Pay Factors

PAY FACTORS	Percent of Unit Price
Density (0.5)	2.5 %
CT Index (0.25)	1.25 %
% AC Content (0.25)	1.25 %
PMTP	2.0 %
Smoothness	3.0 % - 5.0 %
Total Incentive	**10 % - 12 %**

Proposed Lot Size

- Sublot – 1 Day's (Paving Shift) Production
- Lot – Five Paving Shifts
  - Random Numbers – Anticipated Production
  - < 1000 tons – Combine with Next Shift; Treat as 1 Sublot
  - < 1000 tons @ end – Combine with Previous Shift
  - Sublots from incomplete Lots combined with previous Lot
  - Small Quantity: Less than 4000 tons
  - New Lots begin when %AC adjustment and additive/binder changes.

Pay Factors	QC Min. Frequency	QA Frequency
Mat Density	1 Sample / Sublot	1 Sample / Lot
Unconf. Long. Joint	1 Sample / Sublot	1 Sample / Lot
Intell. Comp.	Continuous	10 % of Travelway
CT Index	1 Sample / Sublot	1 Sample / Lot
RT Index*	1 Sample / Sublot	1 Sample / Lot
TSR	1 Sample / Lot	1 / 5 Lots or Project
% AC Content	1 Sample / Sublot	1 Sample / Lot
Volumetrics - 1 / Day – Gmm, Gmb, Va, Vbe		

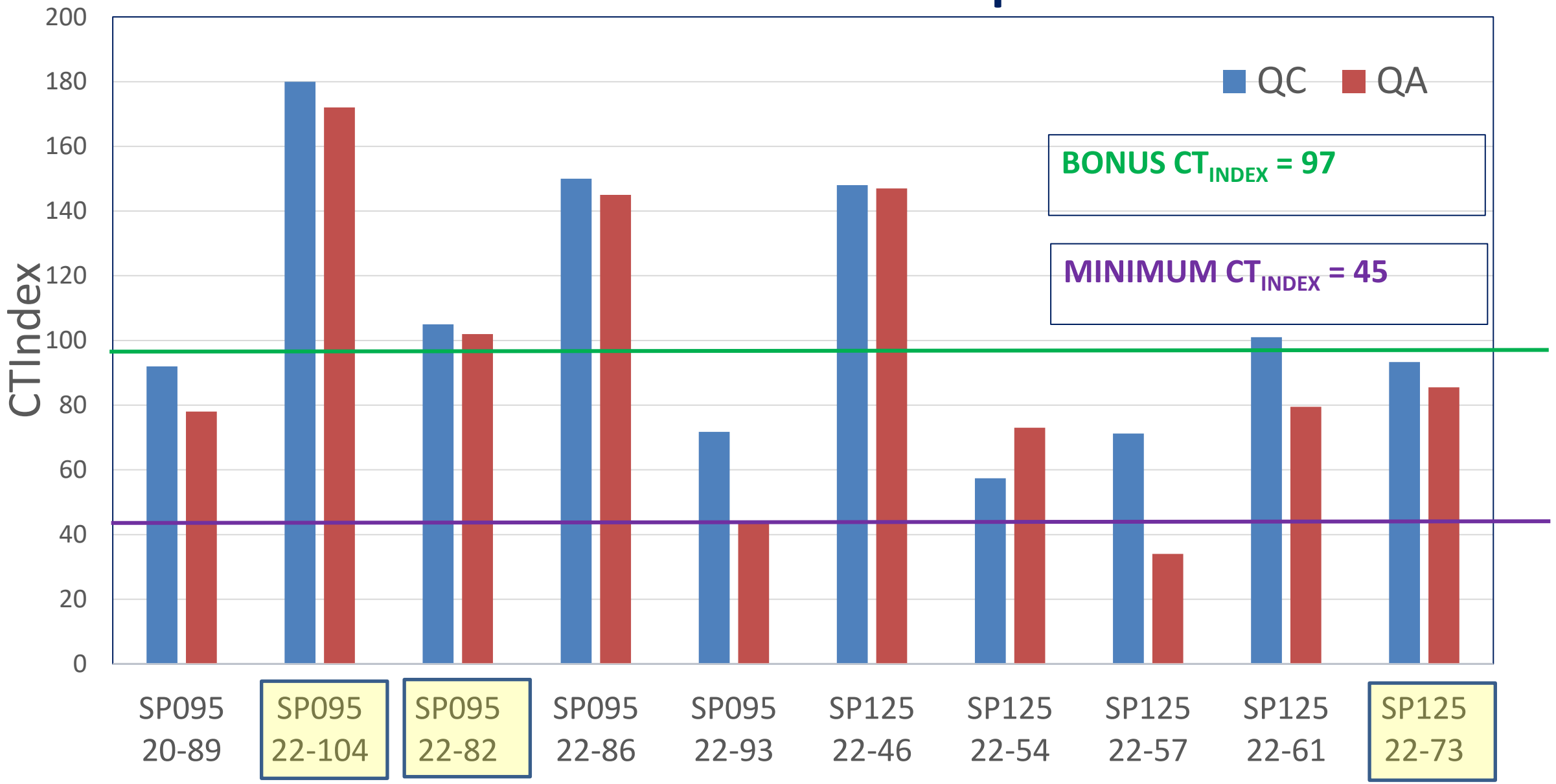
MIX CONSISTENCY		
Property	**Tolerance**	**Action Limit**
Air Voids	± 1.0	± 1.5
Gmm	± 0.02	± 0.04

Density Pay Factors		
Mat Density	(92.5 – 98.0)	Use PWL
Unconf. Long. Joint	> 90.5	Use PWL
	89.5 – 90.5	Correction of Joint + Lower of 100% or PWL
	< 89.5	Remove
Intell. Compaction	≥ 85 % Coverage	Use PWL
	70 – 84 % Coverage	Lower of 100% or PWL
	< 70 %	Lower of 100% or PWL + Verify Density

