11956 SENATE RESOURCES

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Mitigation

PHILLIPS 66
ALASKA

Accomplishments

2001 YTD

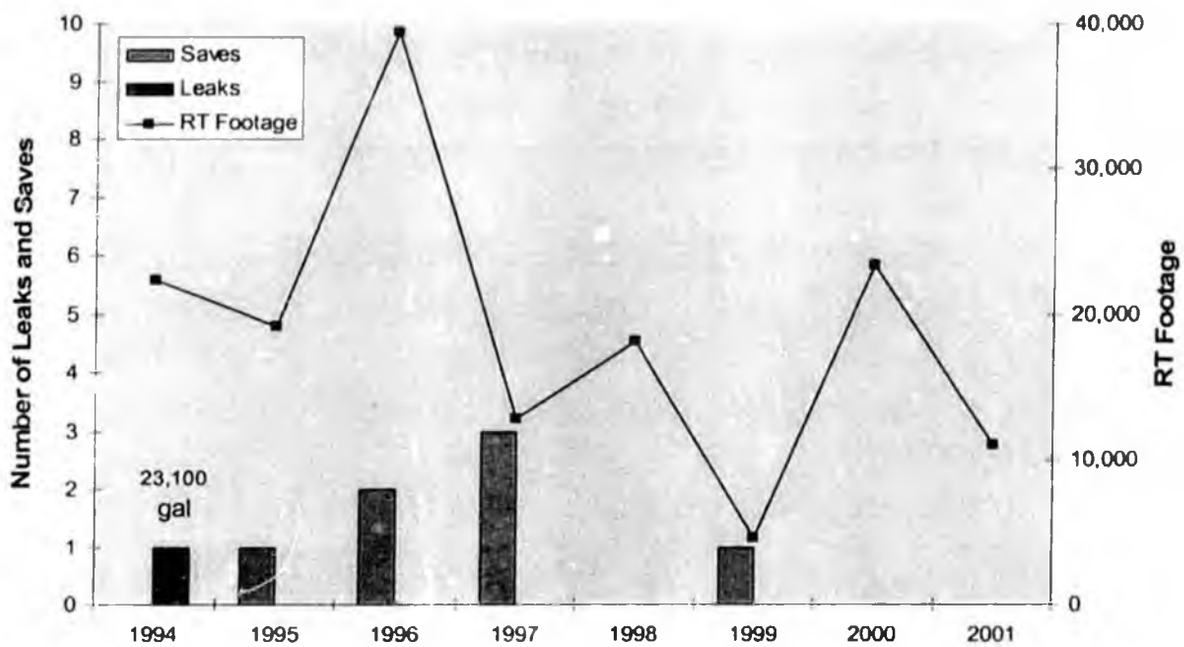
- ✓ New inhibitor, Cortron 2000-25, implemented field-wide in April 2000 - new formulation being field tested 3rd / 4th Qtr
- ✓ First stage of wellhead chemical inhibition facilities in final design, construct late 2001/early 2002 (Drill Site 1G)
- ✓ 24" Wet Oil Line decommissioned in June 2001
- ✓ Created Automated Maintenance Pig Tracking System to enhance correlation of pigging frequency with corrosion data
- ✓ Increased Maintenance Pigging Frequency on 12" Wet Oil Line
- ✓ Initiated (Schmoo-B-Gone) Chemical Treatment Test for Well Line Deposit Reduction on 3 Water Injection Wells/Well Lines

Inspection Results

Internal Corrosion

Cross Country Lines ~234 Cross Country Lines at Kuparuk

- Cross Country Line Inspection Program Successful
  - ✓ 0 lines required repair due to internal corrosion
  - ✓ Inspected 9,500 feet on 16 lines using automated radiography
  - ✓ 1,517 manual radiography inspections on 107 lines; 2 increases
  - ✓ 721 Ultrasonic inspections on 121 lines; 10 increases



