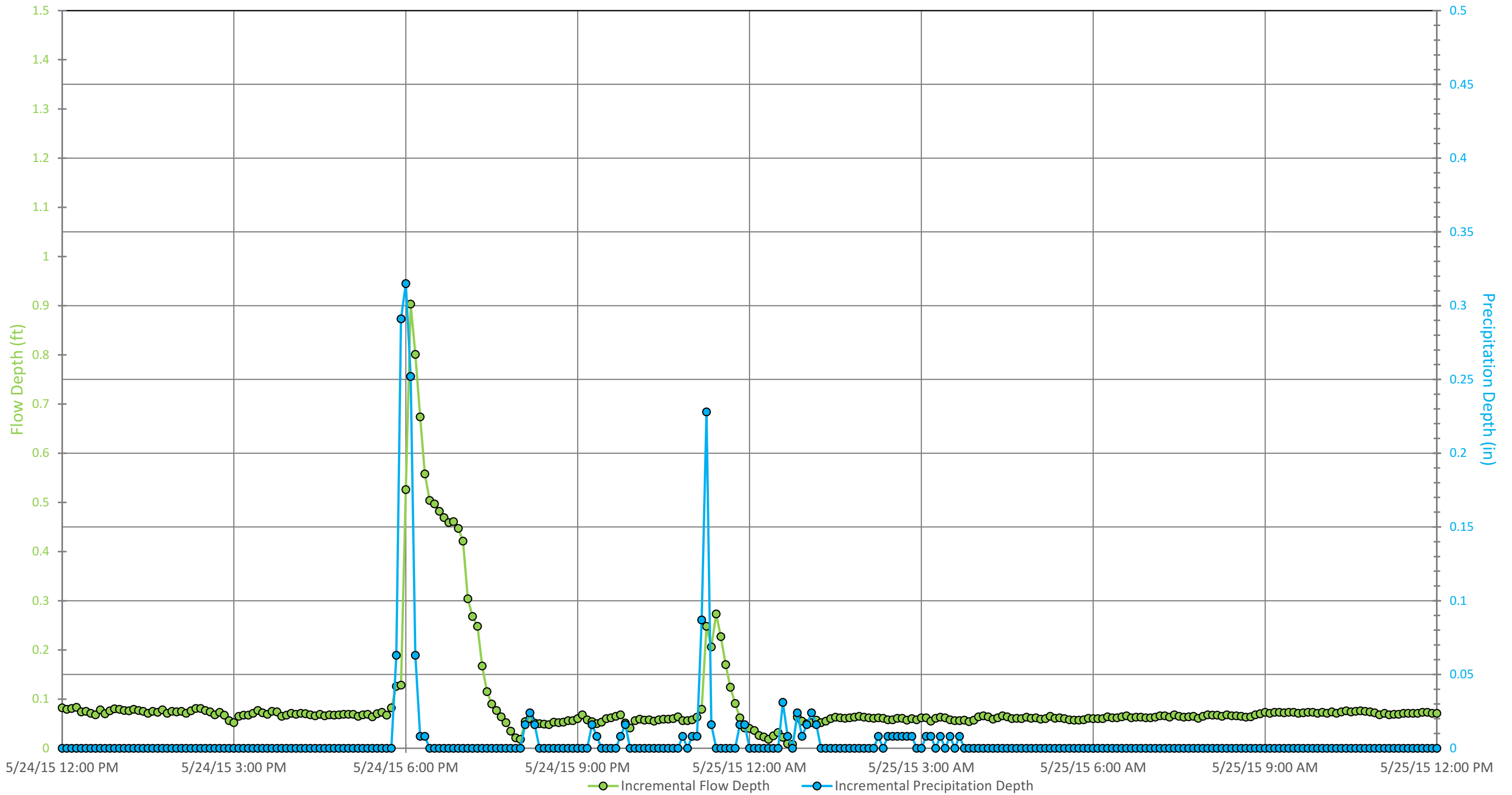
GRAPH 1: EM28453 & RSG01: 05/24/2015 - 05/25/2015

EM28453 Weaver Park Rainfall & RSG01 Flow Depth 05/24/2015 - 05/25/2015



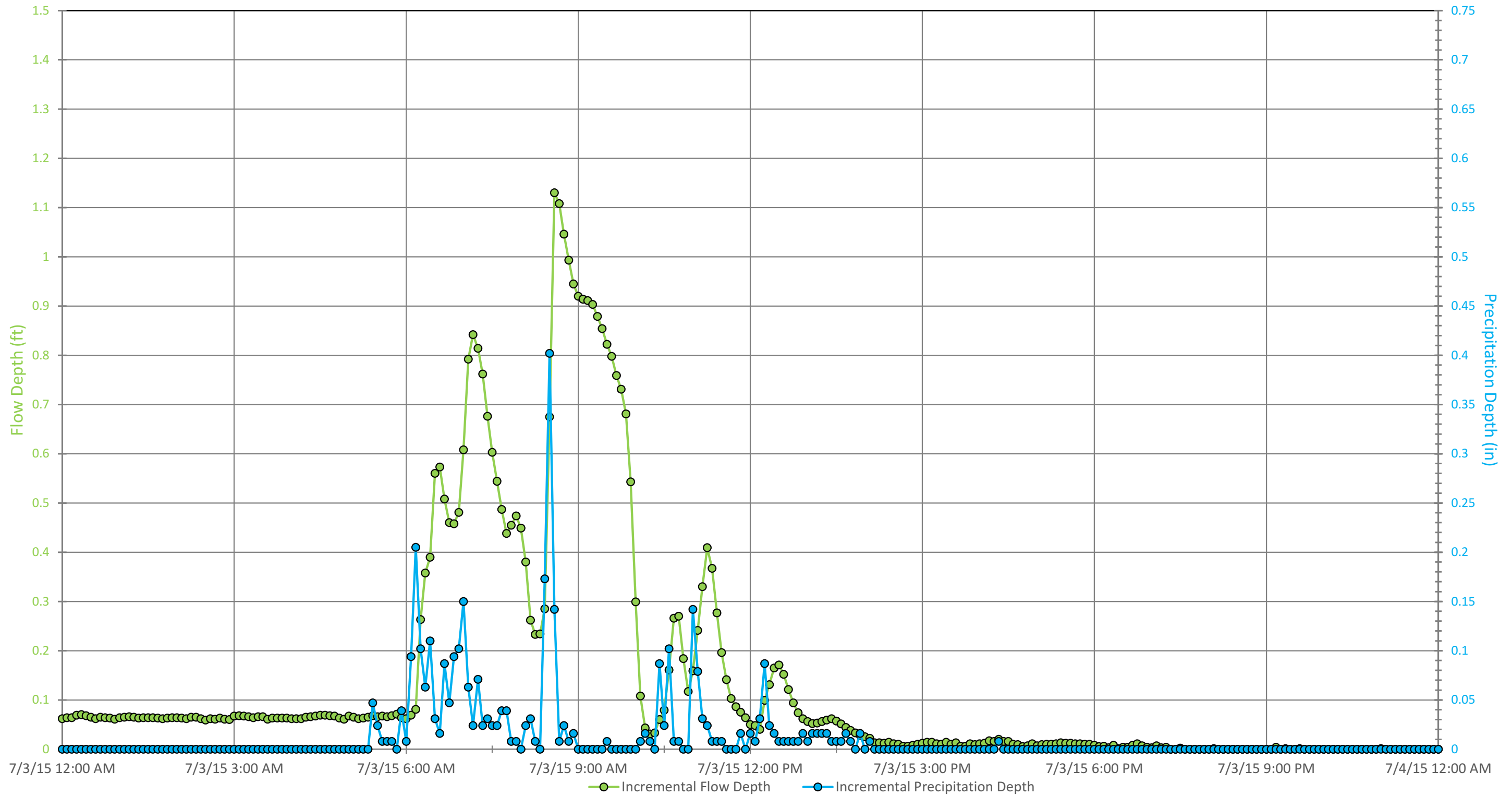
GRAPH 2: EM28454 & SSG02: 05/24/2015 - 05/25/2015

EM28454 Memphis Fire Station No. 36 Rainfall & SSG02 Flow Depth 05/24/2015 - 05/25/2015