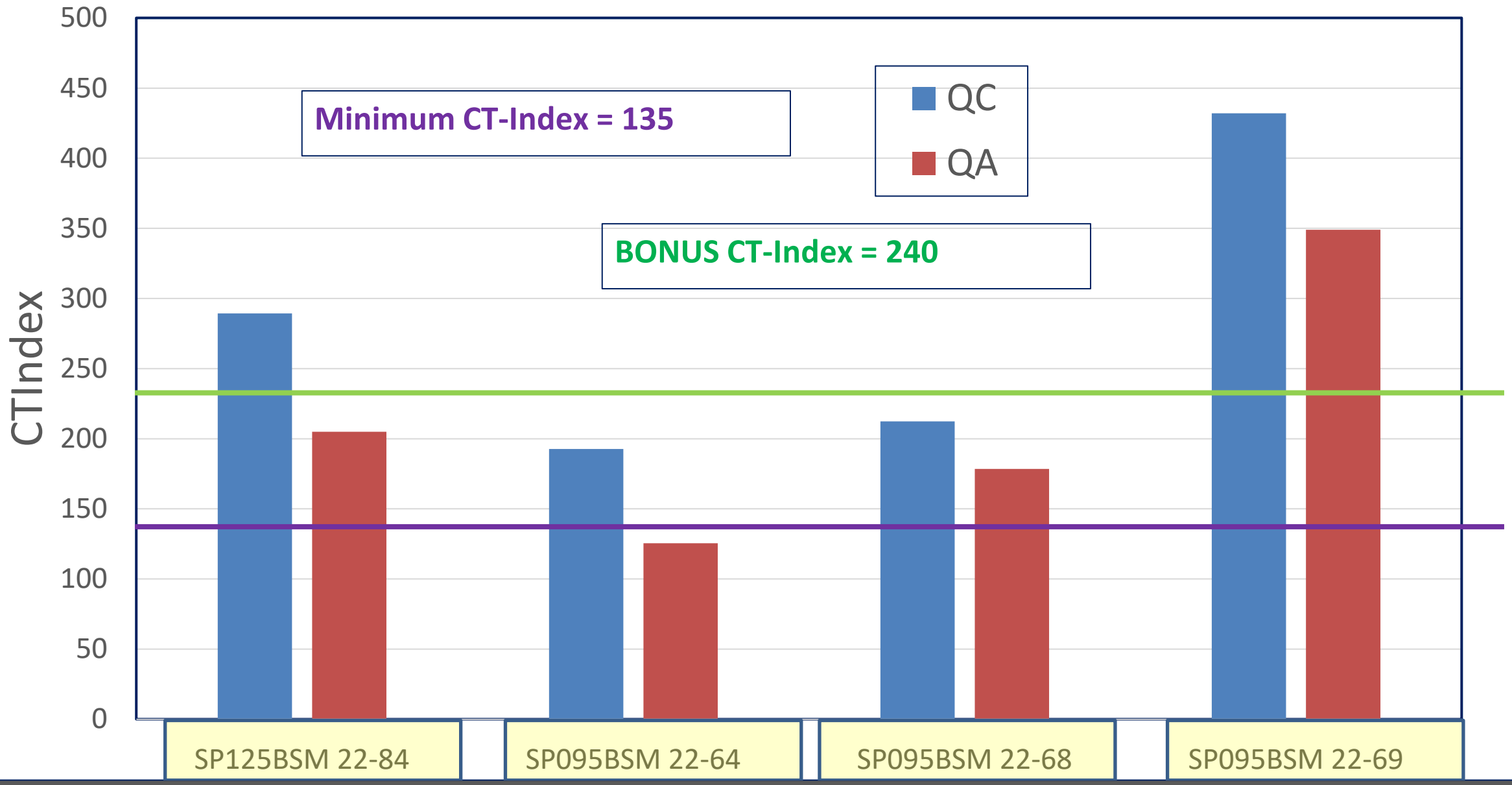
CT Index Pay Factor			
CT Index	> 50		Use PWL
			CT > 80; Min. 100 % Pay
			CT > 100; Full Bonus
RT Index	PG Grade	Min RT	Use PWL or Remove*
	64S or 58H	50	
	64 H	65	
	64 V	80	
TSR	≥ 80		Use PWL
	75 – 79		Lower of 100% or PWL
	70 – 74		Lower of 98% or PWL
	< 70		Remove

Thermal Segregation Category	Adjustment per 150 ft. Sublot
Low	2% Bonus
Moderate	100% Pay
Moderate-High	-2% Deduct (Linear)
Severe	Unacceptable Material

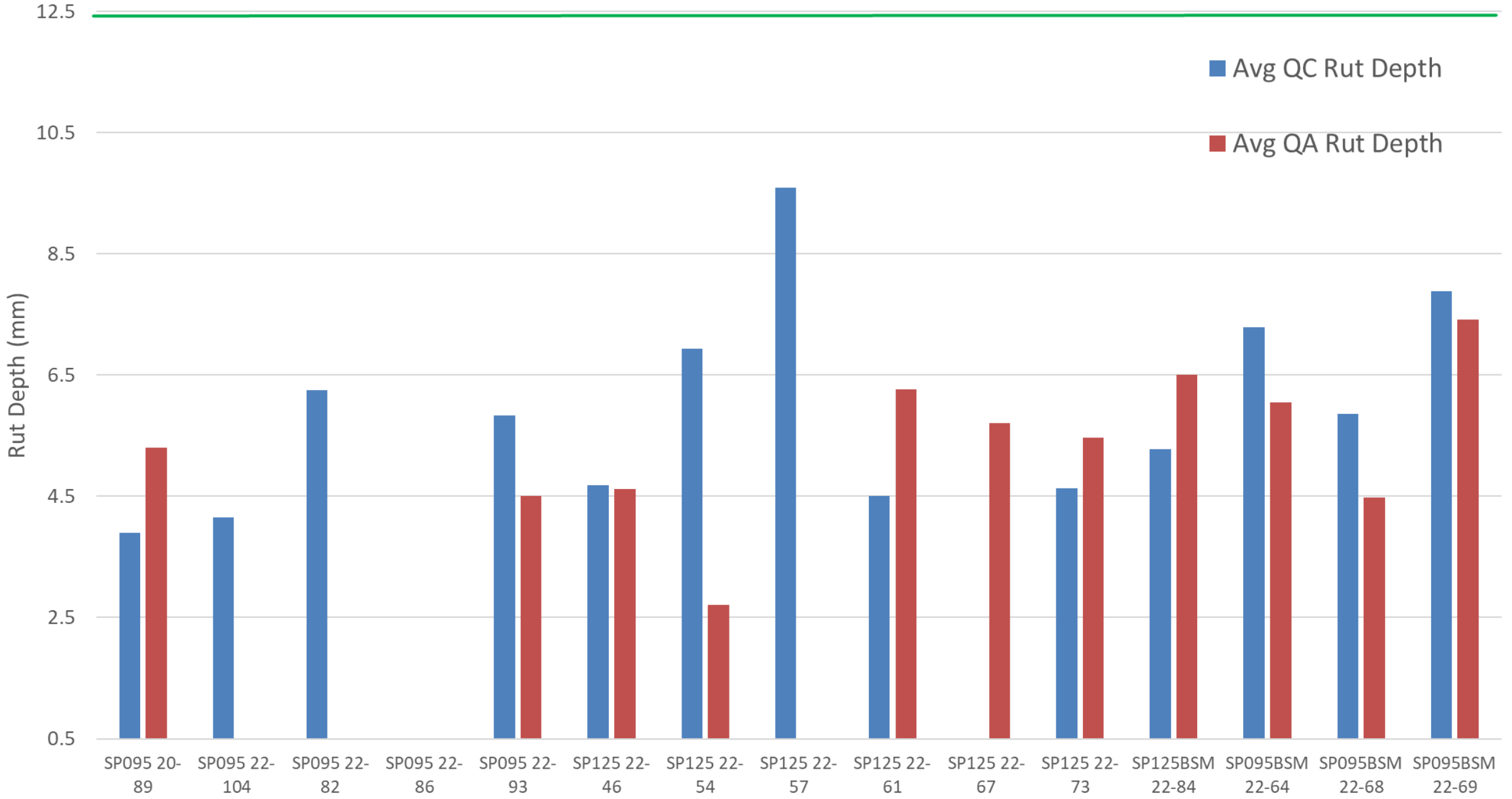
2022 CT-Index Test Results for SuperPave Mixes



