



Eastside II PCCP Pipeline

Condition Assessment Study and Repair

Fort Worth Water Department



Underground Infrastructure Conference

Construction. Rehabilitation. Asset Management.

March 19-21, 2024 | Oklahoma City, OK



AGENDA

1. FWWD BACKGROUND
2. PIPELINE HISTORY
3. CONDITION ASSESSMENT APPROACH
4. LIKELIHOOD AND CONSEQUENCE OF FAILURE ANALYSIS
5. RECOMMENDATIONS



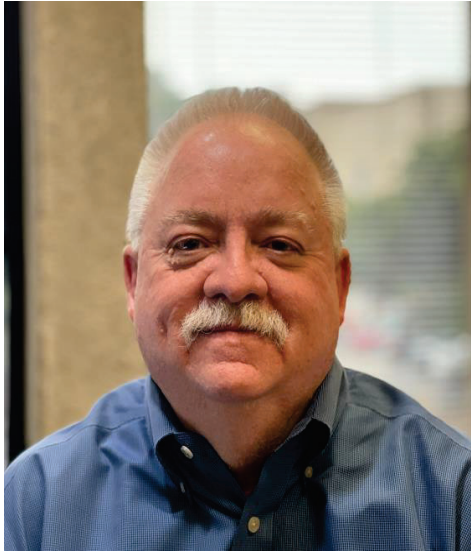
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Project Team



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Senior Professional Engineer
City of Fort Worth Water



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HDR Engineering Inc.



Project support from:



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1. FWWD BACKGROUND

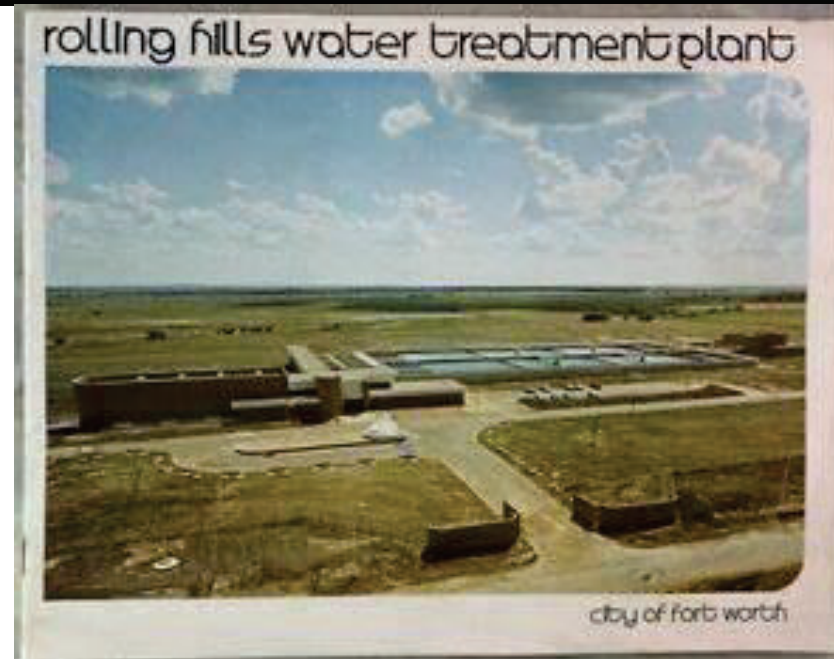
Established in 1884

Holly Pump Station Started 1892

Rolling Hills WTP (source of Eastside II) Began
Operation in 1972

497 MGD Daily Drinking Water Produced

Serves Over 1.3 Million Customers Daily.



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EASTSIDE II PIPELINE HISTORY

- CONSTRUCTION BEGAN 1979
- RE-ALIGNMENTS IN 1983, 1984, 1990, 1993
- SERVES EAST FORT WORTH / CITY OF ARLINGTON AND DFW AIRPORT
- PRESTRESSED CONCRETE LINED CYLINDER PIPE (L-301) CLASS 150 AND 175
- FIRST DOCUMENTED BREAK IN 2016
 - 4 MAJOR BREAKS SINCE 2016
- BREAKS REQUIRE A FULL SYSTEM SHUTDOWN DUE TO LIMITED ISOLATION. IMPACTFUL DUE TO BEING 1 OF THE 2 WATER FEEDERS TO DFW AIRPORT.

