STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM

FEDERAL AID PROJECT NUMBER _____

FINANCIAL PROJECT NUMBER _____

CONTRACT NUMBER _____

COUNTY _____

ROAD NUMBER _____

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QC ERS Review Comments

FINANCIAL PROJECT NUMBER: _____ **QC MANAGER:** _____ **PAGE #:** _____

Date	Initials	Comments

*Recommended review frequency shall be weeky for large jobs, bi-weekly for smaller jobs, or obtain project specific frequency from the District Materials Earthwork Manager.

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Independent Assurance ERS Review Comments

FINANCIAL PROJECT NUMBER: _____ **PAGE #:** _____

Date	IA Inspector	Comments

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Earthwork Technician Qualification List

FINANCIAL PROJECT NUMBER: ______________________________ **PAGE #:** _________

TIN	Initials	Work Title	Begin Work Date	End Work Date	ECI Level 1 Exp. Date	ECI Level 2 Exp. Date

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Earthwork Technician Qualification List

FINANCIAL PROJECT NUMBER: ______________________________ **PAGE #:** __________

TIN	Initials	Work Title	Begin Work Date	End Work Date	ECI Level 1 Exp. Date	ECI Level 2 Exp. Date
1	2	3	4	5	6	7

- This form is used to document all the technicians on the project performing earthwork and identify their qualification.
- Do not enter a technician more than once.

1) **TIN:** Enter the inspector's CTQP training identification number
2) **Initials**: Enter the initials of the inspector just as they will appear when correcting the Density Log Sheet
3) **Work Title**: Enter the position title of the technician
4) **Begin Work Date**: Enter the date the technician started to work on the project
5) **End Work Date**: Enter the date the technician left the project or the project end date, whichever comes first
6) **ECI Level 1 Exp. Date**: Enter the date of the Earthwork Construction Inspection Level 1 expiration date from CTQP
7) **ECI Level 2 Exp. Date**: Enter the date of the Earthwork Construction Inspection Level 2 expiration date from CTQP

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Initial Equipment Comparison Sheet

FINANCIAL PROJECT NUMBER: ______________________________ **PAGE #:** _________

Initial Equipment Comparison											
#	**Company Level**	**Comparison Date**	**TIN**	**Initials**	**Gauge Manufacturer**	**Gauge SN**	**Gauge Cal. Date**	**Wet Density, Υ_{wet} (pcf)**	**Speedy Cal. Date[1]**	**Calculation: Δ[Wet Density] (pcf)**	
	Quality Control (QC)									QC - VT	
	Verification (VT)									VT - IA	
	Independent Assurance (IA)									IA - QC	
	Quality Control (QC)									QC - VT	
	Verification (VT)									VT - IA	
	Independent Assurance (IA)									IA - QC	
	Quality Control (QC)									QC - VT	
	Verification (VT)									VT - IA	
	Independent Assurance (IA)									IA - QC	
	Quality Control (QC)									QC - VT	
	Verification (VT)									VT - IA	
	Independent Assurance (IA)									IA - QC	
	Quality Control (QC)									QC - VT	
	Verification (VT)									VT - IA	
	Independent Assurance (IA)									IA - QC	

[1] Speedy must be calibrated within the last 6 months per FM 5-507.

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM
Initial Equipment Comparison Sheet

FINANCIAL PROJECT NUMBER: _____ **PAGE #:** _____

Initial Equipment Comparison											
#	Company Level	Comparison Date	TIN	Initials	Gauge Manufacturer	Gauge SN	Gauge Cal. Date	Wet Density, γ_{wet} (pcf)	Speedy Cal. Date[1]	Calculation: Δ[Wet Density] (pcf)	
1	Quality Control (QC)	2	3		4	5	6	7	8	QC - VT	9
	Verification (VT)									VT - IA	
	Independent Assurance (IA)									IA - QC	
	Quality Control (QC)									QC - VT	
	Verification (VT)									VT - IA	
	Independ										
	Qualit										
	Ver										
	Independ										
	Qualit										
	Ver										
	Independ										
	Qualit										
	Ver										
	Independ										

- This form is used to document the initial equipment comparison.
- Retain copy of all gauge calibration sheets and place it in the Earthwork Records System in numerical order.

1) **#:** Consecutively number the comparison.
2) **Comparison Date:** Record the date the initial equipment comparison analysis was performed.
3) **TIN**: Record the inspector's CTQP training identification number.
4) **Gauge Manufacturer:** Record the manufacturer of the nuclear density gauge. If the gauge is low activity nuclear density gauge (E-Gauge), input L-NDG in parenthesis after the manufacturer's name.
5) **Gauge SN.:** Record the manufacturer's serial number for the nuclear/moisture density gauge.
6) **Gauge Cal. Date**: Record the most recent gauge calibrate date.
7) **Wet Density**: Record the wet density result from the gauge to the nearest 0.1 PCF.
8) **Speedy Cal. Date**: Record the most recent speedy calibration date. Speedy must be calibrated every 6 months.
9) **Calculation: Δ[Wet Density]**: Calculate the absolute difference of the wet densities between the two parties.

[1]Speedy must be calibrated within the last 6 months per FM 5-507.