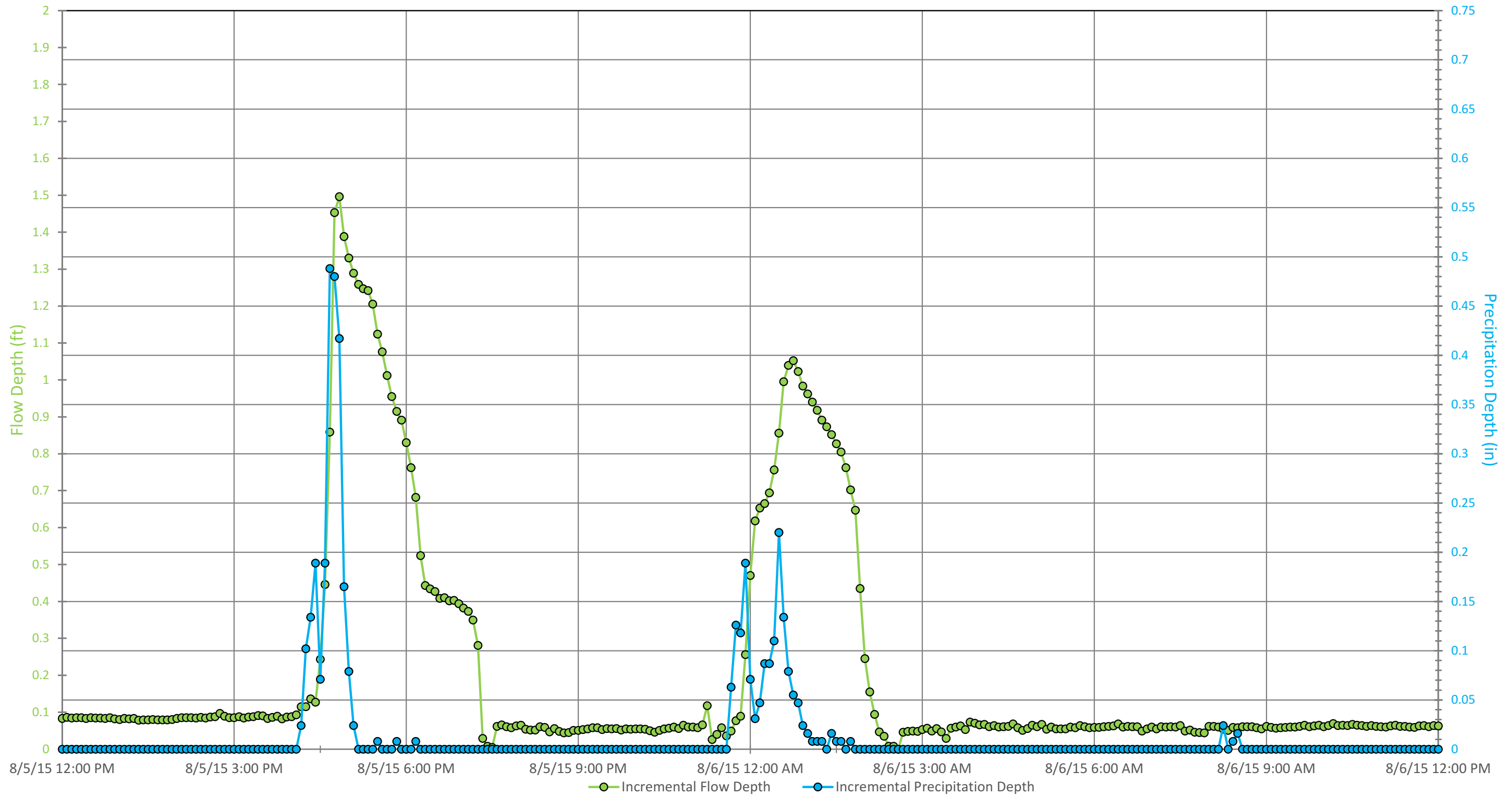
GRAPH 3: EM28454 & SSG02: 07/03/2015 - 07/04/2015

EM28454 Memphis Fire Station No. 36 Rainfall & SSG02 Flow Depth 07/03/2015 - 07/04/2015