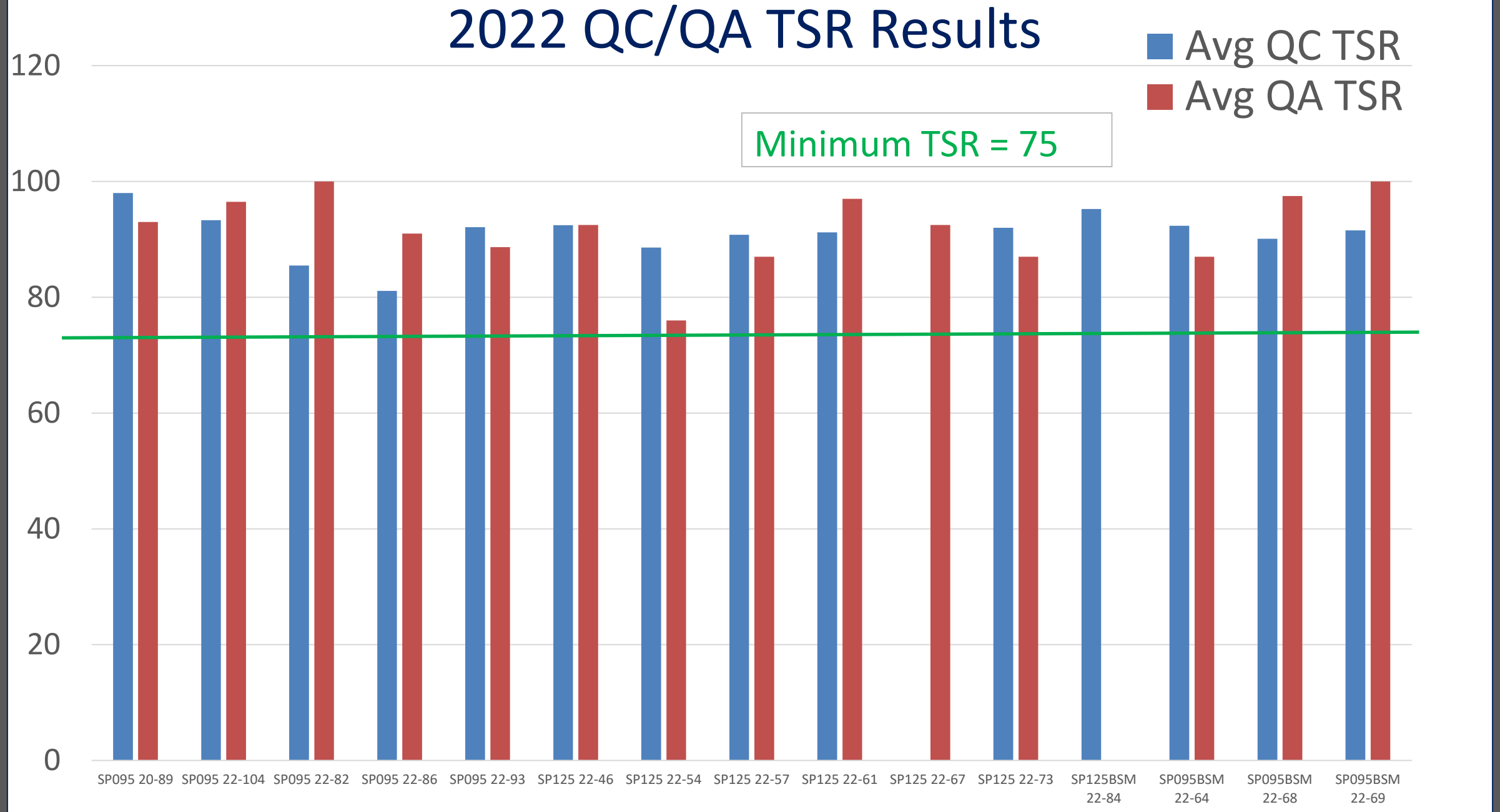
2022 CT-Index Test Results for SMA Mixes