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM
Equipment Comparison Sheet During Production

FINANCIAL PROJECT NUMBER: ______________________________ **PAGE #:** __________

Equipment Comparison During Production														
#	Comparison Date	QC Speedy Cal. Date	Quality Control					Verification					$\Delta\Upsilon_{wet}$(pcf) |QC-VT|
			TIN	Gauge Manufacturer	Gauge SN	Gauge Cal. Date	Υ_{wet} (pcf)	TIN	Gauge Manufacturer	Gauge SN	Gauge Cal. Date	Υ_{wet} (pcf)	

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM
Equipment Comparison Sheet During Production

FINANCIAL PROJECT NUMBER: _____ **PAGE #:** _____

Equipment Comparison During Production													
#	Comparison Date	QC Speedy Cal. Date	Quality Control					Verification					$\Delta\gamma_{wet}$ (pcf) |QC-VT|
			TIN	Gauge Manufacturer	Gauge SN	Gauge Cal. Date	γ_{wet} (pcf)	TIN	Gauge Manufacturer	Gauge No.	Gauge Cal. Date	γ_{wet} (pcf)	
1	2	3	4	5	6	7	8						9

- This form is used to document the equipment comparison during production.
- Retain copy of all gauge calibration sheets and place it in the Earthwork Records System in numerical order.

1) **#:** Consecutively number the comparison.
2) **Comparison Date:** Record the date the equipment comparison analysis was performed.
3) **Speedy Cal. Date:** Record the most recent speedy calibration date. Speedy must be calibrated every 6 months.
4) **TIN**: Record the inspector's CTQP training identification number.
5) **Gauge Manufacturer**: Record the manufacturer of the nuclear density gauge. If the gauge is low activity nuclear density gauge (E-Gauge), input L-NDG in parenthesis after the manufacturer's name.
6) **Gauge SN:** Record the manufacturer's serial number for the nuclear/moisture density gauge.
7) **Gauge Cal. Date**: Record the most recent gauge calibrate date at the time of comparison.
8) **γ_{wet} (pcf)**: Record the wet density result from the gauge to the nearest 0.1 PCF.
9) **$\Delta\gamma_{wet}$ (pcf) |QC-VT|**: Calculate the absolute difference of the wet densities between the two parties.

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM
Gauge Calibration Tracking Sheet

FINANCIAL PROJECT NUMBER: _____ **PAGE #:** _____

Gauge #	Start Date	Cal. Date 1	Cal. Date 2	Cal. Date 3	Cal. Date 4	Cal. Date 5	Cal. Date 6	Cal. Date 7	Cal. Date 8

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM
Gauge Calibration Tracking Sheet

FINANCIAL PROJECT NUMBER: _____ **PAGE #:** _____

Gauge #	Start Date	Cal. Date 1	Cal. Date 2	Cal. Date 3	Cal. Date 4	Cal. Date 5	Cal. Date 6	Cal. Date 7	Cal. Date 8
1	2	3	4	5	6	7	8	9	10

- This form is used to document all the gauges that are used on the project.
- Do not enter a gauge more than once.

(1) **Gauge #:** Enter the manufacturer's serial number for the nuclear/moisture density gauge. A separate line must be completed for each gauge used on the project.
(2) **Start Date**: Enter the start date of when the gauge was used on the project
(3) to (10) **Cal. Date X**: Enter the calibration date each time the gauge has been calibrated.

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Summary of Proctor Samples

FINANCIAL PROJECT NUMBER: _____

PAGE #: _____ **of** _____

Embankment / Pipe Backfill

Quality Control						Verification/IV				Resolution			Calculation: Max. Density (QC - VT)
Sample #	Material Description	Source	Soil Class	-200 (%)	Max. Density	Sample #	Soil Class	-200 (%)	Max. Density	Soil Class	Max. Density	Compr'd To	
NOTES:													

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM
Summary of Proctor Samples

FINANCIAL PROJECT NUMBER: ______________________________

PAGE #: _____ **of** _____

Embankment / Pipe Backfill													
Quality Control						Verification/IV				Resolution			Calculation: Max. Density (QC - VT)
Sample #	Material Description	Source	Soil Class	-200 (%)	Max. Density	Sample #	Soil Class	-200 (%)	Max. Density	Soil Class	Max. Density	Compr'd To	
1	2	3	4	5	6								7
NOTES:													

- This form is used to report the lab results from MAC
(1) **Sample #:** Enter the sample number based on the instructions section of this form.
(2) **Material Description**: Enter the description of the material being sampled.
(3) **Source**: Enter where the material is being sampled from (stockpile, roadway, pond A, etc.).
(4) to (6): Retrieve lab result from MAC and enter in to the appropriate fields.
(7) **Calculation - Max. Density**: Calculate and enter the difference between QC's and VT's Maximum Density Proctor.

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM
Summary of Proctor Samples

FINANCIAL PROJECT NUMBER: _____

PAGE #: _____ of _____

Retaining (MSE) Wall / Geosynthetic Reinforcement Backfill

Quality Control						Verification/IV				Resolution			Calc: Max. Density (QC - VT)
Sample #	Material Description	Source	pH	-200 (%)	Max. Density	Sample #	pH	-200 (%)	Max. Density	Sample #	Max. Density	Compr'd To	
NOTES:													

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM
Summary of Proctor Samples

FINANCIAL PROJECT NUMBER: _____ **Mainline/Shoulder:** _____ **PAGE #:** _____ of _____