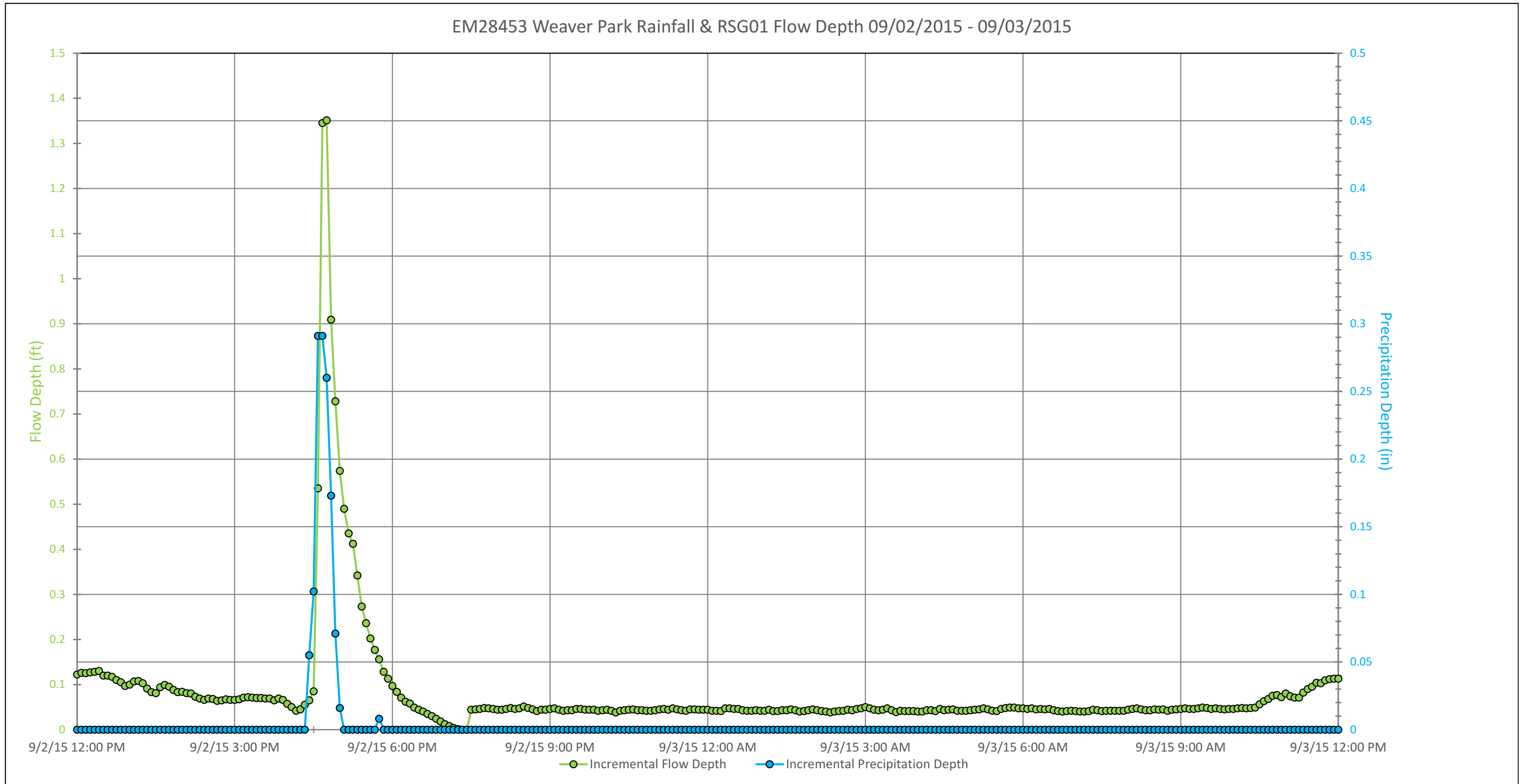


GRAPH 4: EM28454 & SSG02: 08/05/2015 - 058/06/2015

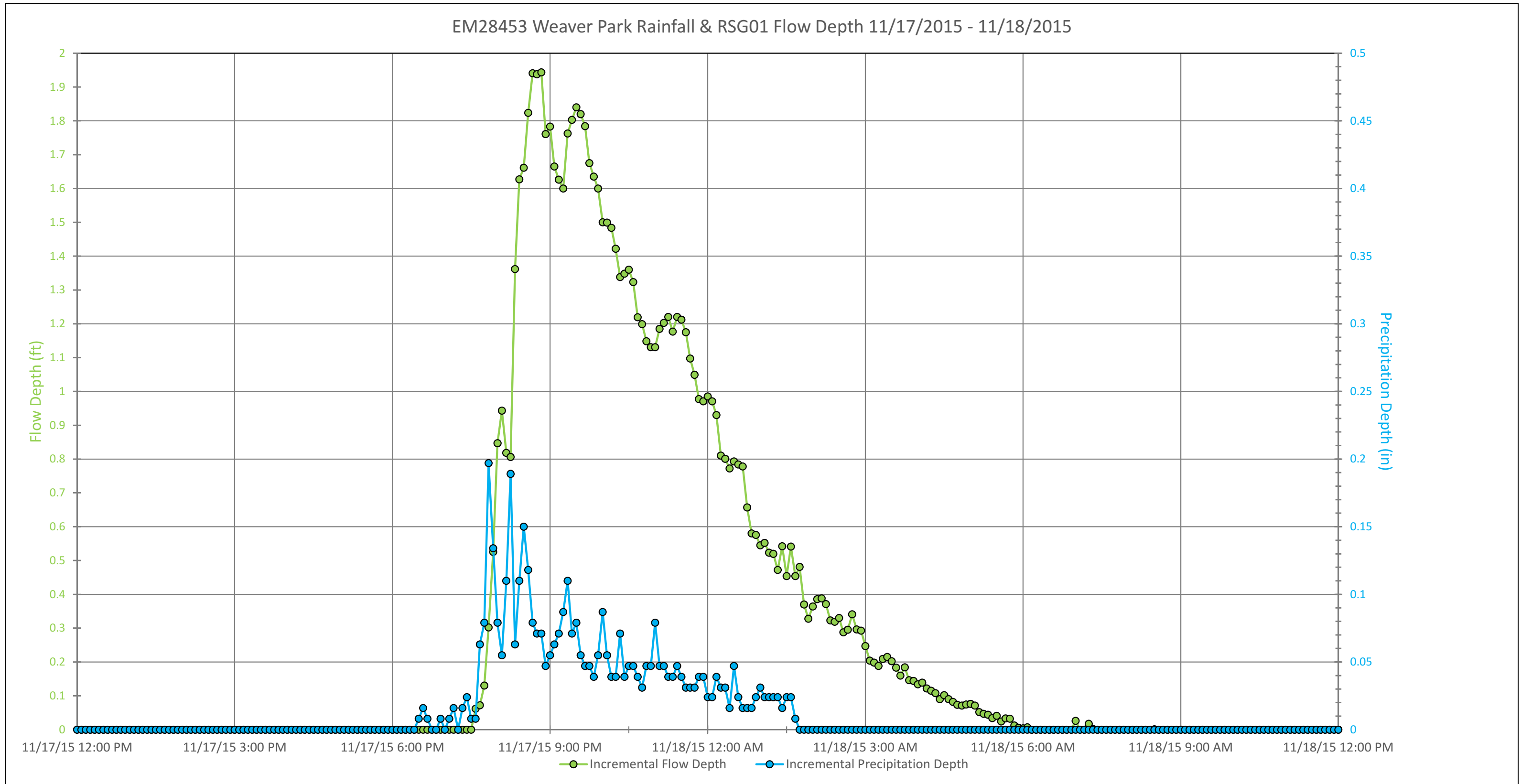
EM28454 Memphis Fire Station No. 36 Rainfall & SSG02 Flow Depth 08/05/2015 - 08/06/2015



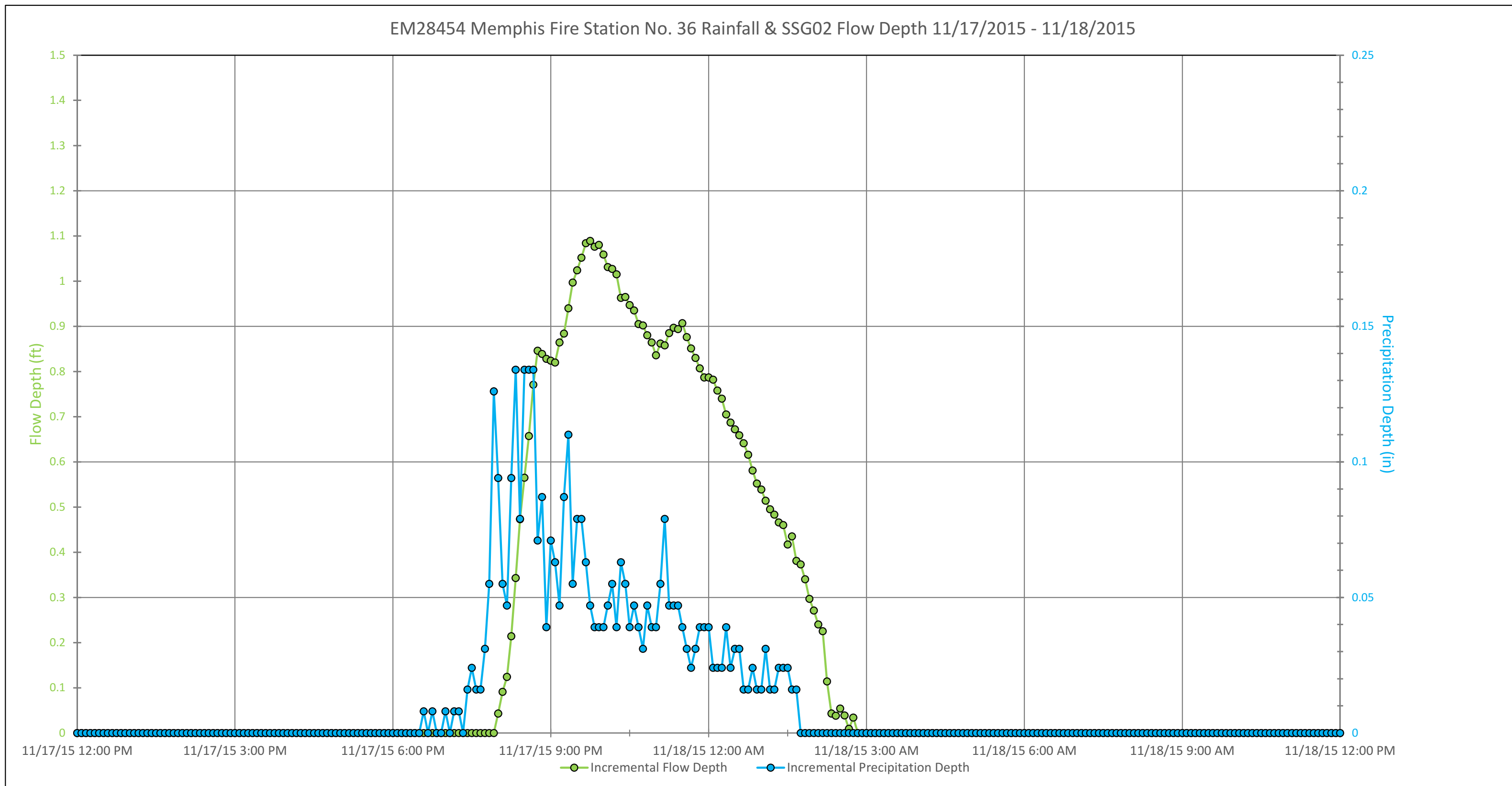
GRAPH 5: EM28453 & RSG01: 09/02/2015 - 09/03/2015