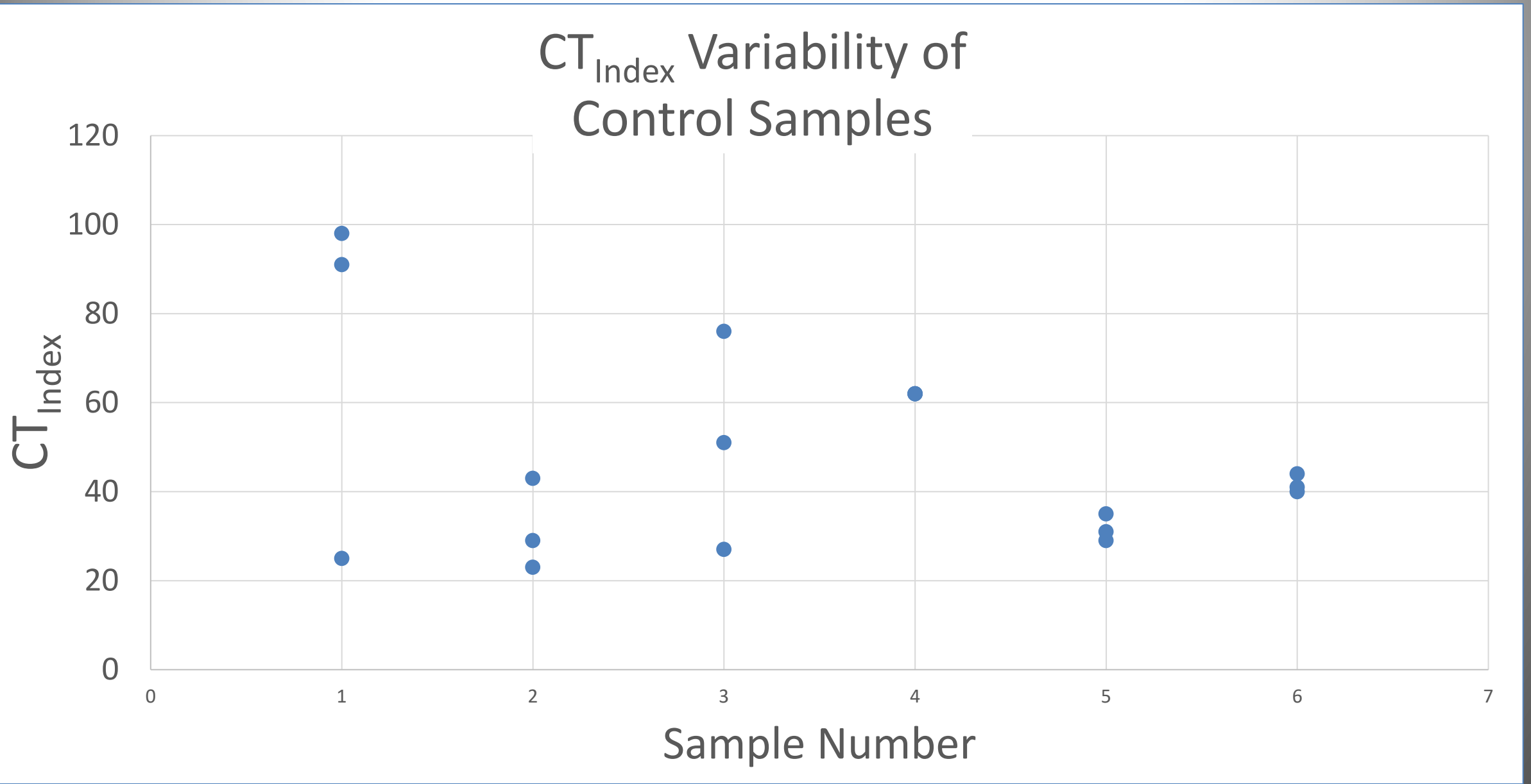
2022 Hamburg Test Results (All Mixtures)