Stabilized Subgrade

Quality Control						Verification/IV (Split Proctor)			Verification/IV (Independent LBR)					Resolution		Calculation: Max. Density (QC - VT)
Sample #	Sample LOT #	Station Sampled	LOTs Represt'd	LBR	Max. Density	Sample #	LOTs Represt'd	Max. Density	Sample #	Sample LOT #	Station Sampled	LOTs Represt'd	LBR	Sample #	Test Result	
NOTES:																

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM
Summary of Proctor Samples

FINANCIAL PROJECT NUMBER: _____ **Mainline/Shoulder:** _____ **PAGE #:** _____ **of** _____

Granular Subbase in-lieu-of Stabilized Subgrade / Base Rock -- [Non Pit-Proctor Method]

Quality Control						Verification				Resolution			Calculation:
Sample #	Sample LOT #	Station Sampled	LOTs Represt'd	Mine #	Max. Density	Sample #	Sample LOT #	LOTs Represt'd	Max. Density	Sample #	Max. Density	Compr'd To	Max. Density (QC - VT)
NOTES:													

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LOT Index & Special Conditions

FINANCIAL PROJECT NUMBER: _____ **CONST. TYPE:** _____ **PAGE #:** _____ **of** _____

Density LOT #	RF	Station		Date Tested	Lift #	VT Ver. (Y/N)	Resolved? (Y/N)	Remarks
		Begin	End					
NOTES:								

* This form may be waived upon the approval in writing from the Earthwork Manager at the District Materials Office.

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM
Pit Proctor Tracking Sheet for Granular Subbase in Lieu of Subgrade

FINANCIAL PROJECT NUMBER: _____ **Mainline/Shoulder:** _____ **PAGE #:** _____ **of** _____

Quality Control									Verification/Independent Verification					Resolution	
PIT LOT #	Density LOT #	Station Begin	Station End	Date Tested	Sample #	Qtr. / Year	Mine #	Pit Proctor	Sample #	PIT LOT #	LOTs Represt'd	Station Sampled	Max Density	Sample # / Max Density	Remarks/Disp. Status

1st Quarter (Jan 1st - Mar 31st) | 2nd Quarter (Apr 1st - Jun 30th) | 3rd Quarter (Jul 1st - Sep 30th) | 4th Quarter (Oct 1st - Dec 31st)

NOTES:

* Draw a bold line horizontally all the way if the Pit LOT frequency is less than 16 LOTs for mainline & 4 LOTs for non-mainline or quarter/year/mine changes before the required frequency is met. For each bold line/block, there must be an IV test to verify the Pit Proctor.

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Pit Proctor Tracking Sheet for Base

FINANCIAL PROJECT NUMBER: _____ **Mainline/Shoulder:** _____ **PAGE #:** _____ **of** _____

Quality Control										Verification/Independent Verification					Resolution	
PIT LOT #	Density LOT #	Station Begin	Station End	Top Bot.	Date Tested	Sample #	Qtr. Year	Mine #	Pit Proctor	Sample #	PIT LOT #	LOTs Represt'd	Station Sampled	Max Density	Sample # / Max Density	Remarks/Disp. Status

1st Quarter (Jan 1st - Mar 31st) | 2nd Quarter (Apr 1st - Jun 30th) | 3rd Quarter (Jul 1st - Sep 30th) | 4th Quarter (Oct 1st - Dec 31st)

NOTES:

* Draw a bold line horizontally all the way if the Pit LOT frequency is less than 16 LOTs for mainline & 4 LOTs for non-mainline or quarter/year/mine changes before the required frequency is met. For each bold line/block, there must be an IV test to verify the Pit Proctor.

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM

Pit Proctor Tracking Sheet for Base

FINANCIAL PROJECT NUMBER: _____ **Mainline/Shoulder:** _____ **PAGE #:** _____ of _____

Quality Control										Verification/Independent Verification					Resolution	
PIT LOT #	Density LOT #	Station		Top	Date Tested	Sample #	Qtr.	Mine #	Pit Proctor	Sample #	PIT LOT #	LOTs Represt'd	Station Sampled	Max Density	Sample # / Max Density	Remarks/Disp. Status
		Begin	End	Bot.			Year									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
NOTI																

- This form is used to track where Pit Proctor material is being used on the project and report Pit Proctor information.

(1) **PIT LOT #:** Number each row consecutively.
(2) **Density LOT #:** Enter the corresponding LOT # where the density was taken by linking it to the density sheet.
(3-4) **Begin/End Station:** Beginning and ending station of section represented.
(5) **Top/Bot.:** Lift 1 is Bottom and lift 2 is top. If more then 2 lifts, then list the lift number.
(6) **Date Tested:** Enter the date that the density test was taken to the corresponding Density LOT #.
(7) **Sample #:** Enter the QC Proctor sample number (i.e. BP001Q).
(8) **Quarter/Year:** Enter the quarter and year in relation to the corresponding Density LOT #.
(9) **Mine #:** Enter the mine number where the material came from using the delivery tickets.
(10) **Pit Proctor:** Retrieve Pit Proctor result from MAC /SMO website.
(11) **Sample #:** Enter the IV Proctor sample number where the material was verified.
(12) **PIT LOT #:** Enter the LOT number the IV sample was retrieved.
(13) **LOTs Represented:** The LOTS the IV sampled verified.
(14) **Station Sampled:** Station the IV sample was retrieved.
(15) **Max Density**: Enter the lab result for Proctor.
(16) **Sample # / Max Density:** If resolution is used, then enter the resolution Proctor
(17) **Remarks/Disposition Status:** Notes, remarks, and/or the disposition status (compared to QC or revert to traditional sampling, etc.).

