

PRECOMMISSIONING CHECKLIST

ISSUE NO. 1

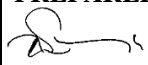
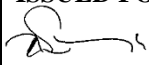
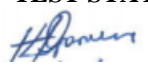

DATE: September 17, 2022

SUBSTATION: ORANGE BAY 69/24 kV SUBSTATION (TRANSFORMER T1 OIL PROCESSING)

The equipment summarized below has been subjected to the precommissioning tests detailed in the specifications and has been found to be in acceptable condition to be energized. This also certifies that the equipment is authorized for commercial use following satisfactory completion of on-load tests.

ATTACHED: Test Reports

EQUIPMENT & INSPECTION/TEST ITEMS	INSPECTION/TEST STATUS	
	COMPLETE	INCOMPLETE
25 MVA 69-24 kV DISTRIBUTION TRANSFORMER T1		
EXTERNAL VISUAL INSPECTION	✓	
VALVE POSITIONS (RADIATOR, CONSERVATOR, ETC)	✓	
CONSERVATOR & AIR BREATHERS	✓	
BUSHINGS & SURGE ARRESTERS	✓	
BUCHHOLZ RELAY & PRESSURE RELIEF DEVICE	✓	
OIL TEMPERATURE GAUGES	✓	
WINDING TEMPERATURE GAUGES	✓	
COOLING FANS	✓	
OIL LEVEL INDICATORS (TRANSF & CONSERVATOR)	✓	
GROUNDING	✓	
OIL DIELECTRIC TESTS	✓	
INSULATION RESISTANCE/PI TESTS	✓	
TURNS RATIO TEST	✓	
WINDING RESISTANCE TEST	✓	
TAP CHANGER OPERATION	✓	
TAP CHANGER RELAY	✓	
INSULATION CAPACITANCE/P.F. TESTS	✓	

PREPARED BY: 	ISSUED FOR TEST: 	TEST STATUS CERT: 	AUTHOR TO ENERGIZE & FOR COMMERCIAL USE: 
DATE: Sep-17-2022	DATE: Sep-17-2022	DATE: Sep-17-2022	DATE: Sep-17-2022

Orange Bay 2022



JAMAICA PUBLIC SERVICE LIMITED

Session Test Date 9/17/2022 10:23:02 AM

Company	JPSCO	Serial Number	88.2.4020
Location	Orange Bay s/s	Special ID	T1
Division	Region West	Circuit Designation	Distribution Xformer
Manufacturer	Pauwels Trafo	Configuration	Δ-Y
Year Manufactured	1988	Tank Type	Sealed Conservation
Mfr Location	Belgium	Coolant	Oil
Phases	Three	Class	OA
Oil Volume	15.8 TN	BIL	350 kV
Weight	63.5 TN		
kV	69, 24	VA Rating	25 MVA

Administration

Test Date	9/17/2022	Test Time:	10:23 AM	Weather	Sunny
Air Temperature	35°C	Apparatus Temp	38°C	Humidity	42 %
Tester	V. Thorpe	Work Order		Date Last Tested	
Verified	E. Vassell	Test Set Type		Date Retested	
Verification Date	17-Sep-22	Set Top Serial #		Reason	
Approved By	H. Garvey	Set Bottom Serial #		Travel Time	
Approved Date		Ins. Book #		Duration	
Authorized By	L. Hopkins	Sheet #		Crew Size	3


Overall Tests


	Insulation	Test kV	mA	Watts	% PF Corr.	Corr Fctr	Cap (pF)	FRANK™	Manual
1	CH+CHL	10	40.762	1.003	0.222	0.903	13105.80		
2	CH	10	11.207	0.42	0.339	0.903	3603.39	Good	
3	CHL(UST)	10	29.538	0.569	0.174	0.903	9497.30	Good	
4	CHL	0	29.555	0.583	0.178	0.903	9502.41		
5	CL+CHL	10	63.321	1.811	0.258	0.903	20359.55		
6	CL	10	33.773	1.242	0.332	0.903	10858.95	Good	
7	CHL(UST)	10	29.534	0.561	0.171	0.903	9495.99		
8	CHL	0	29.549	0.57	0.174	0.903	9500.60	Good	

NOTES:

Tested By C. Walker/V. Thorpe
SSD West

Authorized By:  Sep-17-2022
Director - Transmission

Checked By  Sep-17-2022
Ops. Engineer - SSD West

Approved By  Sep-17-2022
Manager - Substations

INSULATION RESISTANCE



Substation/Location:	ORANGE BAY
Date:	17-Sep-22
Transformer S.N.:	88.2.4020
MVA Rating	25
Manufacturer:	PAUWEL TRAFO
Voltage Rating HV/LV, kV:	69/24

Test Equipment	MEGGER
Model	S1-1568

Ambient Temperature:	32	Deg. C
Temperature Correction Factor:	20	
Winding Temp, Deg. C	40	
Oil Temp, Deg. C	40	
Humidity:		

Oil Dielectric Test (KV)	
Test 1	60.0
Test 2	60.0
Test 3	60.0
Test 4	60.0
Test 5	60.0
Average	60.0

Item No.	Test	Resistance Readings - M Ohms						
		Test Volts	Duration	Measured	Corrected to 20 deg. C	Duration	Measured	PI
1	Megger - Insulation			Ω			Ω	
1.1	HV to LV and ground	5 KV	1 Min	4.17 GΩ		10 Min	5.70 GΩ	1.37
1.2	LV to HV and Ground	5 KV	1 Min	2.82 GΩ		10 Min	4.24 GΩ	1.50
1.3	HV to LV	5 KV	1 Min	4.47 GΩ		10 Min	6.63 GΩ	1.48
1.4								
2	Core Insulation Res.							
2.1	Core ground strap - tank ground	500V	2 Min	4.77 GΩ				

Tested By N. Griffiths/S. Watson

Date: 17-Sep-22

Checked by: 

Date: Sep-17-2022

Approved by: 

Date: Sep-17-2022

Authorized to Energize by: 

Date: Sep-17-2022

3Ø Winding Resistance and Turns Ratio

 DATE 9/17/2022

 PAGE 1

 AMBIENT TEMP. 32 °C

JOB # _____

 SUBSTATION Orange Bay Sub Station

 HUMIDITY _____ % ASSET ID T1 Transformer

 POSITION Distribution Transformer - 69/24kV

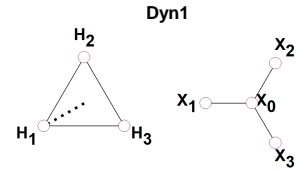
 TEST STATUS Pass

 EQUIPMENT LOCATION Orange Bay Substation

Nameplate

 MFR Pauwels Trafo
 SER NO 88.2.4020
 YEAR 1988
 TYPE SEALED-CONSER

 WEIGHT 63.5 tn
 CLASS OA
 BIL 350 kV

 OIL VOLUME 15.8 TN
 COOLANT OIL
 IMPEDANCE 11.65 %

 Diagram # 5 (ANSI)

	Voltage (V)		MVA	Rated I	# Taps	Nominal	Tap Changer	Tap Setting	First Tap Voltage	Last Tap Voltage	© Material
	L-L	L-G									
Primary	69,000		25	209.18	17	9	OLTC		75,900	62,100	Cu
Secondary	23,900	13,799	25	603.92	1				23,900	23,900	Cu

Transformer Test Conditions

 AMBIENT TEMP. 32 °C

 OIL TEMP 40 °C

 REASON Routine

HUMIDITY _____ %

 WINDING TEMP 40 °C

 TEST STATUS Pass

 WEATHER Sunny

Turns Ratio - Primary Taps to Secondary Nominal

#	Tap Pri/Sec		Voltage Pri/Sec		Test V	Calc TTR	H ₁ - H ₃ / X ₁ - X ₀				H ₂ - H ₁ / X ₂ - X ₀				H ₃ - H ₂ / X ₃ - X ₀			
							Actual TTR	% Error	I exc mA	Phase (Deg)	Actual TTR	% Error	I exc mA	Phase (Deg)	Actual TTR	% Error	I exc mA	Phase (Deg)
1	1	Nominal	75,900	23,900	80	5.501	5.497	-0.06	2.2	-0.370	5.501	0.00	2.0	-0.426	5.502	0.03	3.8	-0.413
2	2	Nominal	75,038	23,900		5.438												
3	3	Nominal	74,175	23,900		5.376												
4	4	Nominal	73,313	23,900		5.313												
5	5	Nominal	72,450	23,900	80	5.251	5.246	-0.09	2.4	-0.360	5.250	-0.02	2.1	-0.414	5.252	0.03	4.2	-0.401
6	6	Nominal	71,588	23,900		5.188												
7	7	Nominal	70,725	23,900		5.125												
8	8	Nominal	69,863	23,900		5.063												
9	Nominal	Nominal	69,000	23,900	80	5.000	4.997	-0.07	2.7	-0.342	5.000	-0.00	2.4	-0.397	5.001	0.02	4.6	-0.384