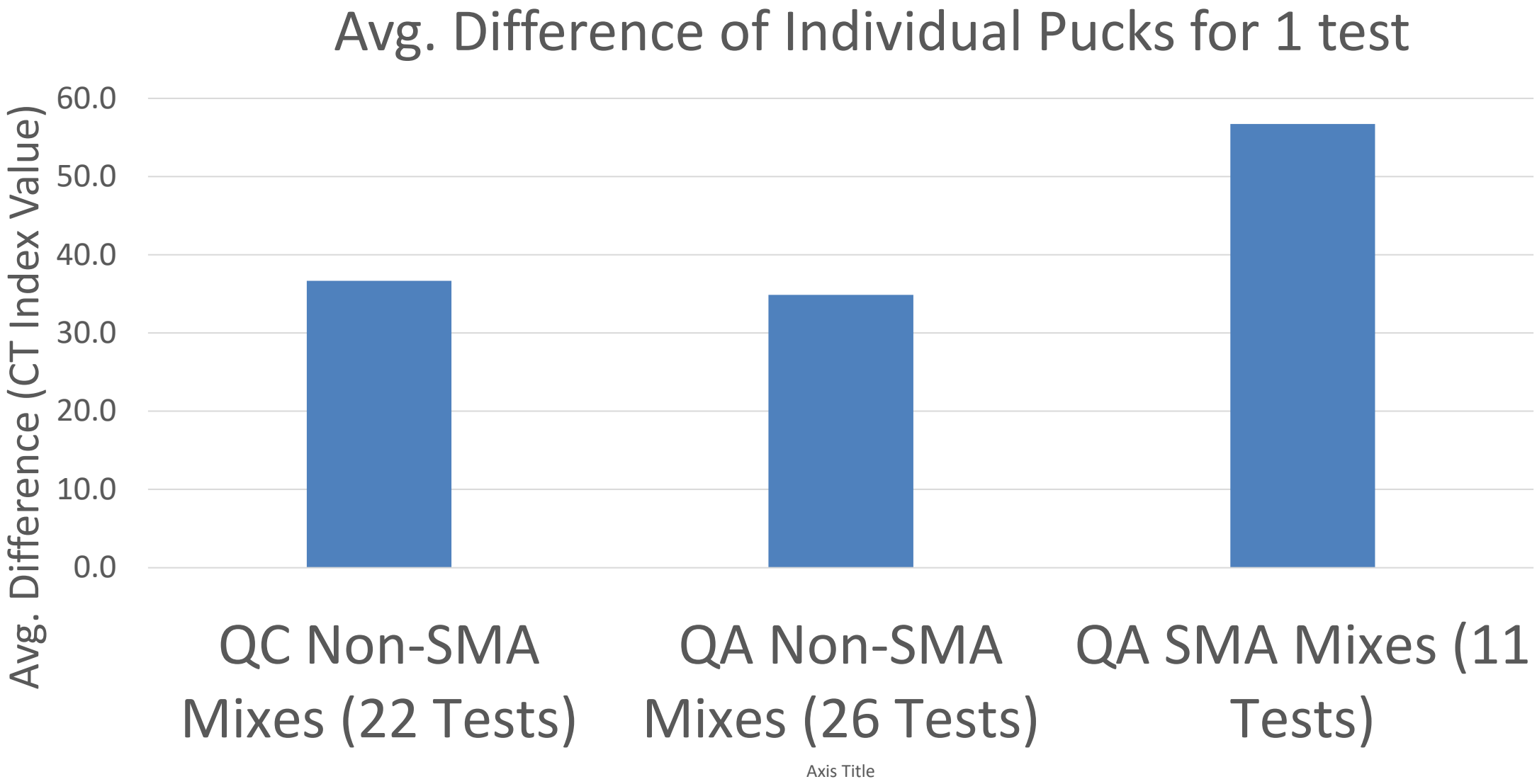


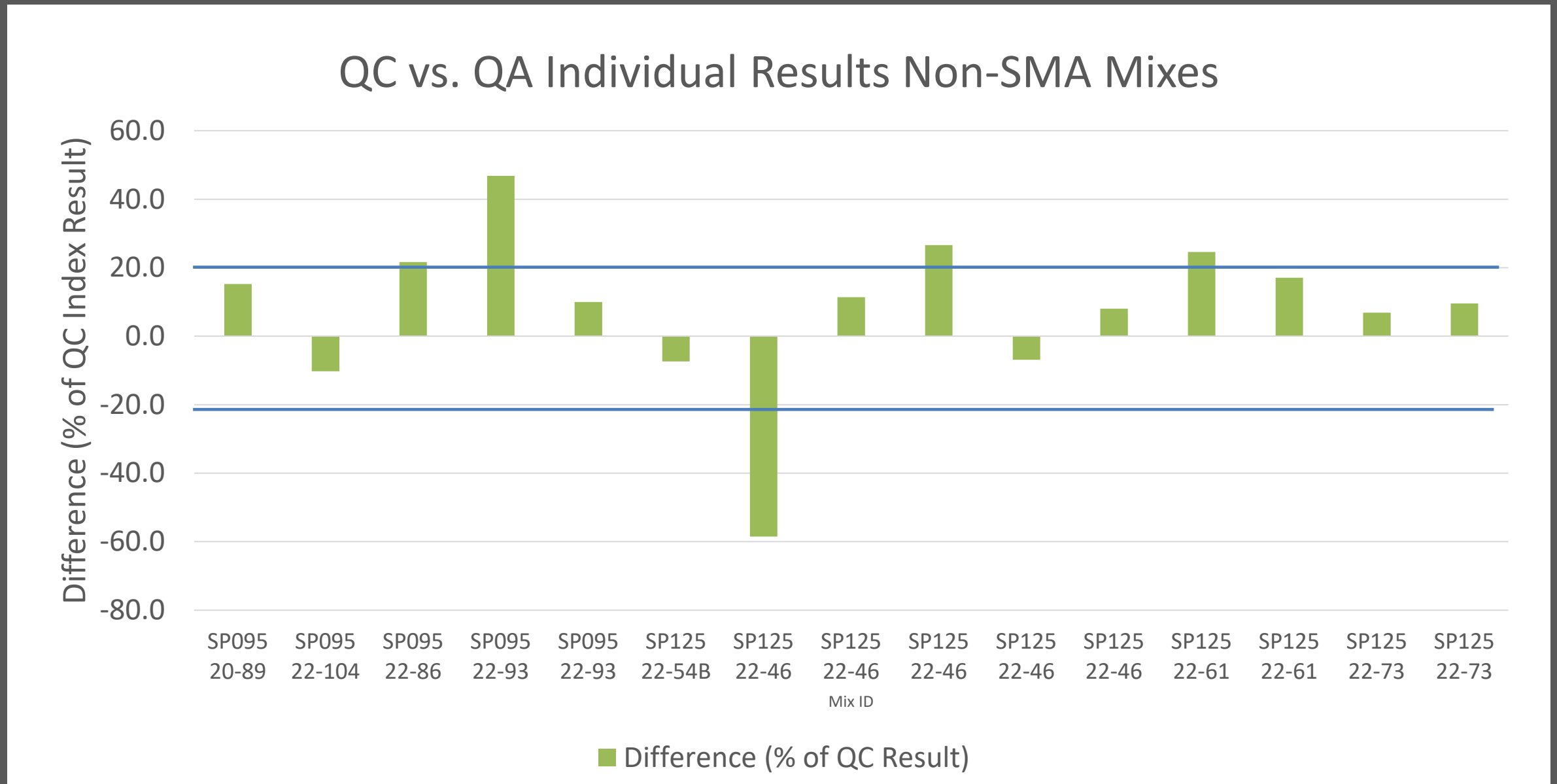
2022 QC/QA TSR Results

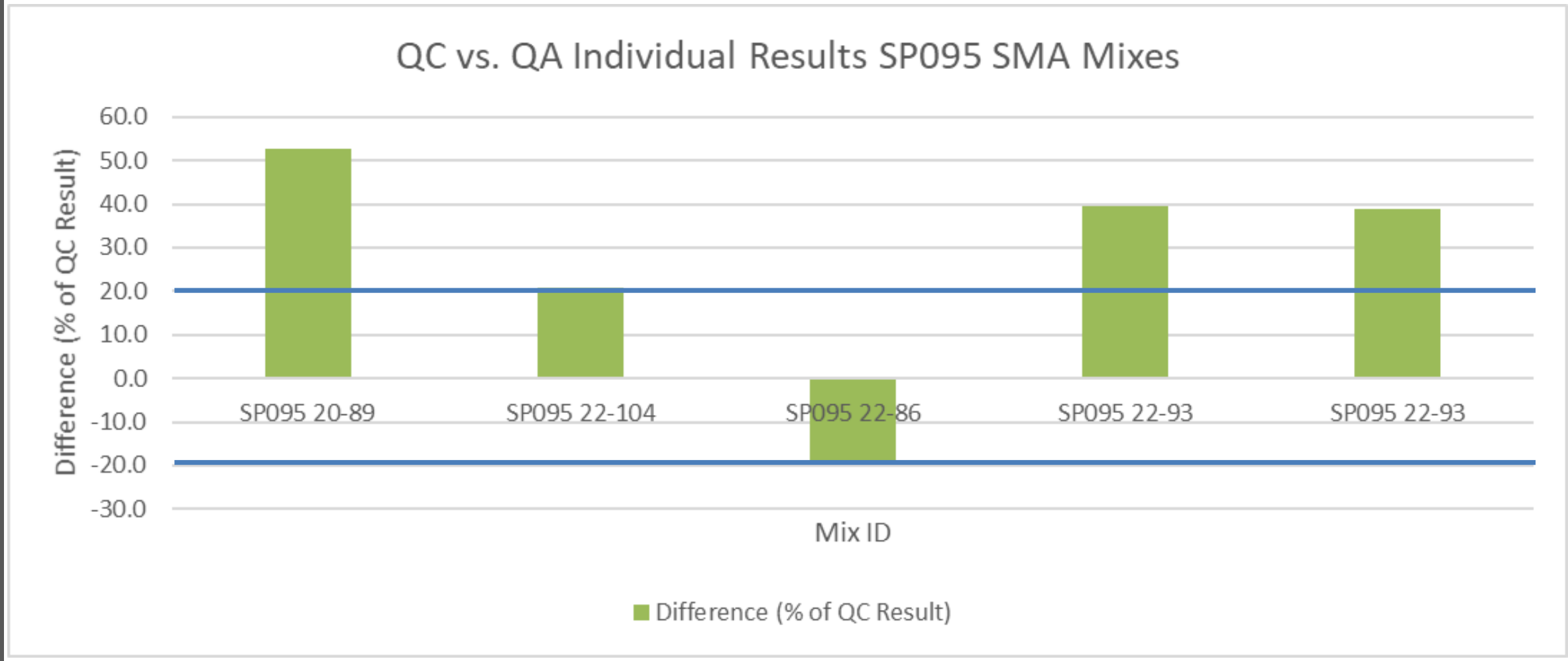


CT_{Index} Variability on 6 Samples from 1 Project

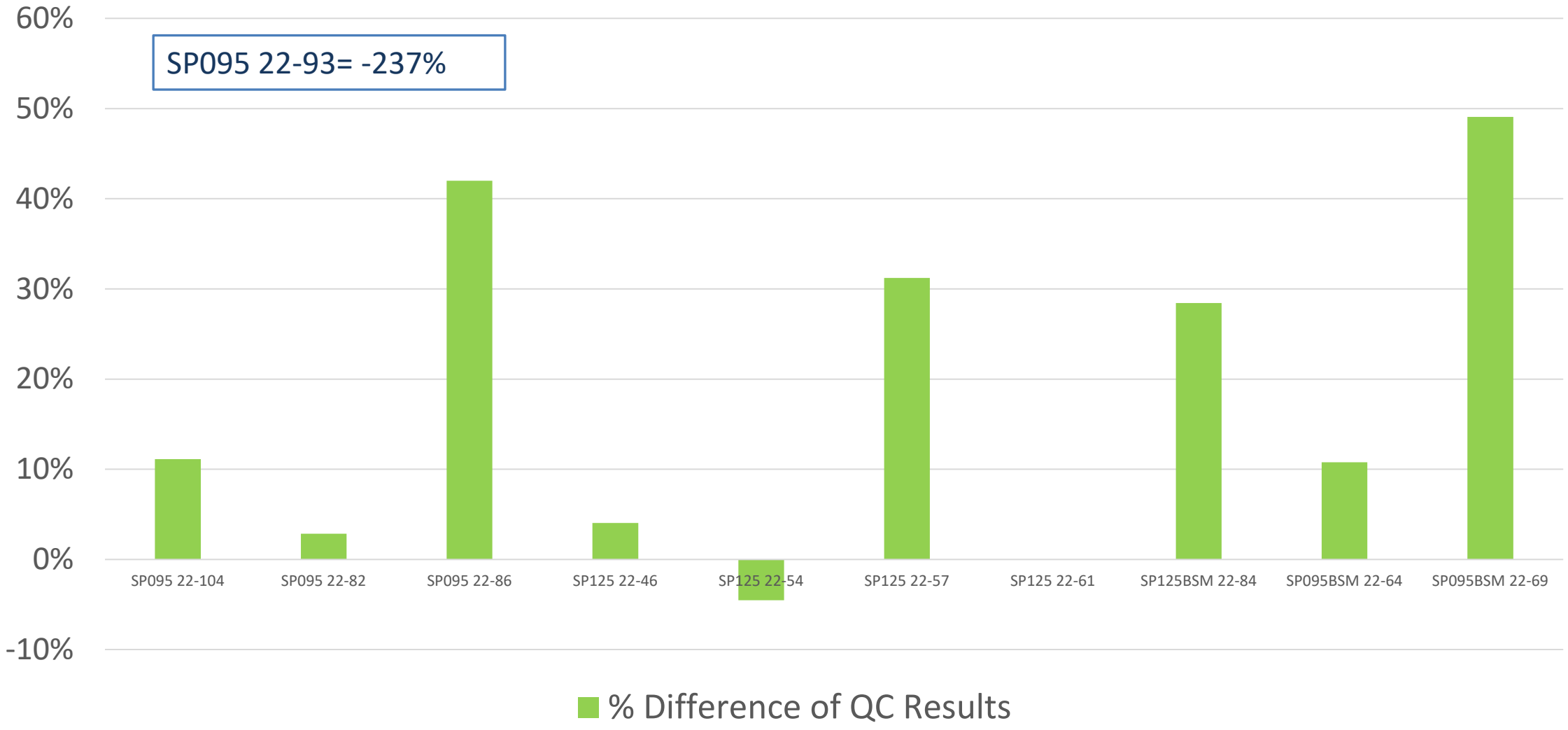



Avg. Difference of Individual Pucks for 1 test
Avg. Difference (CT Index Value)
60.0
50.0
40.0
30.0
20.0
10.0
0.0
QC Non-SMA Mixes (22 Tests)
QA Non-SMA Mixes (26 Tests)
QA SMA Mixes (11 Tests)
Axis Title