* For frequently asked questions and answers, see construction's DCE Memorandun 17-14 (https://www.fdot.gov/construction/memos/2014/2014-memos.shtm).

* Draw a bold line horizontally all the way if the Pit LOT frequency is less than 16 LOTs for mainline & 4 LOTs for non-mainline or quarter/year/mine changes before the required frequency is met. For each bold line/block, there must be an IV test to verify the Pit Proctor.

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM

Pit Proctor Tracking Sheet for Base

FINANCIAL PROJECT NUMBER: 123456-1-52-01 **Mainline/Shoulder:** Shoulder **PAGE #:** 1 of 5

Quality Control										Verification/Independent Verification					Resolution	
PIT LOT #	Density LOT #	Station Begin	Station End	Top Bot.	Date Tested	Sample #	Qtr. Year	Mine #	Pit Proctor	Sample #	PIT LOT #	LOTs Represt'd	Station Sampled	Max Density	Sample # / Max Density	Remarks/Disp. Status
1	1-17	1050+00	1070+00	Bot	11/1/18	BP001Q	Q4 2018	TM111	128	BP001IV	3	1-4	1091+00	127		
2	2-17	1070+00	1090+00	Bot	11/2/18											
3	3-17	1090+00	1110+00	Bot	11/3/18											
4	4-17	1110+00	1130+00	Bot	11/4/18											
5	5-17	1130+00	1150+00	Bot	11/5/18	BP001Q	Q4 2018	TM111	128	BP002IV	8	5-8	1200+00	133	BP002R 130pcf	Compared to QC, use 128pcf
6	6-17	1150+00	1170+00	Bot	11/6/18											
7	7-17	1170+00	1190+00	Bot	11/7/18											
8	8-17	1190+00	1210+00	Bot	11/8/18											
9	9-18	1210+00	1230+00	Top	1/20/19	BP003Q	Q1 2019	TM111	126	BP003IV	9	9-12	1220+00	120		
10	10-18	1230+00	1250+00	Top	1/21/19											
11	11-18	1250+00	1270+00	Top	1/22/19											
12	12-18	1270+00	1290+00	Top	1/23/19											
13	13-18	1290+00	1310+00	Top	1/24/19	BP003Q	Q1 2019	TM111	126	BP004IV	15	13-16	1350+00	132	BP004R 131pcf	Pit Proctor suspended for the Qtr. Revert to traditional sampling & testing.
14	14-18	1310+00	1330+00	Top	1/25/19											
15	15-18	1330+00	1350+00	Top	1/26/19											
16	16-18	1350+00	1370+00	Top	1/27/19											

1st Quarter (Jan 1st - Mar 31st) | 2nd Quarter (Apr 1st - Jun 30th) | 3rd Quarter (Jul 1st - Sep 30th) | 4th Quarter (Oct 1st - Dec 31st)

NOTES:

* Draw a bold line horizontally all the way if the Pit LOT frequency is less than 16 LOTs for mainline & 4 LOTs for non-mainline or quarter/year/mine changes before the required frequency is met. For each bold line/block, there must be an IV test to verify the Pit Proctor.

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM

Earthwork Density Report

FINANCIAL PROJECT NUMBER: _____ **ROADWAY NAME:** _____ **PAGE #:** _____ **OF** _____

CONST. TYPE: _____ **STATION:** _____ **TO** _____ **M/L OR SHOULDER:** _____

LOT #	RF	Date	TIN	Gauge SN	Std. Density Mst./Bkgrd. Count	Proctor Sample #	Test #	Station	Offset /RL	Lift #	Test Depth	Soil Density Mst./Bkgrd Count	Wet Density	% Moist.	Dry Density	% Max. Density	Disp. Status

NOTES:

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM

Earthwork Density Report

FINANCIAL PROJECT NUMBER: _____ **ROADWAY NAME:** _____ **PAGE #:** _____ **OF** _____

CONST. TYPE: 1 **STATION:** 2 **TO** _____ **M/L OR SHOULDER:** _____

LOT #	RF	Date	TIN	Gauge SN	Std. Density / Mst./Bkgrd. Count	Proctor / Sample #	Test #	Station	Offset /RL	Lift #	Test Depth	Soil Density / Mst./Bkgrd. Count	Wet Density	% Moist.	Dry Density	% Max. Density	Disp. Status
3	4	5	6	7	8 / 9	10 / 11	12	13	14	15	16	17 / 18	19	20	21	22	23

- This form is used to document the required densities per specification.

1) **Construction Type:** Record the type of construction (i.e. Embankment, Stabilized Subgrade, Base, MSE Wall, etc.).
2) **Station Begin to End:** Record beginning station to ending station of the section represented.
3) **LOT #:** Record the LOT # - Plot Page #. Start a new set of numbers for each type of construction on each sheet.
4) **RF:** Place a check mark for LOTs that represent reduced frequency.
5) **Date:** Record the date that the density test was taken.
6) **TIN:** Record the inspector's CTQP training identification number.
7) **Gauge SN:** Record the manufacturer's serial number for the nuclear/ moisture density gauge.
8) **Std. Density:** Record the daily standard density count of the gauge used to perform the density test. For L-NDG's, this will be displayed as DS.
9) **Mst./Bkgrd. Count:** Record the daily standard moisture count of the Nuclear Density Guage (NDG) or standard background count if using a Low Activity Nuclear Density Gauge (L-NDG). For L-NDG's, the standard background count maybe displayed as BGD or DSB depening on the model.
10) **Proctor:** Record the laboratory Maximum Density Proctor value to the nearest 1 PCF.
11) **Sample #:** Record the sample number reported in 'Earthwork Summary of Proctors' sheet for the Maximum Density Proctor.
12) **Test #:** Record test number sequentially for each plot page or for each station begin and end areas.