3Ø Winding Resistance and Turns Ratio

#	Tap Pri/Sec		Voltage Pri/Sec		Test V	Calc TTR	H ₁ - H ₃ / X ₁ - X ₀				H ₂ - H ₁ / X ₂ - X ₀				H ₃ - H ₂ / X ₃ - X ₀			
							Actual TTR	% Error	I exc mA	Phase (Deg)	Actual TTR	% Error	I exc mA	Phase (Deg)	Actual TTR	% Error	I exc mA	Phase (Deg)
10	10	Nominal	68,138	23,900		4.938												
11	11	Nominal	67,275	23,900		4.875												
12	12	Nominal	66,413	23,900		4.813												
13	13	Nominal	65,550	23,900		4.750												
14	14	Nominal	64,688	23,900	80	4.688	4.683	-0.10	3.0	-0.334	4.686	-0.04	2.7	-0.383	4.689	0.03	5.1	-0.371
15	15	Nominal	63,825	23,900		4.625												
16	16	Nominal	62,963	23,900		4.563												
17	17	Nominal	62,100	23,900	80	4.500	4.495	-0.11	2.7	-0.341	4.496	-0.09	2.1	-0.362	4.496	-0.11	2.4	-0.360

Turns Ratio - Primary Nominal to Secondary Taps

#	Tap Pri/Sec		Voltage Pri/Sec		Test V	Calc TTR	H ₁ - H ₃ / X ₁ - X ₀				H ₂ - H ₁ / X ₂ - X ₀				H ₃ - H ₂ / X ₃ - X ₀			
							Actual TTR	% Error	I exc mA	Phase (Deg)	Actual TTR	% Error	I exc mA	Phase (Deg)	Actual TTR	% Error	I exc mA	Phase (Deg)
18	Nominal	Nominal	69,000	23,900	80	5.000	4.997	-0.07	2.7	-0.342	5.000	-0.00	2.4	-0.397	5.001	0.02	4.6	-0.384