2016



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DOCUMENTED LINE BREAKS



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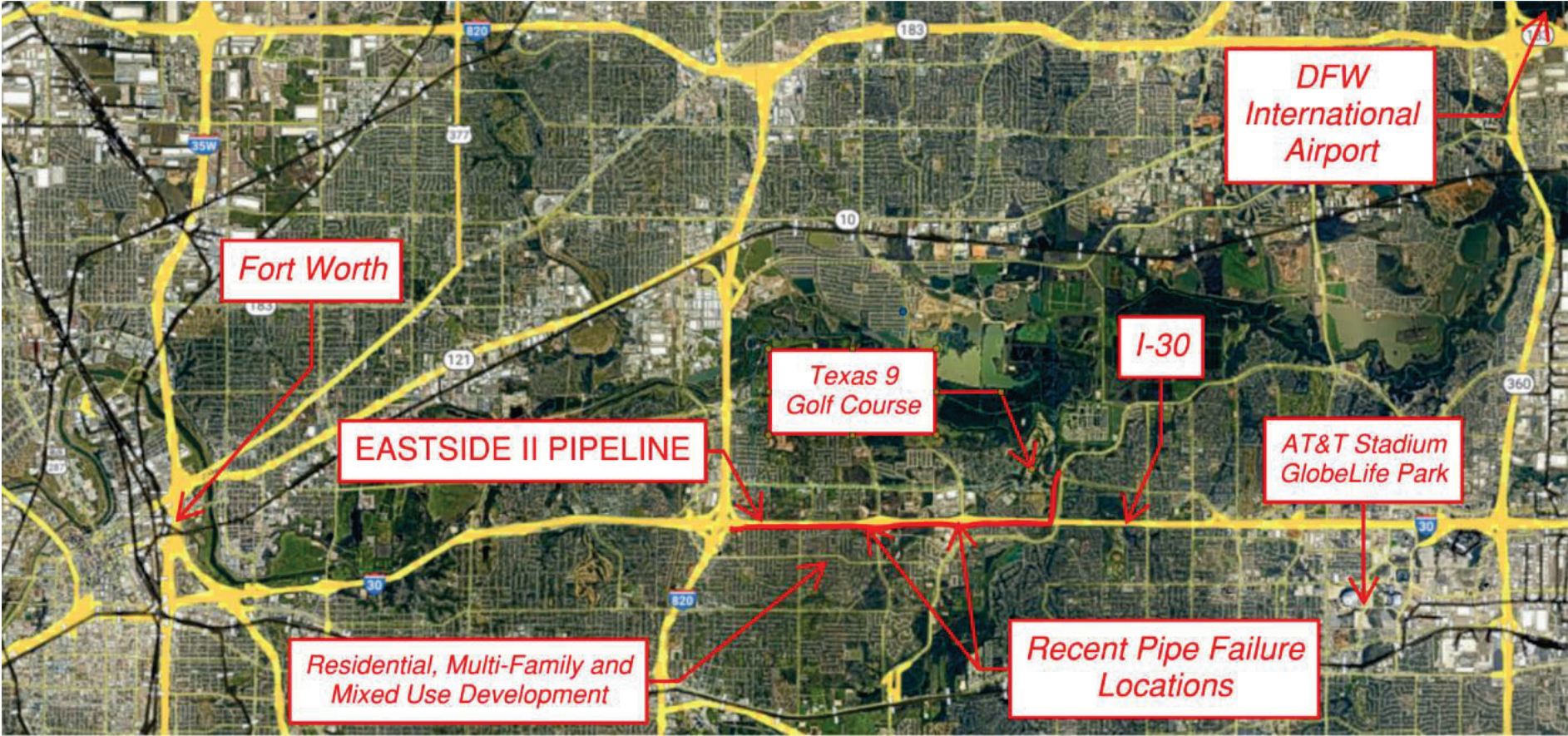
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PROJECT SETTING