CONTINUED .....

14) **Offset/RL:** Record the offset distance from a surveyed line (C/L or B/L of Construction with the direction 'L' or 'R' following the number)
15) **Lift #:** Record the lift number and total lifts at the test location (i.e. 2/10)
16) **Test Depth:** Record the depth of the density test in inches.
17) **Soil Density:** Record the soil density count reading for the test from the density gauge. For L-NDG's, this will be displayed as DC.
18) **Mst./Bkgrd. Count:** Record the soil moisture count reading for NDG's or soil background count diplayed as BC if using L-NDG.
19) **Wet Density:** Record the wet density result from the gauge to the nearest 0.1 PCF.
20) **% Moist.:** Record the percent moisture value to the nearest 0.1%.
21) **Dry Density:** Calculate dry density using the formula below and report to the nearest 0.1 PCF.

$$Dry\ Density = \frac{Wet\ Density}{100 + \%\ Moisture} \times 100$$

22) **% Max. Density**: Calculate percent maximum density using the formula below and report to the nearest whole number.

$$\%\ Max.\ Density = \frac{Dry\ Density}{Max.\ Density\ Proctor} \times 100$$

23) **Disposition Status or LOTs Accepted:** In QC's logbook, input P/F for density test pass or fail. In addition, input V for the sample that was verified by the Department representative. In VT's logbook, list LOTs verified by this test (QC LOT #'s - Corresponding QC Page #'s).

NOTES:

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM

Earthwork Density Report for MAC-ERS

FINANCIAL PROJECT NUMBER: _____ **LOGBOOK NAME:** _____ **M/L OR SHOULDER:** _____ **MAC MTL ID:** _____

MAC CATEGORY/TYPE: _____ **STATION:** _____ **TO** _____ **PAGE NOTE:** _____

FDOT SAMPLE #	RF	Test Date	Company Name	Std. Density	Proctor (pcf)	Station / Length	Offset	Test Depth	Soil Density	Wet Density	% Moist.	Dry Density	% Max. Density	MAC Condition #'s
		Gauge SN	TIN	Mst./Bkgrd. Count	Sample #	El. (ft)	RL		Mst./Bkgrd. Count	Notes				

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM

Earthwork Density Report for MAC-ERS

FINANCIAL PROJECT NUMBER: _____ **LOGBOOK NAME:** 1 **M/L OR SHOULDER:** 2 **MAC MTL ID:** 3

MAC CATEGORY/TYPE: 4 **STATION:** 5 **TO** _____ **PAGE NOTE:** 6

FDOT SAMPLE #	RF	Test Date / Gauge SN	Company Name / TIN	Std. Density / Mst./Bkgrd Count	Proctor (pcf) / Sample #	Station / Length / El. (ft)	Offset / RL	Test Depth	Soil Density / Mst./Bkgrd Count	Wet Density	% Moist.	Dry Density	% Max. Density	MAC Condition #'s
		Notes												
7	8	9 / 10	11 / 12	13 / 14	15 / 16	17 / 18	19	20	21 / 22	23	24	25	26	27
										28				

- This form is used to document the required densities per specification.

1) **Logbook Name:** Record the name of the logbook exactly as it appears in MAC-ERS where the plots are drawn.
2) **M/L or Shoulder:** Denote whether the densities are taken in mainline/whole width of the roadway or shoulder.
3) **MAC ID:** Record the MAC/Material ID that the sample belongs to (i.e. 120, 145, 160, 200, 548).
4) **MAC Category/Type:** Record the name of the MAC category/type. For the list of categories/types, refer to the ERS Sample Manual (see link 1).
5) **Station Begin to End:** Record the beginning station to ending station of the section represented.
6) **Page Note:** Record any specific notes that would affect the entire page; if none leave it blank. For example, for pipe densities, enter the pipe run (i.e. S-1 to S-2).
7) **FDOT Sample #:** Record the FDOT Sample number pertaining to the density test in accordance with the ERS Sampling Numbering instructions (see link 2).
8) **RF:** Place a check mark for LOTs that represent reduced frequency.
9) **Test Date:** Record the date that the density test was taken.
10) **Gauge SN:** Record the manufacturer's serial number of the nuclear/moisture density that has been validated on the project gauge tab in MAC-ERS.
11) **Company Name:** Record the name of the QC technician's employer.
12) **TIN:** Record the inspector's CTQP training identification number.
13) **Std. Density:** Record the daily standard density count of the gauge used to perform the density test. For L-NDG's, this will be displayed as DS.
14) **Mst./Bkgrd Count:** Record the daily standard moisture count of the Nuclear Density Guage (NDG) or standard background count if using a Low Activity Nuclear Density Gauge (L-NDG). For L-NDG's, the standard background count maybe displayed as BGD or DSB depening on the model.
15) **Proctor:** Record the lab Maximum Density Proctor value to the nearest 0. 1 PCF.
16) **Sample #:** Record the sample number reported in 'Earthwork Summary of Proctors' sheet for the Maximum Density Proctor.