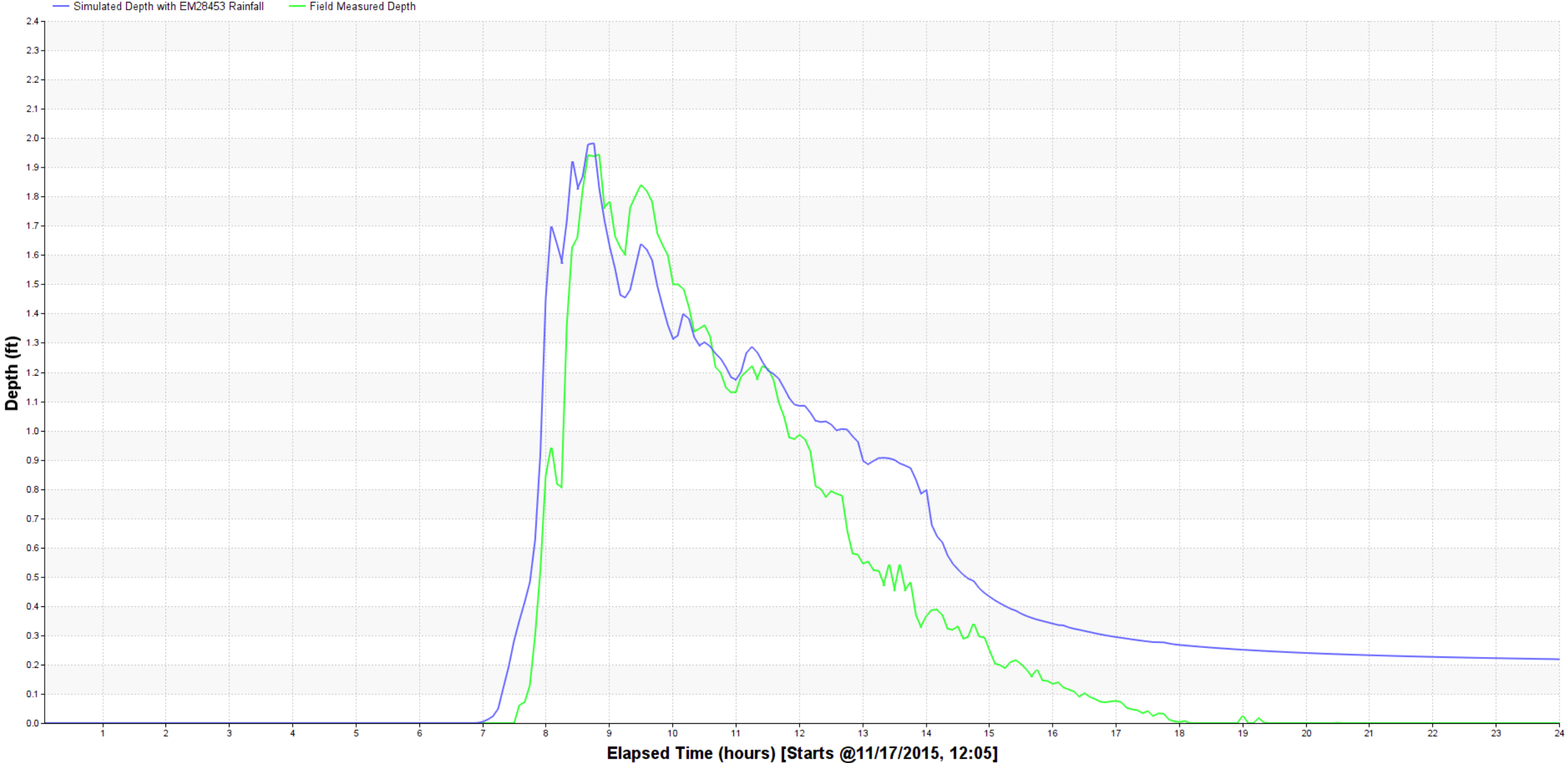
GRAPH 6: EM28453 & RSG01: 11/17/2015 - 11/18/2015



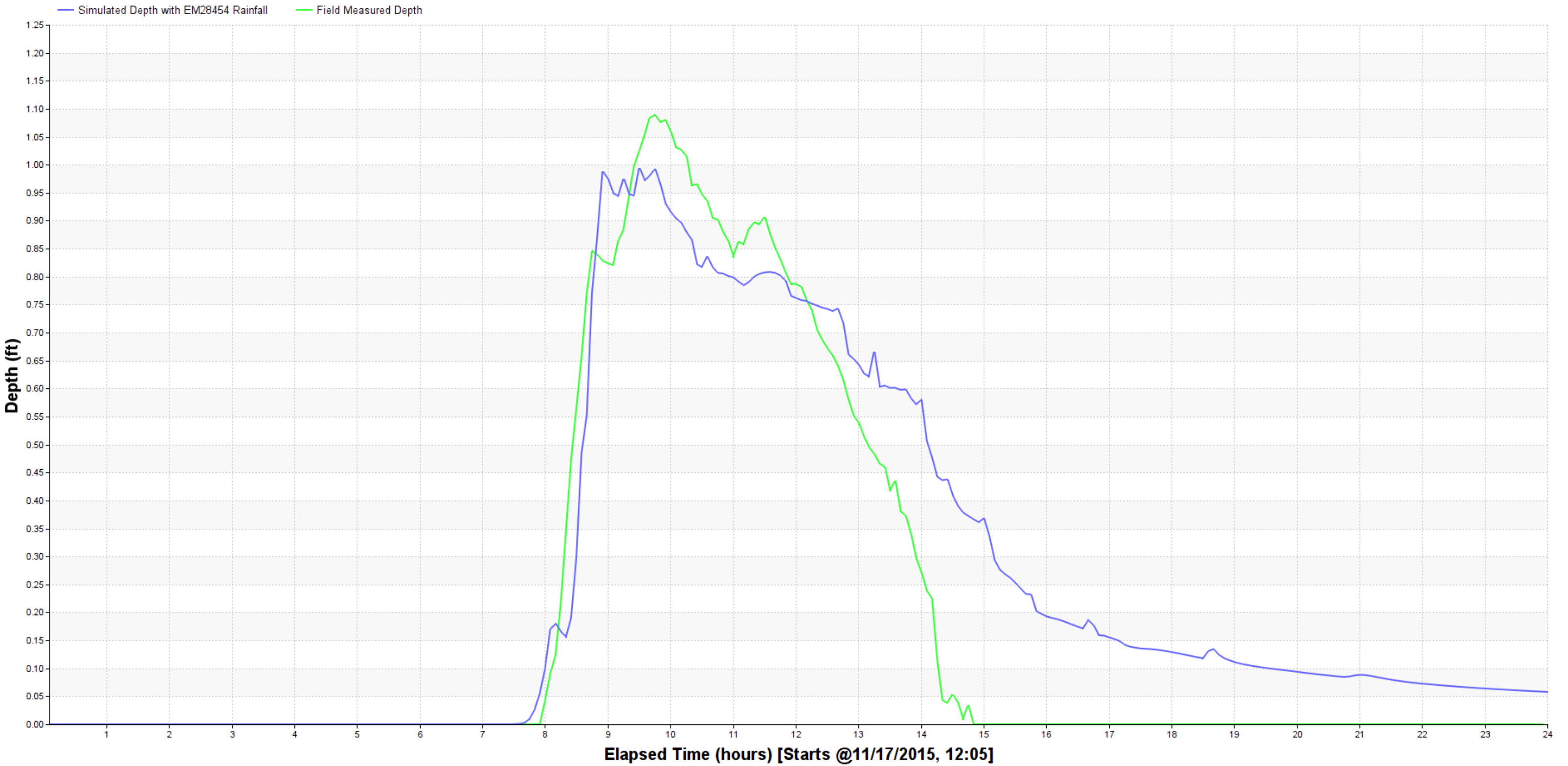
GRAPH 7: EM28454 & SSG02: 11/17/2015 - 11/18/2015