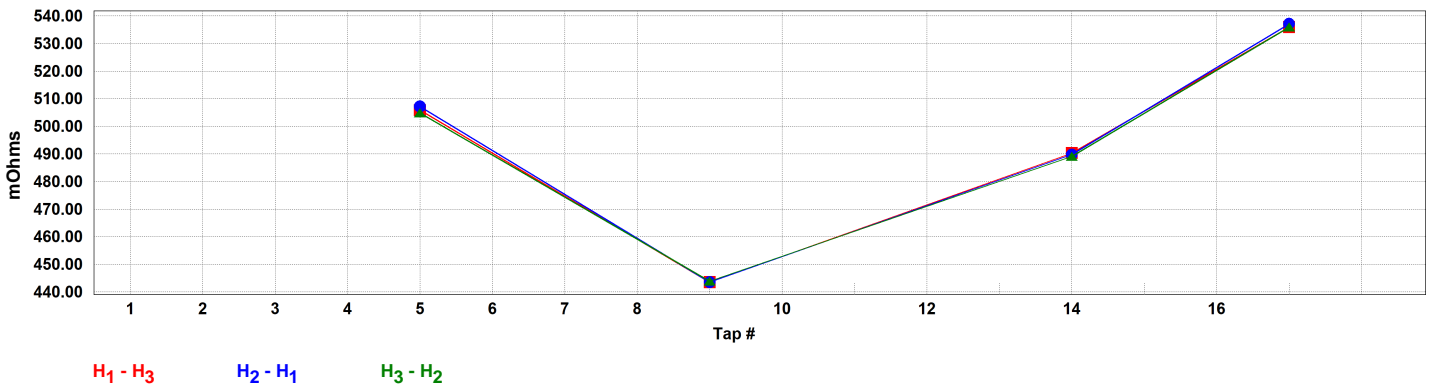
Resistance - Primary

#	Tap	Test Current (A)	Measured Resistance (Corrected to 85°C)				Winding Diff Max: 5 %	Make/Break				
		Stability (%/Digit)	H ₁ - H ₃	H ₂ - H ₁	H ₃ - H ₂	Units: mΩ						
20	1											
21	2											
22	3											
23	4											
24	5	10.0413 99.694	505.8	10.0340 99.637	507.1	10.0320 99.887	504.9	0.444	5 ms	Pass	Pass	Pass
25	6											
26	7											
27	8											
28	Nominal	10.0411 99.791	443.5	10.0296 99.898	443.5	10.0283 99.756	443.9	0.086	5 ms	Pass	Pass	Pass
29	10											
30	11											

3Ø Winding Resistance and Turns Ratio

#	Tap	Test Current (A)		Measured Resistance (Corrected to 85°C)			Units: mΩ	Winding Diff Max: 5 %	Make/Break			
		Stability (%/Digit)		H ₁ - H ₃	H ₂ - H ₁	H ₃ - H ₂						
31	12											
32	13											
33	14	10.0462 99.642	490.3	10.0319 99.912	489.7	10.0281 99.764	489.1	0.244	5 ms	Pass	Pass	Pass
34	15											
35	16											
36	17	10.0603 99.827	535.9	10.0469 99.653	537.1	10.0403 99.746	536.0	0.214	5 ms	Pass	Pass	Pass

Resistance - Primary



Resistance - Secondary

#	Tap	Test Current (A)		Measured Resistance (Corrected to 85°C)			Units: Ω	Winding Diff Max: 5 %
		Stability (%/Digit)		X ₁ - X ₀	X ₂ - X ₀	X ₃ - X ₀		
37	Nominal							

Resistance - Secondary

#	Tap	Test Current (A)		Measured Resistance (Corrected to 85°C)			Units: Ω	Winding Diff Max: 5 %
		Stability (%/Digit)		X ₁ - X ₀	X ₂ - X ₀	X ₃ - X ₀		

Resistance (Ø to Ø) - Secondary

3Ø Winding Resistance and Turns Ratio

#	Tap	Measured Resistance (Corrected to 85°C)			Winding Diff Max: 5 %
		X ₁ - X ₃	X ₂ - X ₁	X ₃ - X ₂	
37	Nominal				


Resistance (Ø to Ø) - Secondary	
Ohms	<div style="display: flex; justify-content: space-around; margin-top: 100px;"> X₁ - X₃ X₂ - X₁ X₃ - X₂ </div>

COMMENTS: _____
 DEFICIENCIES: _____

Form Number and Date: 56000, REVISED 29-Apr-19
 Firmware Information: 6.6

Serial Number: 00430118
 Calibration Date: 01282021


 Sep-17-2022


 Sep-17-2022


 Sep-17-2022

3Ø Winding Resistance and Turns Ratio

DATE 9/17/2022

PAGE 1

AMBIENT TEMP. 32 °C

JOB # _____

SUBSTATION Orange Bay Sub Station

HUMIDITY _____ % ASSET ID T1

POSITION T1 Distribution

TEST STATUS Pass

EQUIPMENT LOCATION Orange Bay Substation

MFR Pauwels Trafo
 SER NO 88,2,4020
 YEAR 1988
 TYPE SEALED-CONSER
 CLASS OA
 PHASES 3

WEIGHT 63.5 tn
 WEATHER Sunny
 BIL 350 kV
 IMPEDANCE 11.65 %
 REASON Routine
 Max Wdg Diff (%): 5

OIL VOLUME 15.8 TN
 OIL TEMP 40 °C
 WINDING TEMP 40 °C
 CORRECT TO 85 °C
 COOLANT OIL

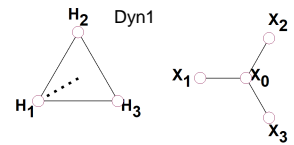


Diagram # 5 (ANSI)

	VOLTAGE (kV)		MVA	RATED I	RECOMMENDED TEST I	# TAPS	NOMINAL	CHANGER	TAP SETTING	WINDING MATERIAL
	L-L	L-G								
PRIMARY:			25			17	3	LTC		Cu
SECOND:	23,900	13,799	25	0.60	0.01A	1				Cu