CONTINUED .....

17) **Station/Length:** Record the station location where the test was taken for ESB plots or the distance (length) from the beginning of the pipe for drainage plots.
18) **El.:** Record the elevation of the test in feet taken in relation to the ERS plot.
19) **Offset/RL:** Record the offset distance from a surveyed line (C/L or B/L of Construction with the direction 'L' or 'R' following the number).
20) **Test Depth:** Record the depth of the density test in inches.
21) **Soil Density:** Record the soil density count reading for the test from the density gauge. For L-NDG's, this will be displayed as DC.
22) **Mst./Bkgrd Count:** Record the soil moisture count reading for NDG's or soil background count diplayed as BC if using L-NDG.
23) **Wet Density:** Record the wet density result from the gauge to the nearest 0.1 PCF
24) **% Moist.:** Record the percent moisture value to the nearest 0.1%.
25) **Dry Density:** Calculate the dry density using the formula below and report to the nearest 0.1 PCF.

$$Dry\ Density = \frac{Wet\ Density}{100 + \%\ Moisture} \times 100$$

26) **% Max. Density**: Calculate the percent maximum density using the formula below and report to the nearest whole number.

$$\%\ Max.\ Density = \frac{Dry\ Density}{Max.\ Density\ Proctor} \times 100$$

27) **MAC Condition #'s:** Record all the possible MAC conditions that are required to be entered into MAC FM 1-T 238 test in MAC. For a list of MAC conditions, refer to the ERS Sample Manual, chapter 4 (see link 1).
28) **Notes:** Add any additional notes about the density test for future references. For example, if target compaction is overriden, then record the required compaction percentage.

LINKS:

Link 1: https://www.fdot.gov/materials/mac
Link 2: https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/materials/mac/training/ers/ers-samples/sample-numbering.pdf

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM
Stabilizing Mixing Depth

FINANCIAL PROJECT NUMBER: _____ **Mainline/Shoulder:** _____ **PAGE #:** _____ **of** _____

LOT #	Measured by TIN	Date	Station Range		QC Depth Check 1			QC Depth Check 2			QC Depth Check 3			LOT Average	Disp. Status
			Begin	End	Station	Offset	Depth	Station	Offset	Depth	Station	Offset	Depth		
NOTES:															

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM
Stabilizing Mixing Depth

FINANCIAL PROJECT NUMBER: ______________________________ **Mainline/Shoulder:** ________________________ **PAGE #:** _____ of _____

LOT #	Measured by TIN	Date	Station Range		QC Depth Check 1			QC Depth Check 2			QC Depth Check 3			LOT Average	Disp. Status
			Begin	End	Station	Offset	Depth	Station	Offset	Depth	Station	Offset	Depth		
1	2	3	4	5	6	7	8							9	10

NOTES:

- This form is used to document the mixing depth for subgrade material

(1) **LOT #**: Enter the consecutive LOT # per roadway/construction type and plan thickness

(2) **TIN:** Enter the inspector's CTQP training identification number

(3) **Date:** Enter the date of the test taken

(4) **Begin Station:** Enter the beginning station representing the LOT number

(5) **End Station:** Enter the ending station representing the LOT number

(6) **QC Depth Check - Station:** Enter the station location where the depth check was taken

(7) **QC Depth Check - Offset:** Enter the offset distance from a surveyed line (C/L or B/L of Construction with the direction ‘L’ or ‘R’ following the number)

(8) **QC Depth Check - Depth:** Record the final compacted depth of the mixed stabilzed subgrade measured by the QC technician to the nearest 1/4" inch.

(9) **LOT Average:** Calculate and report the average of the three depths

(10) **Disp. Status:** Enter the disposition status of the LOT average depth check (Verified? Yes/No)

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM

Rock Base Thickness

FINANCIAL PROJECT NUMBER: _____ **M/L OR SHOULDER:** _____ **PAGE #:** _____ **of** _____

PLAN THICKNESS: _____ **PAY ITEM #:** _____

Core LOT #	Measured By (TIN)	Date	Width	Station		QC Core 1			QC Core 2			QC Core 3			Disp. Status
				Begin	End	Station	Offset/RL	Depth	Station	Offset/RL	Depth	Station	Offset/RL	Depth	

NOTES:

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM

Rock Base Thickness

FINANCIAL PROJECT NUMBER: _____ **M/L OR SHOULDER:** _____ **PAGE #:** _____ **of** _____

PLAN THICKNESS: 1 **PAY ITEM #:** 2

Core LOT #	Measured By (TIN)	Date	Width	Station		QC Core 1			QC Core 2			QC Core 3			Disp. Status
				Begin	End	Station	Offset/RL	Depth	Station	Offset/RL	Depth	Station	Offset/RL	Depth	
3	4	5	6	7	8	9	10	11							12

- This form is used to document the core thickness for base material.
- Separate form must be used if Roadway or Plan Thickness changes.