- CRITICAL WATER MAIN
- RECENT FAILURES
- URBAN SETTING ALONG I-30, RESIDENTIAL COMMUNITIES, AND GOLF COURSE



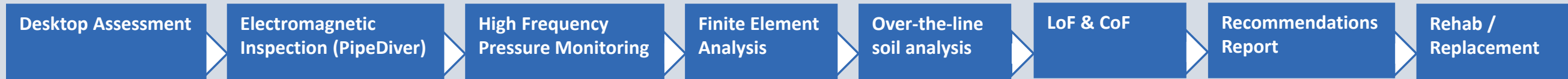
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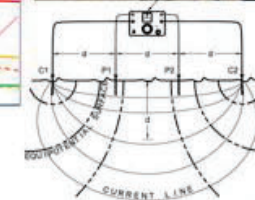
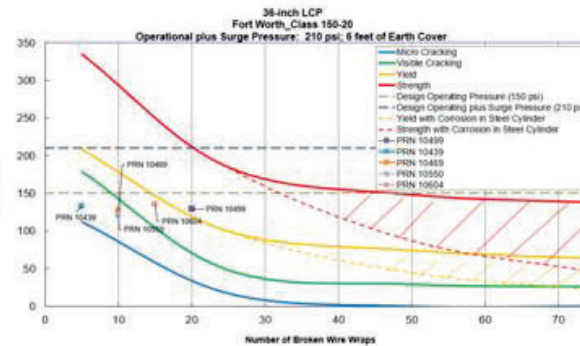
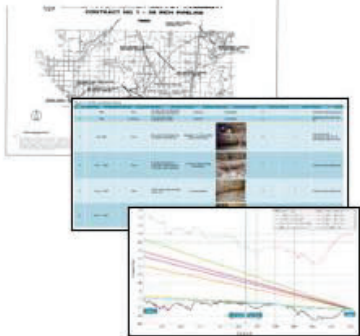


SELECTED TOOLS AND APPROACH



Internal / External Investigation

This Presentation



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4. LIKELIHOOD AND CONSEQUENCE OF FAILURE ANALYSIS

CONSEQUENCE OF FAILURE - HUGE

- EASTSIDE II LINE IS CRITICAL TO EAST FT WORTH AND AIRPORT OPERATIONS
- FWWD CANNOT TAKE LINE DOWN FOR MORE THAN 72 CONSECUTIVE HRS
- LIMITED/NO ROOM FOR PARALLEL PIPE
- LIMITED ABILITY TO ISOLATE PIPE BREAKS



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4. LIKELIHOOD AND CONSEQUENCE OF FAILURE ANALYSIS

LIKELIHOOD OF FAILURE (BROKEN WIRES) – MODERATE/LARGE

- INCREASED FREQUENCY OF FAILURES
- INCREASING WATER DEMANDS
- HIGHLY CORROSIVE SOILS



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4. LIKELIHOOD AND CONSEQUENCE OF FAILURE WEIGHTING

- LIKELIHOOD: 50%
 - FUNCTION OF REPORTED WIRE BREAKS AND PROXIMITY TO YIELD LIMITS.
- CONSEQUENCE: 50%
 - CUSTOMERS AFFECTED (30%)
 - PROXIMITY TO DENSE CUSTOMER AREAS?
 - PIPELINE IMPACTED (30%)
 - HOW MUCH OF THE DOWN STREAM PIPELINE WOULD BE OUT OF SERVICE AT A BREAK POINT?
 - OUTAGE DURATION (20%)
 - HOW EASY IS A FIX TO EXECUTE? DEEP PIPE? UNDER ROADWAY? PHYSICAL IMPEDIMENTS TO REPAIRS?
 - REDUNDENCY (20%)
 - CAN THE LINE BE QUICKLY BACK FED FROM OTHER SERVICES?