HIGH VOLTAGE WINDING RESISTANCE

Show Graph

Disable Recording of Make/Break Transition

Units: mΩ

#	TAP	Current (amp)	Nameplate Voltage	Measured Resistance			Reading Stability %	Winding Difference %	Make/Break			
				H ₁ - H ₃	H ₂ - H ₁	H ₃ - H ₂			5 ms	Pass	Pass	Pass
1	1		0	487.2	487.4	486.5	99.6850	0.192	5 ms	Pass	Pass	Pass
2	2		0									
3	Nominal		0									
4	4		0									
5	5		0	434.6	435.7	433.7	99.6940	0.444	5 ms	Pass	Pass	Pass
6	6		0									
7	7		0									
8	8		0									
9	9		0	381.0	381.0	381.4	99.7910	0.086	5 ms	Pass	Pass	Pass
10	10		0									
11	11		0									
12	12		0									
13	13		0	407.0	407.6	407.3	99.8560	0.144	5 ms	Pass	Pass	Pass
14	14		0	421.2	420.8	420.2	99.6420	0.244	5 ms	Pass	Pass	Pass

3Ø Winding Resistance and Turns Ratio

HIGH VOLTAGE WINDING RESISTANCE

Show Graph

Disable Recording of Make/Break Transition

Units:

#	TAP	Current (amp)	Nameplate Voltage	Measured Resistance			Reading Stability %	Winding Difference %	Make/Break			
				H ₁ - H ₃	H ₂ - H ₁	H ₃ - H ₂						
15	15		0									
16	16		0									
17	17		0	460.4	461.4	460.5	99.8270	0.214	5 ms	Pass	Pass	Pass

LOW VOLTAGE WINDING RESISTANCE

Show Graph

Units:

#	TAP	Current (amp)	Nameplate Voltage	Measured Resistance			Reading Stability %	Winding Difference %			
				X ₁ - X ₀	X ₂ - X ₀	X ₃ - X ₀					
37	Nominal		23,900,000	19.92	19.88	19.97	99.9630	0.449			

COMMENTS:

DEFICIENCIES:

--

Form Number and Date: 56353, REVISED 03-May-17

Serial Number: 00430118

Firmware Information: 6.6

Calibration Date: 01282021



Sep-17-2022



Sep-17-2022



Sep-17-2022

Arrester Insulation Test Sheet -



Jamaica Public Service Company Limited
CHANGING LIVES WITH OUR ENERGY

Substation:	ORANGE BAY
Date:	15-Sep-22
Line/Equipment Installed On:	T1 TRANSFORMER
Line/Equipment Voltage (kV):	69KV
Arrester Type:	

Item	Check		
	Phase A	Phase B	Phase C
Serial Number	7776312	7776310	7776311
Model Number	-----	-----	-----
Manufacturer	ABB	ABB	ABB
Inspect physical condition	OK	OK	OK
Check for shipping damage	OK	OK	OK
Inspect mounting	OK	OK	OK
Class	STATION CLASS	STATION CLASS	STATION CLASS
Rated Voltage	60KV	60KV	60KV
MCOV	48KV	48KV	48KV
Connections complete?	YES	YES	YES
Positioned to dwg.			

PF Watt Loss Test:	Phase A	Phase B	Phase C
Test Mode	GND RB	GND RB	GND RB
Test kV	10KV	10KV	10KV
Current in mA	0.246mA	0.250mA	0.247mA
Watts	0.147	0.152	0.146
Rtg			
Insulation Resistance Test:	Phase A	Phase B	Phase C
Insulation resistance in GΩ	67.4GΩ	60.5GΩ	68.2GΩ
Leakage Current in nA	75.6nA	84.2nA	74.7nA
Ground Resistance Test:			
Grounding resistance in Ω	0.4		

Note:

Tested by: C. Walker/N. Griffiths

Date: 15-Sep-22

Issued For Test by: 

Date: Sep-17-2022

Test Certified by: 

Date: Sep-17-2022

Authorized to Energize by: 

Date: Sep-17-2022

Arrester Insulation Test Sheet -



Jamaica Public Service Company Limited
CHANGING LIVES WITH OUR ENERGY

Substation:	ORANGE BAY
Date:	15-Sep-22
Line/Equipment Installed On:	T1 TRANSFORMER
Line/Equipment Voltage (kV):	24KV
Arrester Type:	

Item	Check		
	Phase A	Phase B	Phase C
Serial Number	7776307	7776308	7776309
Model Number	-----	-----	-----
Manufacturer	ABB	ABB	ABB
Inspect physical condition	OK	OK	OK
Check for shipping damage	OK	OK	OK
Inspect mounting	OK	OK	OK
Class	STATION CLASS	STATION CLASS	STATION CLASS
Rated Voltage	26KV	26KV	26KV
MCOV	21KV	21KV	21KV
Connections complete?	YES	YES	YES
Positioned to dwg.			