(1) **Plan Thickness**: Record the thickness called for in the Plans.
(2) **Pay Item #**: Record the pay item number associated with the depth measurements.
(3) **Core LOT #**: Record the consecutive Core LOT # per roadway/construction type and plan thickness.
(4) **TIN:** Record the inspector's CTQP training identification number.
(5) **Date:** Record the date of the test taken.
(6) **Width:** Record the width of the roadway as shown in the Plans.
(7) **Begin Station**: Record the beginning station representing the LOT number.
(8) **End Station:** Record the ending station representing the LOT number.
(9) **QC Core - Station:** Record the station location where the depth check was taken.
(10) **QC Core - Offset/RL:** Record the offset distance from a surveyed line (C/L or B/L of Construction with the direction 'L' or 'R' following the number)
(11) **QC Core - Depth:** Record the thickness of the core hole measured to 0.1 inch. Subtract out the granular subbbase in lieu of stabilzed subgrade if used.
(12) **Disp. Status:** Record the disposition status of the core depths check (Verified? Yes/No)

NOTES:

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM

Stabilizing Mixing Depth for MAC-ERS

FINANCIAL PROJECT NUMBER: _____ **LOGBOOK NAME:** _____ **M/L OR SHOULDER:** _____

WITNESSED BY COMPANY: _____ _____ **PAD THICKNESS :** _____

FDOT SMPL #	Company Name / Measured By (TIN)	Test Date	Station Range		QC Depth Check 1			QC Depth Check 2			QC Depth Check 3			LOT Avg.
			Begin	End	Station	Offset/RL	Depth	Station	Offset/RL	Depth	Station	Offset/RL	Depth	

NOTES:

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM
Stabilizing Mixing Depth for MAC-ERS

FINANCIAL PROJECT NUMBER: _____ **LOGBOOK NAME:** 1 **M/L OR SHOULDER:** 2

WITNESSED BY COMPANY: 3 **PAD THICKNESS :** 4

FDOT SMPL #	Company Name / Measured By (TIN)	Test Date	Station Range		QC Depth Check 1			QC Depth Check 2			QC Depth Check 3			LOT Avg.
			Begin	End	Station	Offset/RL	Depth	Station	Offset/RL	Depth	Station	Offset/RL	Depth	
5	6 / 7	8	9		10	11	12							13

- This form is used to document the mixing depth for subgrade material for later upload into MAC-ERS.

1) **Logbook Name:** Record the name of the logbook exactly as it appears in MAC-ERS where the plots are drawn.
2) **M/L or Shoulder:** Denote whether the depth checks are taken in mainline/whole width of the roadway or shoulder.
3) **Witnessed by Company:** Record the name of the VT technician's employer who is witnessing the QC test.
4) **Pad Thickness:** Record the pad thickness when measuring depth for shoulder areas. If mainline, input N/A.
5) **FDOT Sample #:** Record the FDOT-Sample number pertaining to the density test in accordance with the ERS Sampling Numbering System document and the ERS Sample Manual (documents can be found @ www.fdot.gov/materials/mac).
6) **Company Name:** Record the name of the QC technician's employer.
7) **Measured by TIN:** Record the inspector's CTQP training identification number.
8) **Test Date:** Record the date that the density test was taken.
9) **Station Range (Begin to End):** Record the beginning station to ending station of the section represented.
10) **Station:** Record the station location where the depth check was taken.
11) **Offset/RL:** Enter the offset distance from a surveyed line (C/L or B/L of Construction with the direction 'L' or 'R' following the number).
12) **Depth:** Record the final compacted depth of the mixed stabilzed subgrade measured by the QC technician to the nearest 1/4" inch.
13) **LOT Avg.:** Calculate and report the average of the three depths.

NOTES:

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM

Rock Base Thickness for MAC-ERS

FINANCIAL PROJECT NUMBER: _____ **LOGBOOK NAME:** _____ **M/L OR SHOULDER:** _____

WITNESSED BY COMPANY: _____ **DEPTH INCLUDES LRI (Y/N):** _____ **PLAN THICKNESS:** _____

FDOT SMPL #	Company Name / Measured By (TIN)	Test Date	Width	Station		QC Core 1			QC Core 2			QC Core 3		
				Begin	End	Station	Offset/RL	Depth	Station	Offset/RL	Depth	Station	Offset/RL	Depth

NOTES:

CONTRACTOR - QUALITY CONTROL EARTHWORK RECORDS SYSTEM

Rock Base Thickness for MAC-ERS

FINANCIAL PROJECT NUMBER: _____ **LOGBOOK NAME:** 1 **M/L OR SHOULDER:** 2

WITNESSED BY COMPANY: 3 **DEPTH INCLUDES LRI (Y/N):** 4 **PLAN THICKNESS:** 5

FDOT SMPL #	Company Name / Measured By (TIN)	Test Date	Width	Station		QC Core 1			QC Core 2			QC Core 3		
				Begin	End	Station	Offset/RL	Depth	Station	Offset/RL	Depth	Station	Offset/RL	Depth
6	7 / 8	9	10	11		12	13	14						

- This form is used to document the core thickness for base material for later upload into MAC-ERS.

1) **Logbook Name:** Record the name of the logbook exactly as it appears in MAC-ERS where the plots are drawn.
2) **M/L or Shoulder:** Denote whether the base rock cores are taken in mainline/whole width of the roadway or shoulder.
3) **Witnessed by Company:** Record the name of the VT technician's employer who is witnessing the QC test.
4) **Depth Includes LRI:** Record yes or no, if the base thickness test includes granular subace in lieu of subgrade.
5) **Plan Thickness:** Record the Plan thickness of the base group. Exclude 6" when LRI is applicable.
6) **FDOT Sample #:** Record the FDOT-Sample number pertaining to the density test in accordance with the ERS Sampling Numbering System document and the ERS Sample Manual (documents can be found @ www.fdot.gov/materials/mac).
7) **Company Name:** Record the name of the QC technician's employer.
8) **Measured by TIN:** Record the inspector's CTQP training identification number.
9) **Test Date:** Record the date that the density test was taken.
10) **Width**: Record the wdith of the roadway that covers the base layer.
11) **Station Range (Begin to End):** Record the beginning station to ending station of the section represented.
12) **Station:** Record the station location where the rock base thickness was taken.
13) **Offset/RL:** Enter the offset distance from a surveyed line (C/L or B/L of Construction with the direction ‘L’ or ‘R’ following the number)
14) **Depth:** Record the final compacted depth of the rock base thickness measured by the QC technician to the nearest 0.1 inch.