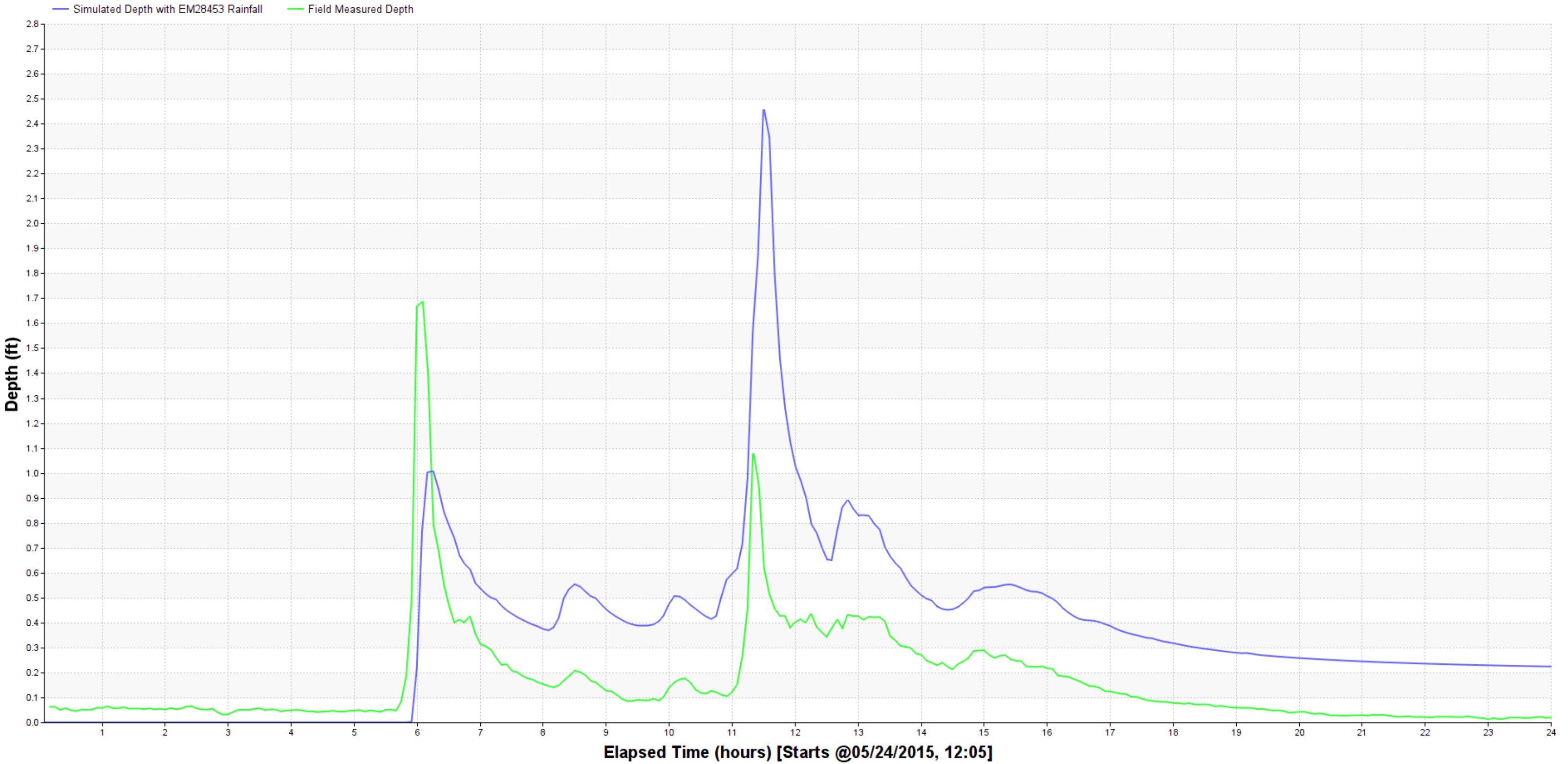
Calibration: Conduit 0604_RSG01, EM28453 Rainfall 11/17/2015 - 11/18/2015