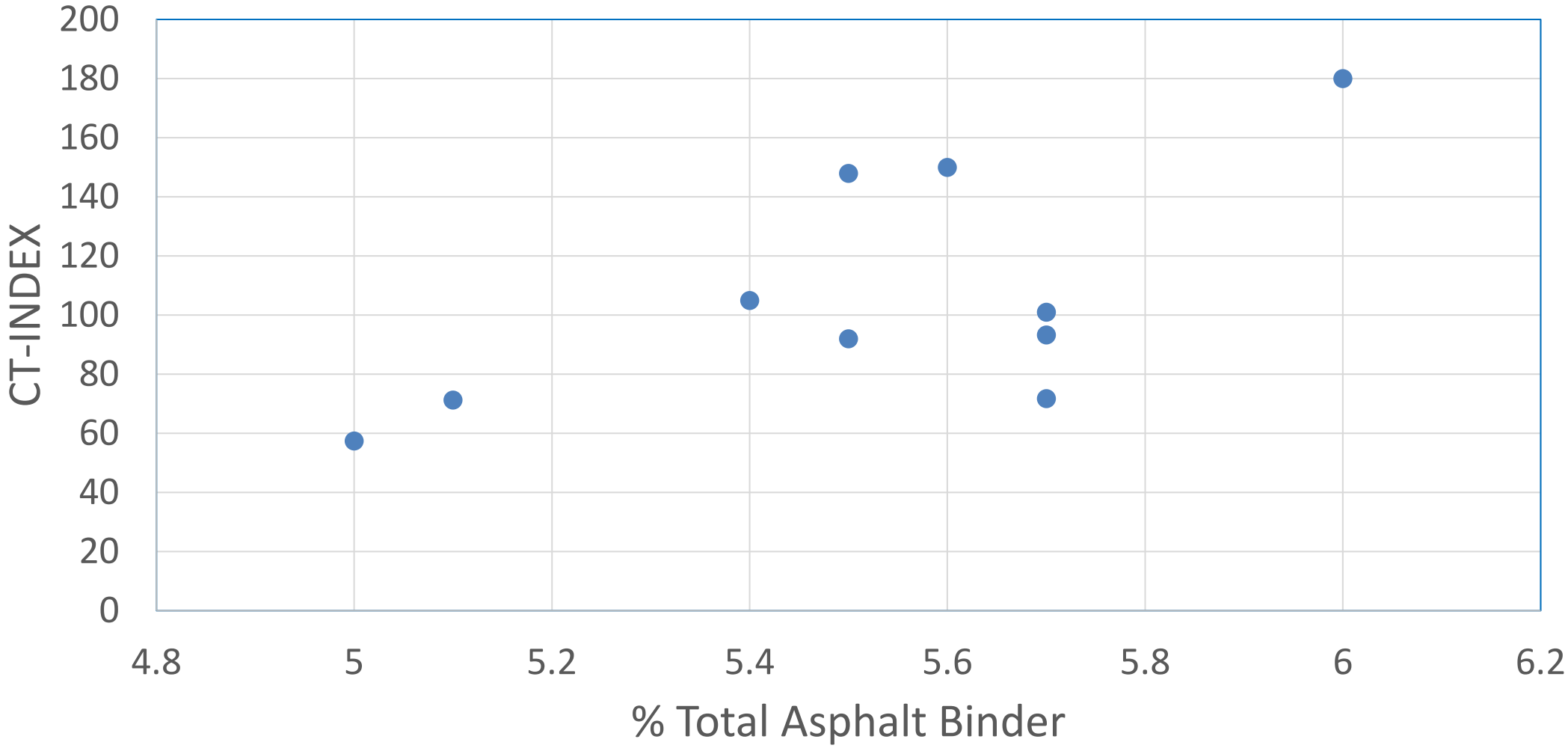

QC vs. QA Individual Results Non-SMA Mixes
Difference (% of QC Index Result)
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
-80.0
SP095 20-89
SP095 22-104
SP095 22-86
SP095 22-93
SP095 22-93
SP125 22-54B
SP125 22-46
SP125 22-46
SP125 22-46
SP125 22-46
SP125 22-46
SP125 22-61
SP125 22-61
SP125 22-73
SP125 22-73
Mix ID
Difference (% of QC Result)