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LIKELIHOOD AND CONSEQUENCE OF FAILURE SUMMARY TABLE

Pipe Data									LoF and CoF Analysis						
Lay Schedule Piece Number	Low Station	Pipe Length (feet)	Asset Type	Reported Class	Break Region or Anomaly Location (fet from Low Station)	Number of Broken Wire Wraps by Region	Total Number of Broken Wire Wraps	Pipe Reference Number	Likelihood of Failure (LoF)	Consequence of Failure (CoF) Categories					Asset Risk Score (LoF x CoF) (1-16)
										Customers Affected (30%)	Pipeline Impact Sta 10+50 - 233-85 (30%)	Outage Duration (20%)	Redundancy (20%)	Weighted Total (Raw)	
									0 = Recently Installed Pipe 1 = 0 recorded wire breaks 2 = 5 recorded wire breaks 3 = 5-14 recorded wire breaks 4 = over 14 recorded wire breaks	0 - No Customers Affected 1 - 0-100 Customers or Reduced Pressure 2 - 100-200 Customers Affected or Complete Loss of water to any customers 3 - 200-1000 Customers Affected 4 - Over 1000 Customers Affected	0 - less than 10% of the assessed line 1 - Up to 25% of the assessed line 2 - Up to 50% of the assessed line 3 - Up to 75% of the assessed line 4 - Over 75% of the assessed line	How easy or hard would the repair be to complete? Close to access? Deep or Consealed Pipe? 0 Easiest - 4 Hardest	Is there a way to Supply water via other means or methods? How easy or hard is this to enact. 0 Easiest - 4 Hardest	0 - Lowest Consequence 4 - Most Consequence	
Towards Insertion Point									LoF	CA	PI	OD	Rud	CoF WT	ARS
LSPN	LS	PL	AT	RC	BR	BWR	TBW	PRN							
476-SP-BV	153+00	32	Pipe w/ OL	150-20	5.5	20	20	10499	4	4	3	4	3	4	14.0
446	143+40	32	Pipe	150-20	13.0	10	10	10469	3	4	3	1	3	3	8.7
526	169+01	32	Pipe	150-20	8.0;25.0	5;5	10	10550	3	4	3	1	3	3	8.7
579	184+69	32	Pipe	150-20	12.5	15	15	10604	4	2	1	2	4	2	8.4
31	206+43	24	Pipe	175-33	3.0;8.5	15;5	20	10677	4	2	1	1	4	2	7.6
418	134+43	32	Pipe	150-20	16.0	5	5	10439	2	4	3	1	3	3	5.8
157-HB	52+59	32	Pipe	150-20				10159	1	4	4	4	4	4	4.0
158-HB	52+91	32	Pipe	150-20				10160	1	4	4	4	4	4	4.0
159-HB	53+23	32	Pipe	150-20				10161	1	4	4	4	4	4	4.0
160-HB	53+55	32	Pipe	150-20				10162	1	4	4	4	4	4	4.0
161-HB	53+87	32	Pipe	150-20				10163	1	4	4	4	4	4	4.0
162-HB	54+19	32	Pipe	150-20				10164	1	4	4	4	4	4	4.0



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5. CONDITION ASSESSMENT RECOMMENDATIONS

- Replace the 6 pipes with reported wire breaks;
- Replace a failing blow off valve;
- Replace a damaged isolation valve; and
- Install a new isolation butterfly valve adjacent to one of the break locations for added flexibility.

Table 4-1. Pipes To Be Replaced

Station*	Pipe Number	Above Ground Reference*
134+43	10439	Approximately 540 ft west of Eastchase Parkway
143+40	10469	Approximately 330 ft east of Eastchase Parkway
153+00	10499	Approximately 1,000 ft east of Eastchase Parkway
169+01	10550	Approximately 565 ft west of Randol Mill Road
184+69	10604	Approximately 820 ft east of Randol Mill Road
206+43	10677	Approximately 290 ft north of I-30 near the east boundary of the Waterchase Golf Club



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Questions?