PF Watt Loss Test:	Phase A	Phase B	Phase C
Test Mode	GND RB	GND RB	GND RB
Test kV	10KV	10KV	10KV
Current in mA	0.211mA	0.211mA	0.206mA
Watts	0.188	0.179	0.230
Rtg			
Insulation Resistance Test:	Phase A	Phase B	Phase C
Insulation resistance in GΩ	45.3GΩ	47.2GΩ	53.8GΩ
Leakage Current in nA	113nA	108nA	94.6nA
Ground Resistance Test:			
Grounding resistance in Ω	0.4		

Note:

Tested by: C. Walker/N. Griffiths

Date: 15-Sep-22

Issued For Test by: 

Date: Sep-17-2022

Test Certified by: 

Date: Sep-17-2022

Authorized to Energize by: 

Date: Sep-17-2022

Signature Certificate



Envelope Ref:ce95949a64d3e7a735291cfd6a337ab3d76f527c

Author: Earl Vassell Creation Date: 17 Sep 2022, 14:57:25, EST Completion Date: 17 Sep 2022, 15:44:29, EST

Document Details:

Name: T1 Test Results

Type:

Document Ref: d2e4f7ac2f3ee6222b4eda21389d7a5ec1ce93e08d4c928096209e3085016f17

Document Total Pages: 11

Document Signed By:

Name: Hugh Garvey
Email: hGarvey@jpsco.com
IP: 67.230.42.216
Location: KINGSTON, 02 (JM)
Date: 17 Sep 2022, 15:22:54, EST
Consent: eSignature Consent Accepted
Security Level: Email

Name: Earl Vassell
Email: eVassell@jpsco.com
IP: 208.131.181.146
Location: KINGSTON, 02 (JM)
Date: 17 Sep 2022, 15:07:53, EST
Consent: eSignature Consent Accepted
Security Level: Email

Name: Lenbern Hopkins
Email: lHopkins@jpsco.com
IP: 173.225.242.190
Location: KINGSTON, 02 (JM)
Date: 17 Sep 2022, 15:44:29, EST
Consent: eSignature Consent Accepted
Security Level: Email



Document History:

Envelope Created	Earl Vassell created this envelope on 17 Sep 2022, 14:57:25, EST
Invitation Sent	Invitation sent to Earl Vassell on 17 Sep 2022, 15:07:09, EST
Invitation Accepted	Invitation accepted by Earl Vassell on 17 Sep 2022, 15:07:09, EST
Signed by Earl Vassell	Earl Vassell signed this Envelope on 17 Sep 2022, 15:07:53, EST
Invitation Sent	Invitation sent to Hugh Garvey on 17 Sep 2022, 15:07:54, EST
Invitation Accepted	Invitation accepted by Hugh Garvey on 17 Sep 2022, 15:11:29, EST
Signed by Hugh Garvey	Hugh Garvey signed this Envelope on 17 Sep 2022, 15:22:54, EST
Invitation Sent	Invitation sent to Lenbern Hopkins on 17 Sep 2022, 15:22:54, EST
Invitation Accepted	Invitation accepted by Lenbern Hopkins on 17 Sep 2022, 15:38:06, EST
Signed by Lenbern Hopkins	Lenbern Hopkins signed this Envelope on 17 Sep 2022, 15:44:29, EST
Executed	Document(s) successfully executed on 17 Sep 2022, 15:44:29, EST
Signed Document(s)	Link emailed to eVassell@jpsco.com
Signed Document(s)	Link emailed to hGarvey@jpsco.com
Signed Document(s)	Link emailed to lHopkins@jpsco.com
Signed Document(s)	Link emailed to Assistant_Control_Engineers@jpsco.com
Signed Document(s)	Link emailed to Assistant_Control_Engineers@jpsco.com
Signed Document(s)	Link emailed to crDixon@jpsco.com