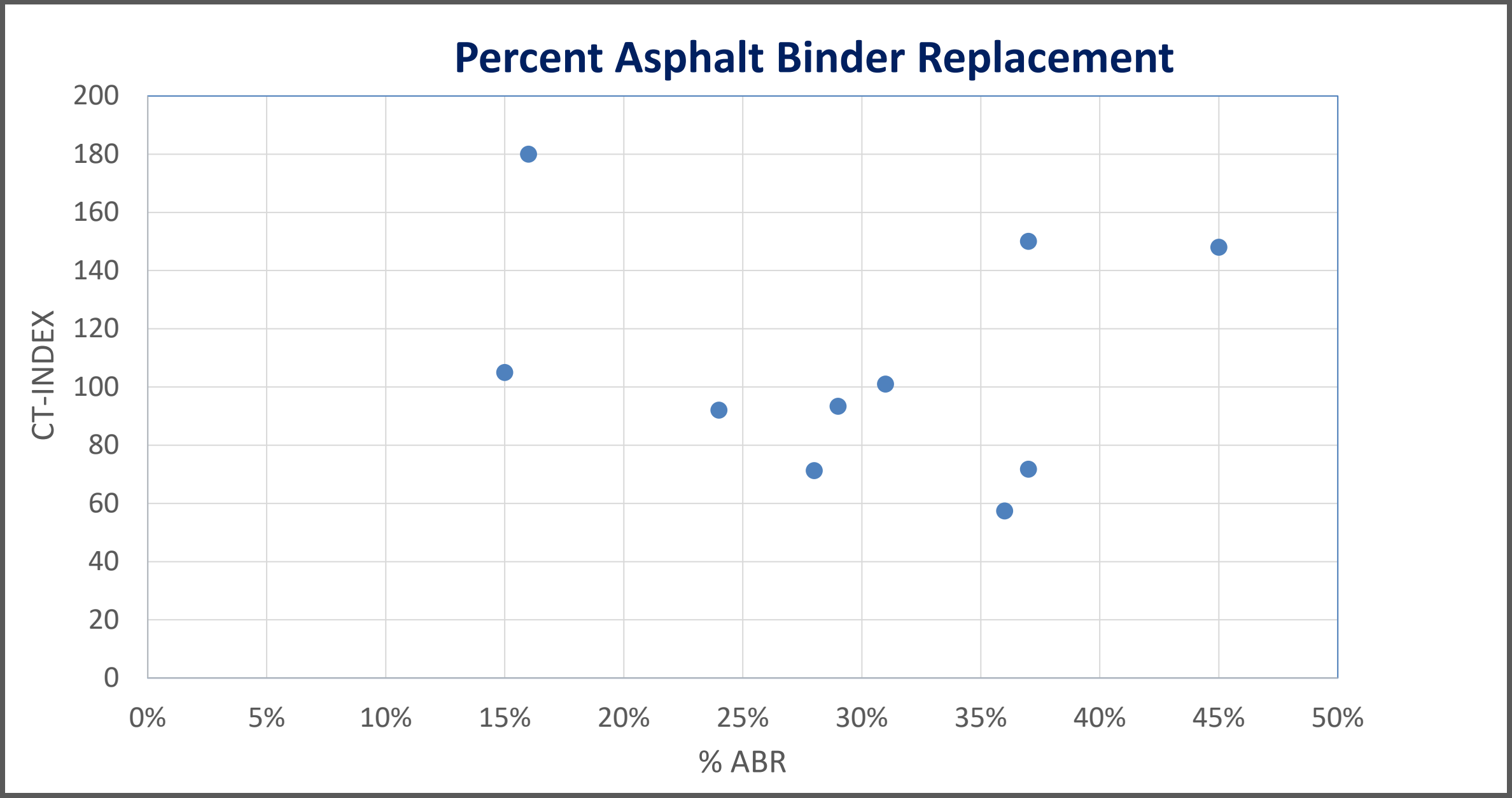

QC vs. QA Individual Results SP095 SMA Mixes
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
Difference (% of QC Result)
SP095 20-89
SP095 22-104
SP095 22-86
SP095 22-93
SP095 22-93
Mix ID
Difference (% of QC Result)

CT_{Index} - JMF vs QC Field Comparison



% Asphalt Binder vs CT-INDEX




Percent Asphalt Binder Replacement
CT-INDEX
200
180
160
140
120
100
80
60
40
20
0
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%
50%
% ABR

2022 LESSONS LEARNED

➢ ***NEED TO REDUCE TESTING!***

- CT-Index, Hamburg, and TSR's
- Volumetrics – VMA, Air Voids, % AC, Gmm
- Mat and Longitudinal Joint Density
- Gradation and Deleterious
- RAP and/or RAS Tests
- Smoothness
- Intelligent Compaction
- Paver Mounted Thermal Profilers

Industry/Agency/ Academia Partnership

- MAPA Quarterly Meetings
- Bituminous Technical Team Meetings
- BMD Group

2022 LESSONS LEARNED

➢ NEED TO REVISIT TESTING PROTOCOLS

- Mix Sampling and Handling
  - AASHTO R97 – Sampling Asphalt Mixtures
- Mix Additives
  - Caused False Rutting Failure on Hamburg
  - Reheat - < 5 mm of Rutting
  - Reheat – Reduced CTIndex by 25%; CTIndex = 180 to 141

34 BMD Construction Projects in 2023

- 15 Projects with BMD QC/QA production sampling and testing
- 19 Projects with BMD testing for Job Mix Approval Only

Intelligent Compaction - Home (mo.gov)

Faster Rutting Performance Field Test

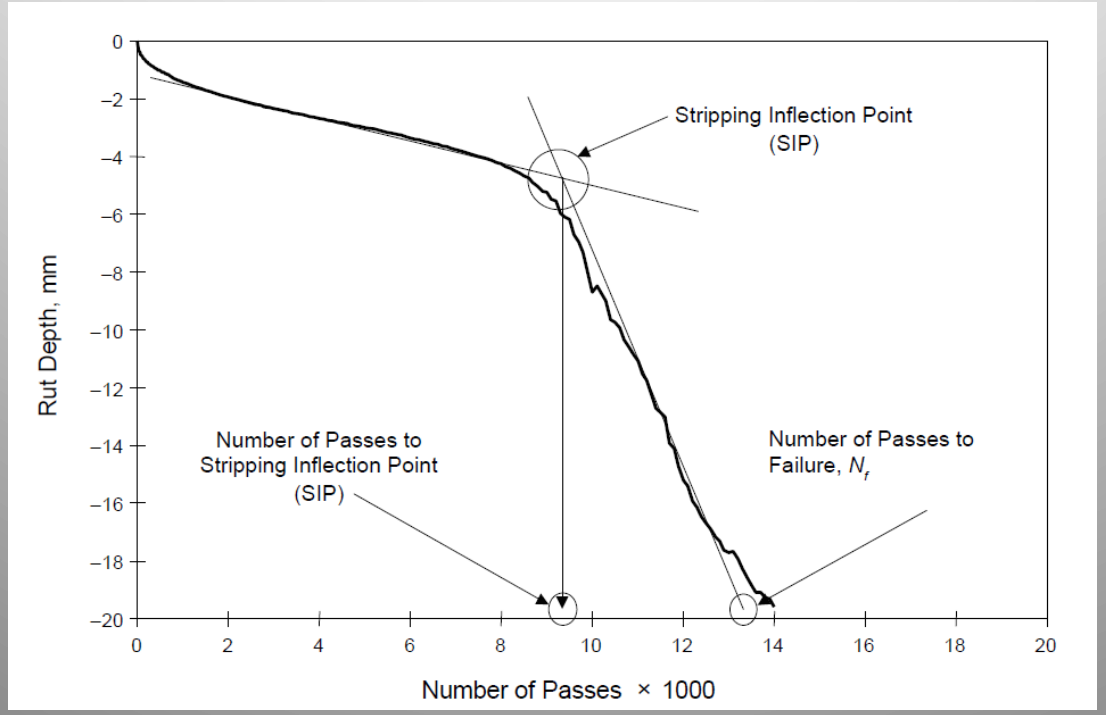
Hamburg Wheel

Track Test (HWTT)

- RT-Index
  - Same equipment as CT-Index
- Hot IDT Test
  - Indirect Tensile Strength equipment ran at elevated temperature

Improving Durability Test

- Resistance to Moisture Damage
  - Cantabro
  - Hamburg Slope Inflection Point (SIP) Value
  - MiST (Moisture Induced Stress Testter)



QUESTIONS