NOTES:

INSTRUCTIONS FOR NON-ELECTRONIC ERS PROJECTS

General Instructions:

- For MAC-ERS projects, refer to manuals posted on www.fdot.gov/materials/mac.
- Keep a copy of the instruction with the logbook.
- Keep books separated by construction types (Left Roadway, Right Roadway, MSE Wall, Ramp, Pipe Backfill, etc.)
- Ensure all required information on the plot and density report are current, legible, and written in ink.
- Do not use dittos, white-out, and erasures, unless otherwise allowed in the directions.
- Make corrections with a single line striking through the original data and writing the corrected data in close proximity. Initial and date all corrections.
- If earthwork testing and sampling is different from the standard specification, then place a copy of the contract specification documents in the logbook.
- Notes may be written in Earthwork Records System by Independent Assurance personnel to assist in review of the Earthwork Records System.

FDOT Sample Numbering Process

- Keep a copy of the FDOT sample numbering instructions for Proctor samples (page 1) from the 'ERS Sample Numbering System' manual posted on www.fdot.gov/materials/mac in the logoobk.

Embankment, Bar Graphs, and Drainage Plot

- Use the Density Log Book Plot program to plot Embankment, Subgrade, Base, Shared-Use-Paths, Sidewalks/Driveways and Drainage Pipes.
- Plot the test number excluding the page number at the appropriate station and lift location where the test was conducted.
- All failing test locations should be circled to indicate the failing status
- Groundwater elevations and the date of the observation should be noted on the plot sheet (i.e. ▼07/04/25). The horizontal line represents the water table elevation. The symbol should be placed at the left or right side of the graph. Water table elevations should be indicated, dated, and initialed.

EARTHWORK RANDOM NUMBER GENERATOR

Instructions:

Choose random numbers to determine the each location and offset for Earthwork sampling and testing. Arbitrarily select numbers for the row and column. Use the row and column numbers to determine the random number from the table below.

	1	2	3	4	5	6	7	8	9	10	11	12
1	0.834	0.996	0.385	0.603	0.821	0.821	0.370	0.526	0.342	0.502	0.414	0.737
2	0.138	0.329	0.581	0.333	0.434	0.596	0.848	0.524	0.638	0.751	0.793	0.911
3	0.788	0.370	0.460	0.348	0.224	0.375	0.785	0.003	0.875	0.589	0.350	0.979
4	0.693	0.679	0.317	0.476	0.684	0.881	0.392	0.959	0.513	0.076	0.242	0.915
5	0.846	0.670	0.572	0.118	0.559	0.677	0.764	0.016	0.202	0.538	0.764	0.774
6	0.001	0.492	0.940	0.922	0.852	0.138	0.147	0.876	0.788	0.072	0.940	0.758
7	0.736	0.562	0.862	0.807	0.655	0.630	0.628	0.636	0.873	0.635	0.126	0.197
8	0.829	0.543	0.061	0.947	0.112	0.497	0.787	0.717	0.009	0.773	0.372	0.582
9	0.725	0.834	0.189	0.345	0.503	0.987	0.059	0.709	0.125	0.196	0.251	0.553
10	0.251	0.368	0.405	0.795	0.866	0.394	0.791	0.484	0.393	0.567	0.638	0.111
11	0.341	0.782	0.180	0.057	0.214	0.835	0.298	0.206	0.740	0.271	0.441	0.535
12	0.660	0.748	0.578	0.712	0.882	0.941	0.769	0.664	0.110	0.775	0.164	0.261
13	0.884	0.723	0.188	0.547	0.527	0.658	0.226	0.096	0.129	0.871	0.765	0.135
14	0.567	0.187	0.151	0.399	0.238	0.923	0.133	0.757	0.532	0.679	0.063	0.357
15	0.254	0.163	0.145	0.240	0.390	0.164	0.589	0.491	0.840	0.220	0.587	0.148
16	0.376	0.314	0.673	0.260	0.423	0.527	0.418	0.409	0.699	0.459	0.977	0.422
17	0.306	0.863	0.382	0.069	0.077	0.210	0.613	0.462	0.568	0.703	0.213	0.796
18	0.300	0.468	0.206	0.155	0.401	0.263	0.901	0.825	0.074	0.802	0.230	0.631

Density test example:

To get station and offset for a density test, multiply the length of the LOT in question by a random number obtained from the chart. For example, if the LOT you are testing is 500ft, and you choose Row 4 Column 5, then the number is 0.684. Your location for testing would be 0.684 X 500' = 342' from the beginning of the LOT, or 342' up station. Then select a random number and multiply by the width to determine the offset. For example, if the width of the LOT is 24 ft and you selected the random number from Row 8 Column 2, your offset is 0.543 X 24' = 13.0 ft.