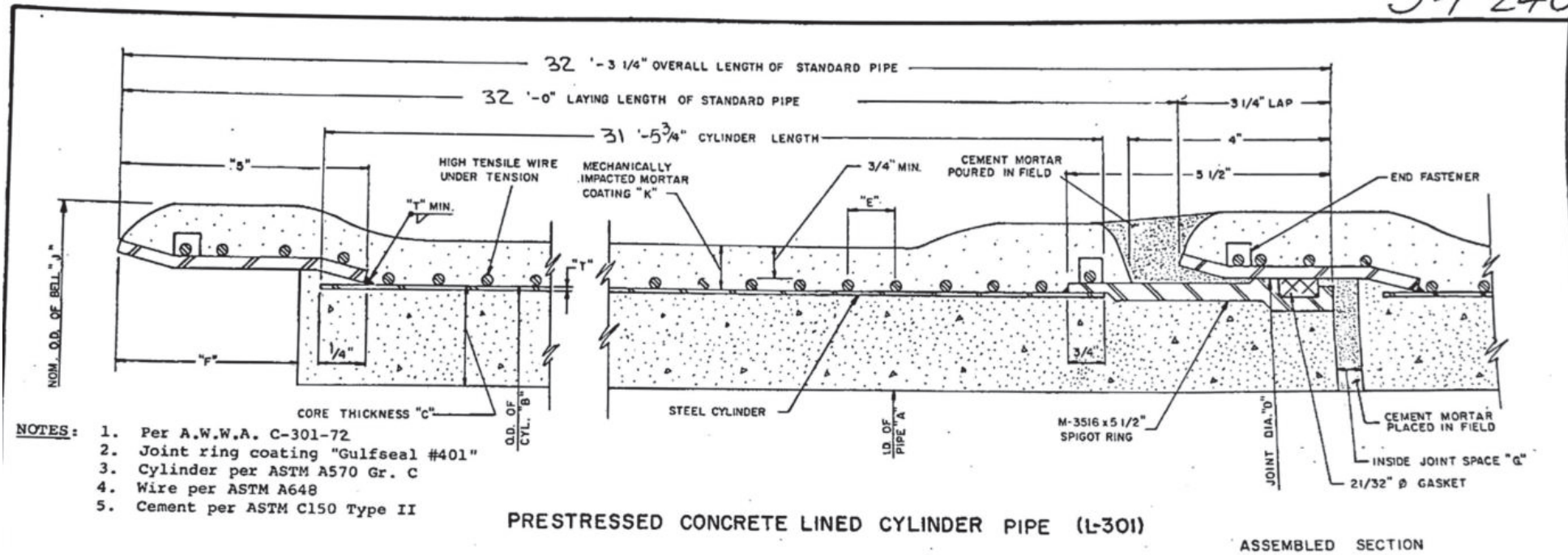
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Existing Pipeline Lay Detail



MANUFACTURING DATA													INSTALLATION DATA										
QUANTITY OF PIPE L.F.	I.D. OF PIPE "A"	DESIGN PRESSURE OR CLASS P.S.I.-FT.	STEEL CYLINDER				HIGH TENSILE PRESTRESS WIRE						JOINT DIA. "D"	BELL RING THK.	CORE THK. "C"	DEPTH OF SOCKET "F"	COAT. THK. "K"	NOM. O.D. BELL "J"	INSIDE JOINT SPACE "G"	MAX. DEFL. IN (PULL)	OFFSET IN 32' FT	MIN. RADIUS WITH 32' PIPE	APPROX. WEIGHT PER FT.
			O.D. CYL. "B"	CYL. GAGE	CYL. TEST PRESSURE P _B = 25,000	WT. OF CYL. LBS./L.F.	A _s PER LINEAR FOOT (SQ. IN.)	GAGE-CL OF WIRE	WIRE SPACING C TO C "E"	WT. OF WIRE LB./L.F.	GROSS WRAPPING STRESS IN WIRE P.S.I.	WIRE PULL LBS.											
19,968.72	36"	150-20	40 1/2"	#16	74 psi	26.80	0.359	#8-II	0.69"	13.79	173,250	3,571	41"	1 1/4"	2 1/4"	4"	5/16"	44 1/2"	3 1/4"	1903'	7"	1747'	464



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