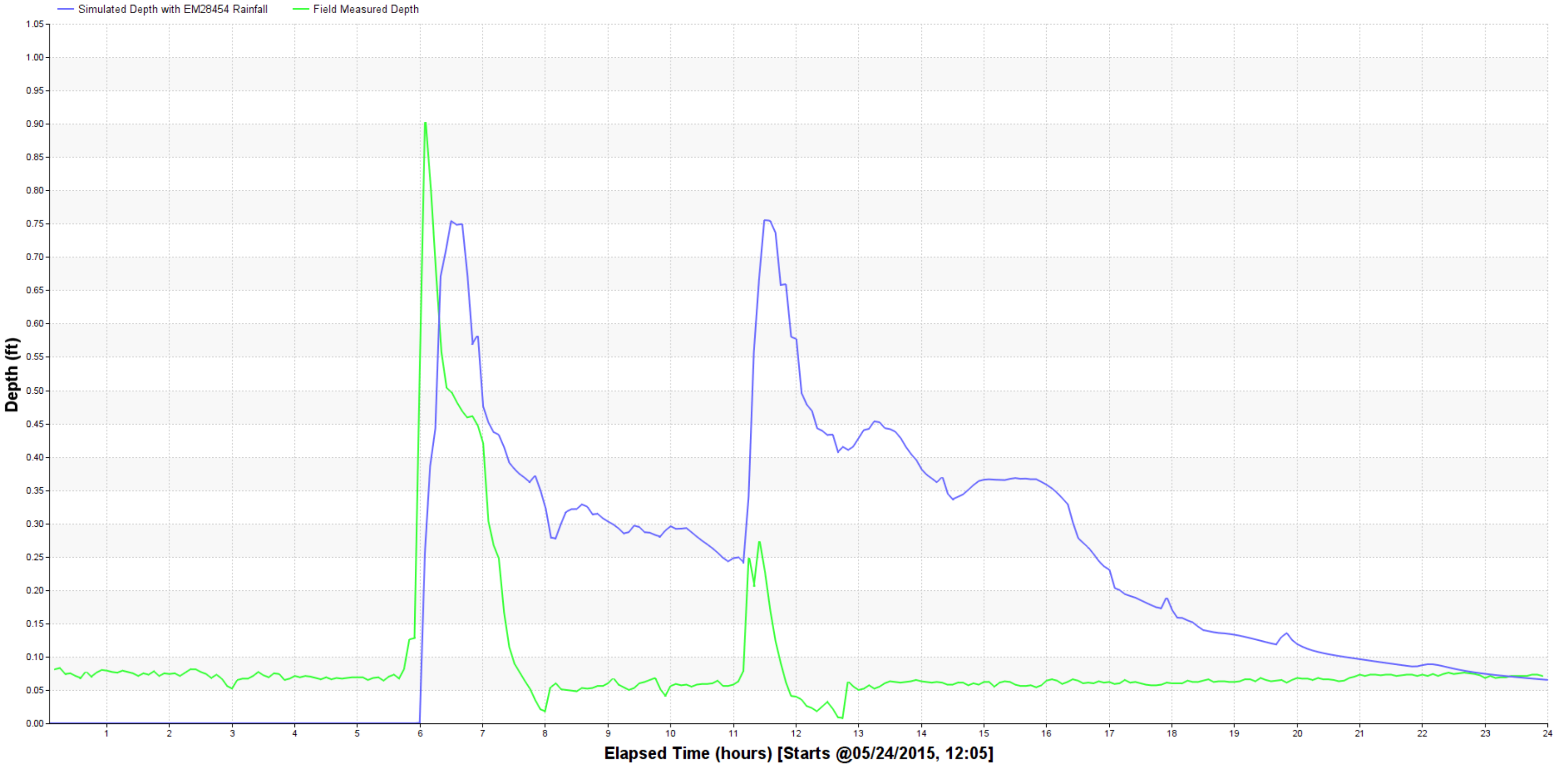
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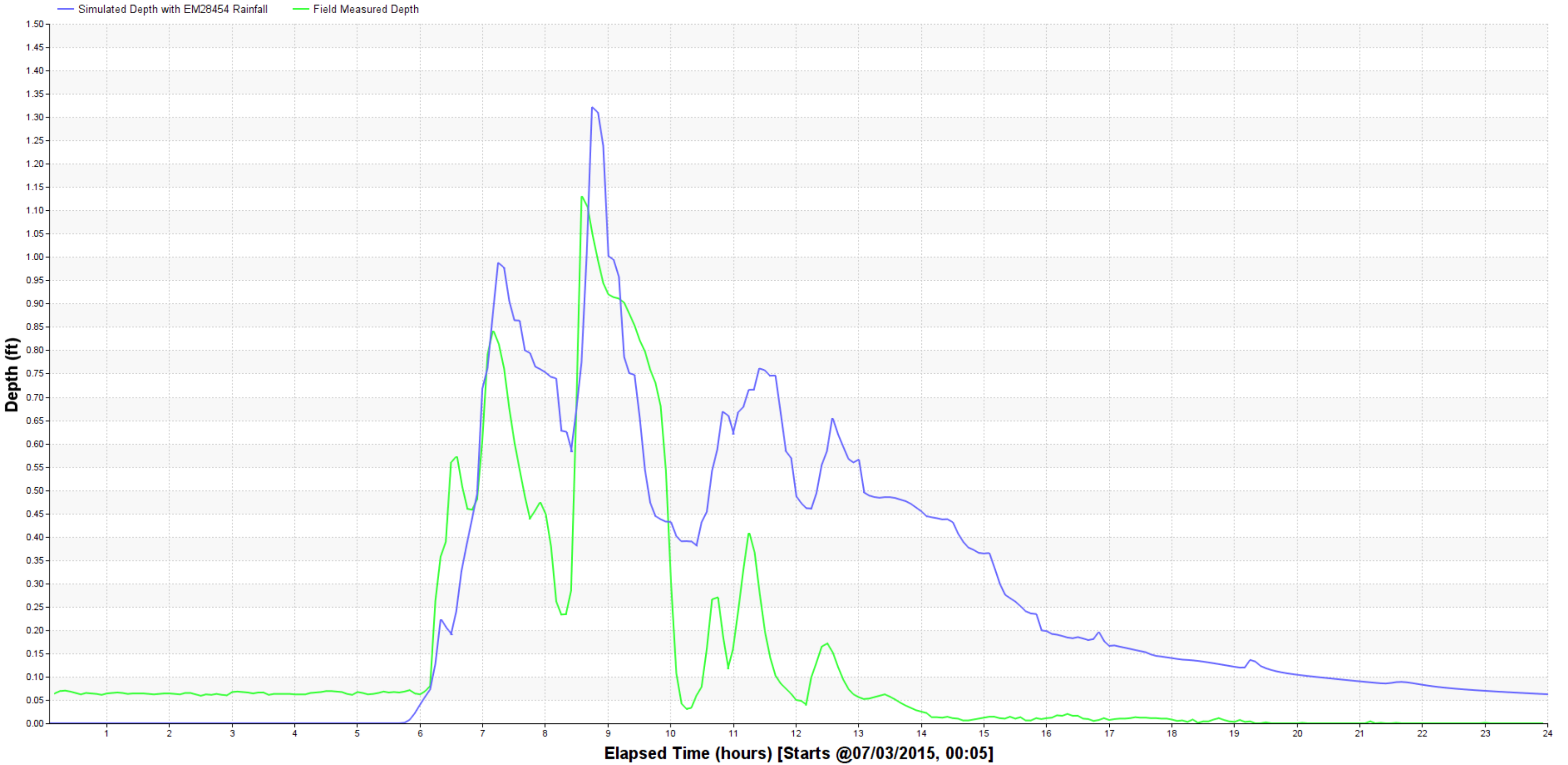
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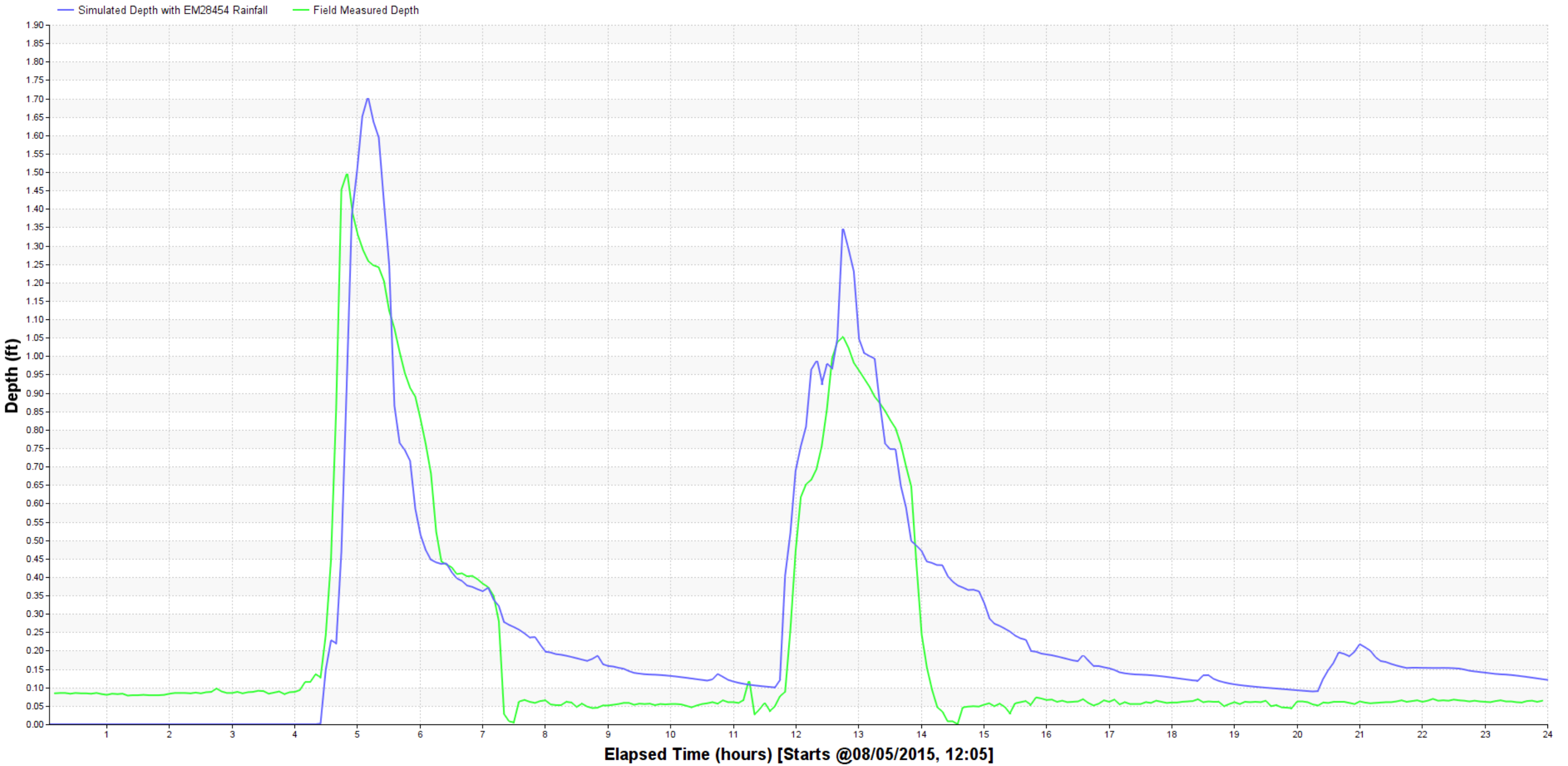
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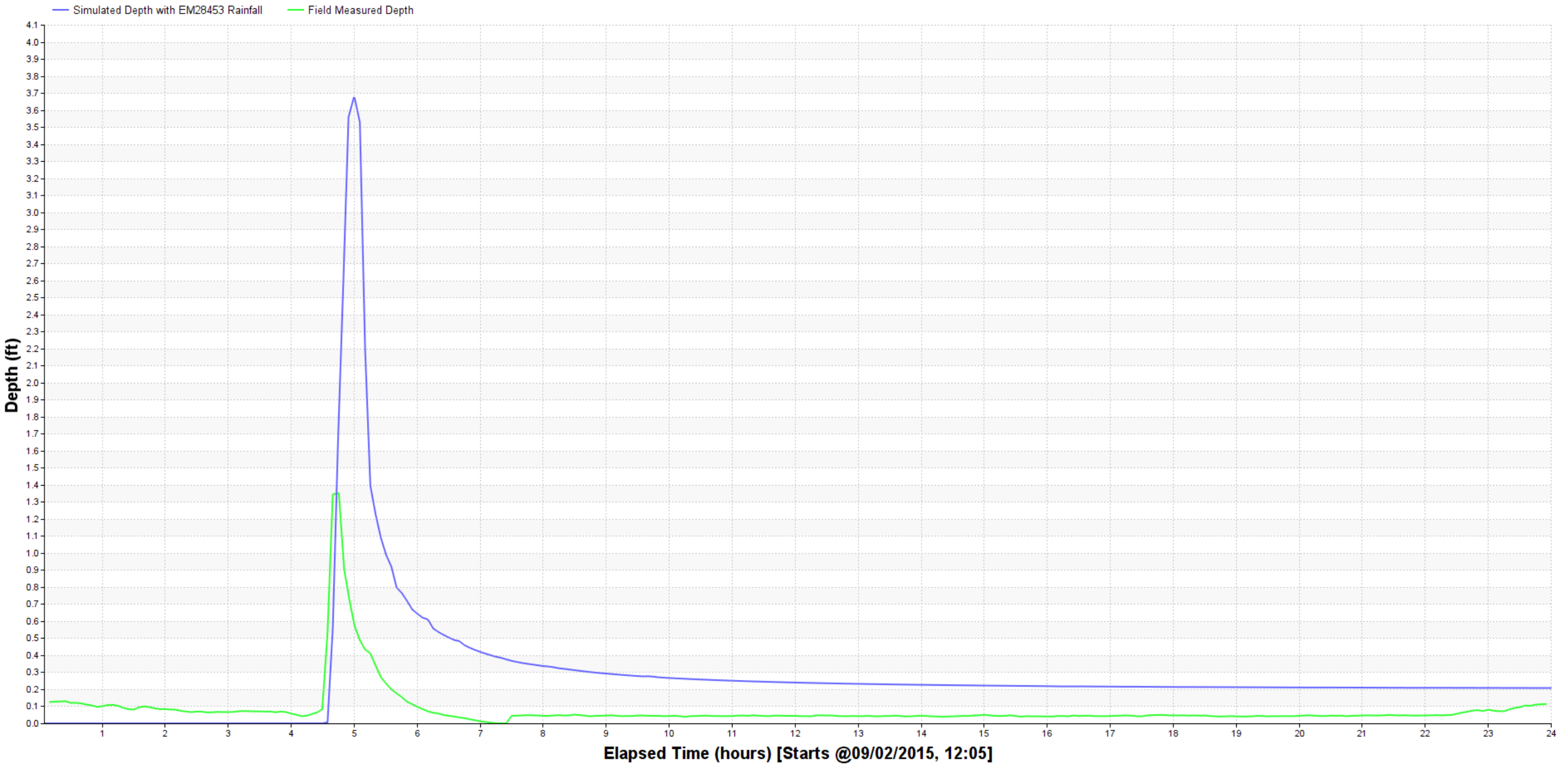
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Verification: Conduit 0604_SSG02, EM28454 Rainfall 08/05/2015 - 08/06/2015



Verification: Conduit 0604_RSG01, EM28453 Rainfall 09/02/2015 - 09/03/2015



APPENDIX D

COST ESTIMATE FIGURES

FIGURE 8: IA1 Planning Level Cost Estimate

Smith Seckman Reid, Inc		City of Memphis		
Southland Area Drainage Study		Rochester Drainage Basin		
Improvement Alternative 1: IA1				
DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
Mobilization	L.S.	1	\$10,000.00	\$10,000.00
Removal of 24" RCP Pipe and Replace with 36" RCP Pipe	L.F.	30	\$200.00	\$6,000.00
Removal of 36" RCP Pipe and Replace with 48" RCP Pipe	L.F.	217	\$230.00	\$49,910.00
Removal of 48" RCP Pipe and Replace with 48" RCP Pipe	L.F.	178	\$230.00	\$40,940.00
Sidewalk Saw Cut, Removal, and Replacement	S.Y.	27	\$100.00	\$2,700.00
Asphalt Saw Cut, Removal, and Replacement	S.Y.	420	\$175.00	\$73,500.00
Curb and Gutter Saw Cut, Removal, and Replacement	L.F.	26	\$100.00	\$2,600.00
Removal and Replacement of Drainage Structure, 0' - 4' Depth	EACH	2	\$12,000.00	\$24,000.00
Removal and Replacement of Drainage Structure, 4' - 8' Depth	EACH	2	\$18,000.00	\$36,000.00
Channel Regrading	C.Y.	115	\$40.00	\$4,600.00
Channel End Transitions	L.S.	1	\$2,000.00	\$2,000.00
Waste Material Haul-Off	C.Y.	105	\$30.00	\$3,150.00
Removal and Disposal of Brush and Trees	L.S.	1	\$25,000.00	\$25,000.00
Traffic Control	L.S.	1	\$15,000.00	\$15,000.00
Erosion Control	L.S.	1	\$10,000.00	\$10,000.00
Additional Recommendations Outside of Modeling Scope				
Removal of 15" RCP Pipe and Replace with 24" RCP Pipe	L.F.	34	\$125.00	\$4,250.00
Sidewalk Saw Cut, Removal, and Replacement	S.Y.	18	\$100.00	\$1,800.00
Asphalt Saw Cut, Removal, and Replacement	S.Y.	15	\$200.00	\$3,000.00
Curb and Gutter Saw Cut, Removal, and Replacement	L.F.	15	\$100.00	\$1,500.00
Removal and Replacement of Drainage Structure, 0' - 4' Depth	EACH	1	\$12,000.00	\$12,000.00
Waste Material Haul-Off	C.Y.	2.5	\$30.00	\$75.00
			SUB-TOTAL =	\$328,025.00
Construction Contingencies			30%	\$98,407.50
Design, Survey, CA Services			20%	\$65,605.00
			TOTAL =	\$492,037.50

FIGURE 9: IA2A Planning Level Cost Estimate

Smith Seckman Reid, Inc		City of Memphis		
Southland Area Drainage Study		Rochester Drainage Basin		
Improvement Alternative 2: IA2A				
DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
Mobilization	L.S.	1	\$10,000.00	\$10,000.00
Removal of 24" RCP Pipe and Replace with (36" RCP Eq.) 45" x 29" HERCP Pipe	L.F.	153	\$225.00	\$34,425.00
Removal of (42" RCP Eq.) 53" x 34" HERCP Pipe and Replace with (48" RCP Eq.) 60" x 38" HERCP Pipe	L.F.	42	\$450.00	\$18,900.00
Removal of (42" RCP Eq.) 53" x 34" HERCP Pipe and Replace with (54" RCP Eq.) 68" x 43" HERCP Pipe	L.F.	18	\$525.00	\$9,450.00
Removal of 48" RCP Pipe and Replace with (54" RCP Eq.) 68" x 43" HERCP Pipe	L.F.	379	\$425.00	\$161,075.00
Removal of 48" RCP Pipe and Replace with (60" RCP Eq.) 73" x 45" RCAP Pipe	L.F.	10	\$650.00	\$6,500.00
Removal of (60" RCP Eq.) 73" x 45" RCAP Pipe and Replace with (60" RCP Eq.) 73" x 45" RCAP Pipe	L.F.	31	\$650.00	\$20,150.00
Sidewalk Saw Cut, Removal, and Replacement	S.Y.	85	\$100.00	\$8,500.00
Asphalt Saw Cut, Removal, and Replacement	S.Y.	200	\$175.00	\$35,000.00
Curb and Gutter Saw Cut, Removal, and Replacement	L.F.	101	\$100.00	\$10,100.00
Removal and Replacement of Drainage Structure, 0' - 4' Depth	EACH	2	\$12,000.00	\$24,000.00
Removal and Replacement of Drainage Structure, 4' - 8' Depth	EACH	9	\$18,000.00	\$162,000.00
Removal and Disposal of Brush and Trees	L.S.	1	\$40,000.00	\$40,000.00
Waste Material Haul-Off	C.Y.	245	\$30.00	\$7,350.00
Traffic Control	L.S.	1	\$20,000.00	\$20,000.00
Erosion Control	L.S.	1	\$20,000.00	\$20,000.00
			SUB-TOTAL =	\$587,450.00
Construction Contingencies			30%	\$176,235.00
Design, Survey, CA Services			20%	\$117,490.00
			TOTAL =	\$881,175.00

FIGURE 10: IA2B Planning Level Cost Estimate

Smith Seckman Reid, Inc		City of Memphis		
Southland Area Drainage Study		Rochester Drainage Basin		
Improvement Alternative 2: IA2B				
DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
Mobilization	L.S.	1	\$10,000.00	\$10,000.00
Removal of 24" RCP Pipe and Replace with (36" RCP Eq.) 45" x 29" HERCP Pipe	L.F.	60	\$275.00	\$16,500.00
Asphalt Saw Cut, Removal, and Replacement	S.Y.	69	\$200.00	\$13,800.00
Removal and Replacement of Drainage Structure, 0' - 4' Depth	EACH	1	\$12,000.00	\$12,000.00
Rework Pipe Connection at Box Culvert Wall	EACH	1	\$3,000.00	\$3,000.00
Waste Material Haul-Off	C.Y.	9	\$30.00	\$270.00
Traffic Control	L.S.	1	\$10,000.00	\$10,000.00
Erosion Control	L.S.	1	\$5,000.00	\$5,000.00
Additional Recommendations Outside of Modeling Scope				
Removal of Assumed 15" RCP Pipe and Replace with (24" RCP Eq.) 30" x 19" HERCP Pipe	L.F.	50	\$175.00	\$8,750.00
Sidewalk Saw Cut, Removal, and Replacement	S.Y.	36	\$100.00	\$3,600.00
Asphalt Saw Cut, Removal, and Replacement	S.Y.	35	\$200.00	\$7,000.00
Curb and Gutter Saw Cut, Removal, and Replacement	L.F.	30	\$100.00	\$3,000.00
Removal and Replacement of Drainage Structure, 0' - 4' Depth	EACH	2	\$12,000.00	\$24,000.00
Waste Material Haul-Off	C.Y.	4	\$30.00	\$120.00
			SUB-TOTAL =	\$117,040.00
Construction Contingencies			30%	\$35,112.00
Design, Survey, CA Services			20%	\$23,408.00
			TOTAL =	\$175,560.00

FIGURE 11: IA3 Planning Level Cost Estimate

Smith Seckman Reid, Inc		City of Memphis		
Southland Area Drainage Study		Rochester Drainage Basin		
Improvement Alternative 3: IA3				
DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
Mobilization	L.S.	1	\$10,000.00	\$10,000.00
Removal of 24" RCP Pipe and Replace with 36" RCP Pipe	L.F.	480	\$150.00	\$72,000.00
Removal of 24" RCP Pipe and Replace with 42" RCP Pipe	L.F.	160	\$200.00	\$32,000.00
Sidewalk Saw Cut, Removal, and Replacement	S.Y.	110	\$80.00	\$8,800.00
Asphalt Saw Cut, Removal, and Replacement	S.Y.	440	\$175.00	\$77,000.00
Curb and Gutter Saw Cut, Removal, and Replacement	L.F.	340	\$80.00	\$27,200.00
Removal and Replacement of Drainage Structure, 4' - 8' Depth	EACH	3	\$18,000.00	\$54,000.00
Waste Material Haul-Off	C.Y.	78	\$30.00	\$2,340.00
Traffic Control	L.S.	1	\$15,000.00	\$15,000.00
Erosion Control	L.S.	1	\$10,000.00	\$10,000.00
Additional Recommendations Outside of Modeling Scope				
Removal of Assumed 15" RCP Pipe and Replace with 24" RCP Pipe	L.F.	31	\$125.00	\$3,875.00
Removal of 24" RCP Pipe and Replace with 36" RCP Pipe	L.F.	48	\$200.00	\$9,600.00
Sidewalk Saw Cut, Removal, and Replacement	S.Y.	36	\$100.00	\$3,600.00
Asphalt Saw Cut, Removal, and Replacement	S.Y.	64	\$200.00	\$12,800.00
Curb and Gutter Saw Cut, Removal, and Replacement	L.F.	30	\$100.00	\$3,000.00
Removal and Replacement of Drainage Structure, 4' - 8' Depth	EACH	1	\$18,000.00	\$18,000.00
Removal and Replacement of Drainage Structure, 0' - 4' Depth	EACH	1	\$12,000.00	\$12,000.00
Waste Material Haul-Off	C.Y.	10	\$30.00	\$300.00
			SUB-TOTAL =	\$371,515.00
Construction Contingencies			30%	\$111,454.50
Design, Survey, CA Services			20%	\$74,303.00
			TOTAL =	\$557,272.50

FIGURE 12: IA4 Planning Level Cost Estimate

Smith Seckman Reid, Inc		City of Memphis		
Southland Area Drainage Study		Red Budd Drainage Basin		
Improvement Alternative 4: IA4				
DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
Mobilization	L.S.	1	\$10,000.00	\$10,000.00
Removal of 24" RCP Pipe and Replace with (36" RCP Eq.) 45" x 29" HERCP Pipe	L.F.	368	\$200.00	\$73,600.00
Sidewalk Saw Cut, Removal, and Replacement	S.Y.	90	\$100.00	\$9,000.00
Asphalt Saw Cut, Removal, and Replacement	S.Y.	285	\$175.00	\$49,875.00
Curb and Gutter Saw Cut, Removal, and Replacement	L.F.	180	\$80.00	\$14,400.00
Removal and Replacement of Drainage Structure, 4' - 8' Depth	EACH	3	\$18,000.00	\$54,000.00
Rework Pipe Connection at Concrete Channel Wall	EACH	1	\$3,000.00	\$3,000.00
Waste Material Haul-Off	C.Y.	55	\$30.00	\$1,650.00
Removal and Disposal of Brush and Trees	L.S.	1	\$30,000.00	\$30,000.00
Traffic Control	L.S.	1	\$30,000.00	\$30,000.00
Erosion Control	L.S.	1	\$20,000.00	\$20,000.00
Additional Recommendations Outside of Modeling Scope				
Removal of 18" RCP Pipe and Replace with (24" RCP Eq.) 30" x 19" HERCP Pipe	L.F.	183	\$150.00	\$27,450.00
Sidewalk Saw Cut, Removal, and Replacement	S.Y.	73	\$100.00	\$7,300.00
Asphalt Saw Cut, Removal, and Replacement	S.Y.	130	\$175.00	\$22,750.00
Curb and Gutter Saw Cut, Removal, and Replacement	L.F.	70	\$100.00	\$7,000.00
Removal and Replacement of Drainage Structure, 0' - 4' Depth	EACH	3	\$12,000.00	\$36,000.00
Waste Material Haul-Off	C.Y.	10	\$30.00	\$300.00
			SUB-TOTAL =	\$396,325.00
Construction Contingencies			30%	\$118,897.50
Design, Survey, CA Services			20%	\$79,265.00
			TOTAL =	\$594,487.50

FIGURE 13: IA8A Planning Level Cost Estimate

Smith Seckman Reid, Inc		City of Memphis		
Southland Area Drainage Study		Rosita Drainage Basin		
Improvement Alternative 8: IA8A				
DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
Mobilization	L.S.	1	\$10,000.00	\$10,000.00
Removal of 36" CMP Culvert and Replace with (54" RCP Eq.) 68" x 43" HERCP Culvert	L.F.	14	\$525.00	\$7,350.00
Removal of two parallel 42" RCP Culverts and Replace with 60" RCP Culvert	L.F.	42	\$600.00	\$25,200.00
Asphalt Saw Cut, Removal, and Replacement	S.Y.	95	\$200.00	\$19,000.00
Removal and Replacement of Drainage Structure, 4' - 8' Depth	EACH	2	\$18,000.00	\$36,000.00
Removal and Replacement of Drainage Structure, 8' - 12' Depth	EACH	2	\$25,000.00	\$50,000.00
Channel Regrading	C.Y.	1900	\$40.00	\$76,000.00
Channel End Transitions	L.S.	1	\$5,000.00	\$5,000.00
Removal and Disposal of Brush and Trees	L.S.	1	\$70,000.00	\$70,000.00
Waste Material Haul-Off	C.Y.	885	\$30.00	\$26,550.00
Traffic Control	L.S.	1	\$15,000.00	\$15,000.00
Erosion Control	L.S.	1	\$30,000.00	\$30,000.00
			SUB-TOTAL =	\$370,100.00
Construction Contingencies			30%	\$111,030.00
Design, Survey, CA Services			20%	\$74,020.00
			TOTAL =	\$555,150.00

FIGURE 14: IA8B Planning Level Cost Estimate

Smith Seckman Reid, Inc		City of Memphis		
Southland Area Drainage Study		Rosita Drainage Basin		
Improvement Alternative 8: IA8B				
DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
Mobilization	L.S.	1	\$10,000.00	\$10,000.00
Removal of 24" RCP Culvert and Replace with (36" RCP Eq.) 44" x 27" RCAP Culvert	L.F.	37	\$275.00	\$10,175.00
Asphalt Saw Cut, Removal, and Replacement	S.Y.	30	\$200.00	\$6,000.00
Removal and Replacement of Drainage Structure, 0' - 4' Depth	EACH	2	\$12,000.00	\$24,000.00
Removal of 24" RCP Culvert	L.F.	15	\$40.00	\$600.00
Removal of Drainage Structure, 0' - 4' Depth	EACH	1	\$2,500.00	\$2,500.00
Channel Regrading	C.Y.	430	\$40.00	\$17,200.00
Saw Cut Existing Concrete Channel Walls 1' from Top Below Embedded Fence Posts	L.F.	2280	\$15.00	\$34,200.00
Removal of Chain Link Fence and Saw Cut Concrete Wall Sections	L.F.	2280	\$20.00	\$45,600.00
Reinforced Concrete Channel Construction (New Channels and Existing Channel Wall Modifications)	C.Y.	160	\$1,300.00	\$208,000.00
Chain Link Fence Placement in Concrete Channel Walls	L.F.	2800	\$25.00	\$70,000.00
Channel End Transitions and Existig Channel Connection Modifications	L.S.	1	\$10,000.00	\$10,000.00
Removal and Disposal of Brush and Trees	L.S.	1	\$100,000.00	\$100,000.00
Waste Material Haul-Off	C.Y.	225	\$30.00	\$6,750.00
Traffic Control	L.S.	1	\$10,000.00	\$10,000.00
Erosion Control	L.S.	1	\$15,000.00	\$15,000.00
			SUB-TOTAL =	\$570,025.00
Construction Contingencies			30%	\$171,007.50
Design, Survey, CA Services			20%	\$114,005.00
			TOTAL =	\$855,037.50