Internal Corrosion Spills - Cross Country Lines

1994 Spill 24" 1Y/R Crude CC Line

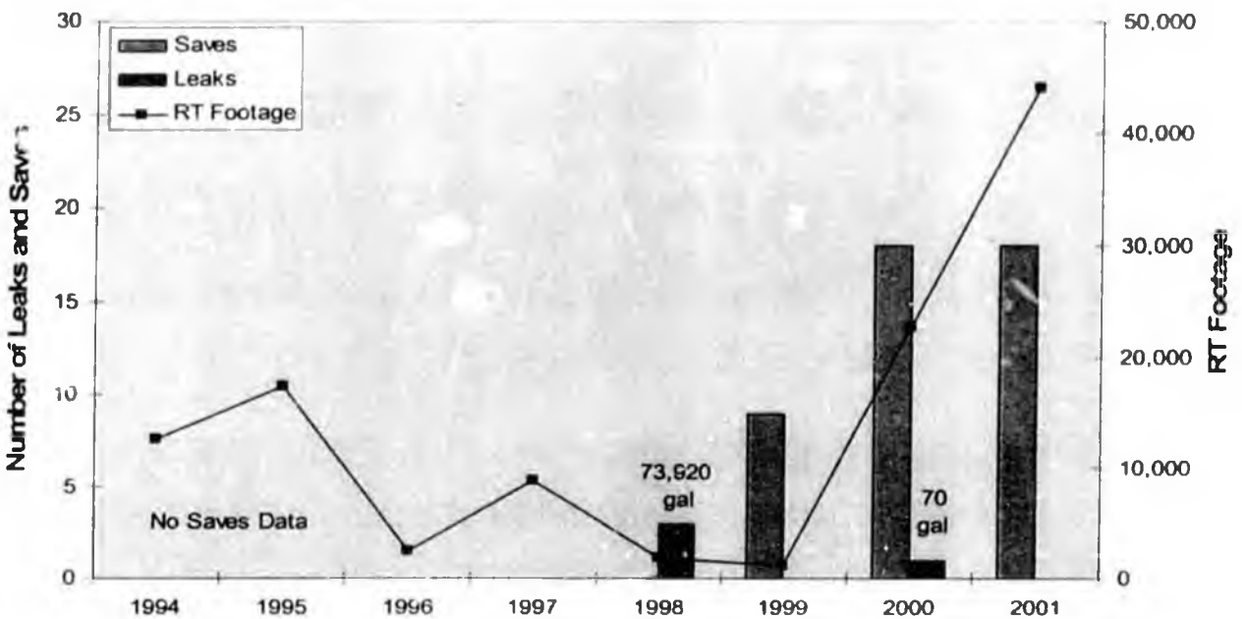
Inspection Results

Internal Corrosion

Well Lines ~ 1000 well lines at Kuparuk

- Inspection Efficiency Increasing, Doubled Funding
- Older/Thinner Wall Well Lines are corroding
  - ✓ Inspected 41,600 feet on 265 well lines using automated radiography
  - ✓ 2,530 manual radiography inspections on 292 well lines; 15 increases
  - ✓ 2,012 ultrasonic inspections on 310 well lines; 77 increases
  - ✓ 18 well lines required repair (11 injectors, 7 producers)

Internal Corrosion Spills -Well Lines	
1998 Spills	1L-1 6" WI Line
	1L-3 6" WI Line
	1A-9 6" WI Line
2000 Spill	1G-8 6" PC Line



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Inspection - Internal Corrosion

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Accomplishments

2001 YTD

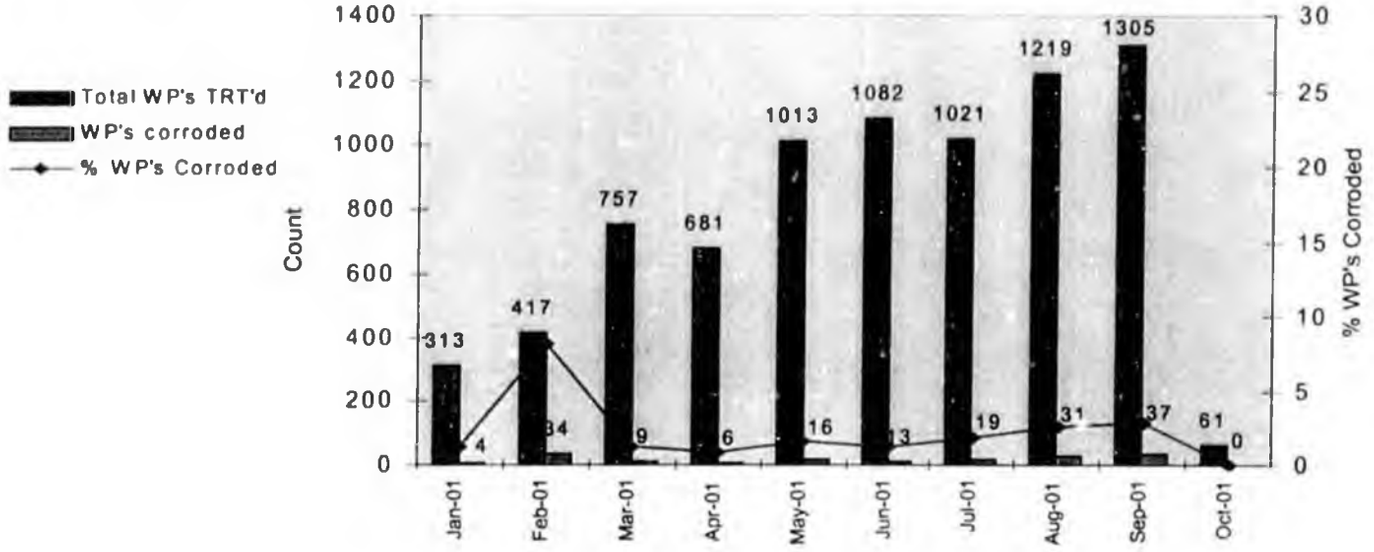
- ✓ Accelerated Real Time Radiography well line program
  - Doubled funding, increased inspection efficiency for well lines
  - Focus on older, thinner-walled well lines
    - ➡ 0.280" Wt Lines, 100% inspected YE 2001
    - ➡ 0.312" Wt, 50%+ inspected YE 2001, 100% YE 2002
- ✓ Initiated "wandering can" inspection to confirm prioritization and check for anomalies
- ✓ Finalizing Data Base Implementation for risk-ranked Cross Country Line Elbow Program

Inspection Results

External Corrosion

- **Common Lines, Off-Pad**
  - ✓ Off-pad weld pack inspection 99.9% complete (out of ~67,000 total)
  - ✓ 2 repair locations in 2001
  - ✓ Complete inspection of off-pad weld packs by end of 2001
- **Common Lines, On-Pad**
  - ✓ On-pad weld pack inspection 50% complete (out of ~8,900 total)
  - ✓ 0 repair locations in 2001
  - ✓ Complete inspection of on-pad weld packs by end of 2004
- Well Lines
  - ✓ Weld pack inspection ~41% complete (out of ~24,000 total)
  - ✓ 2 repair locations in 2001
  - ✓ Complete inspection of well line weld packs by end of 2005

Well Line weld pack inspection efficiency increasing



Inspection - External Corrosion

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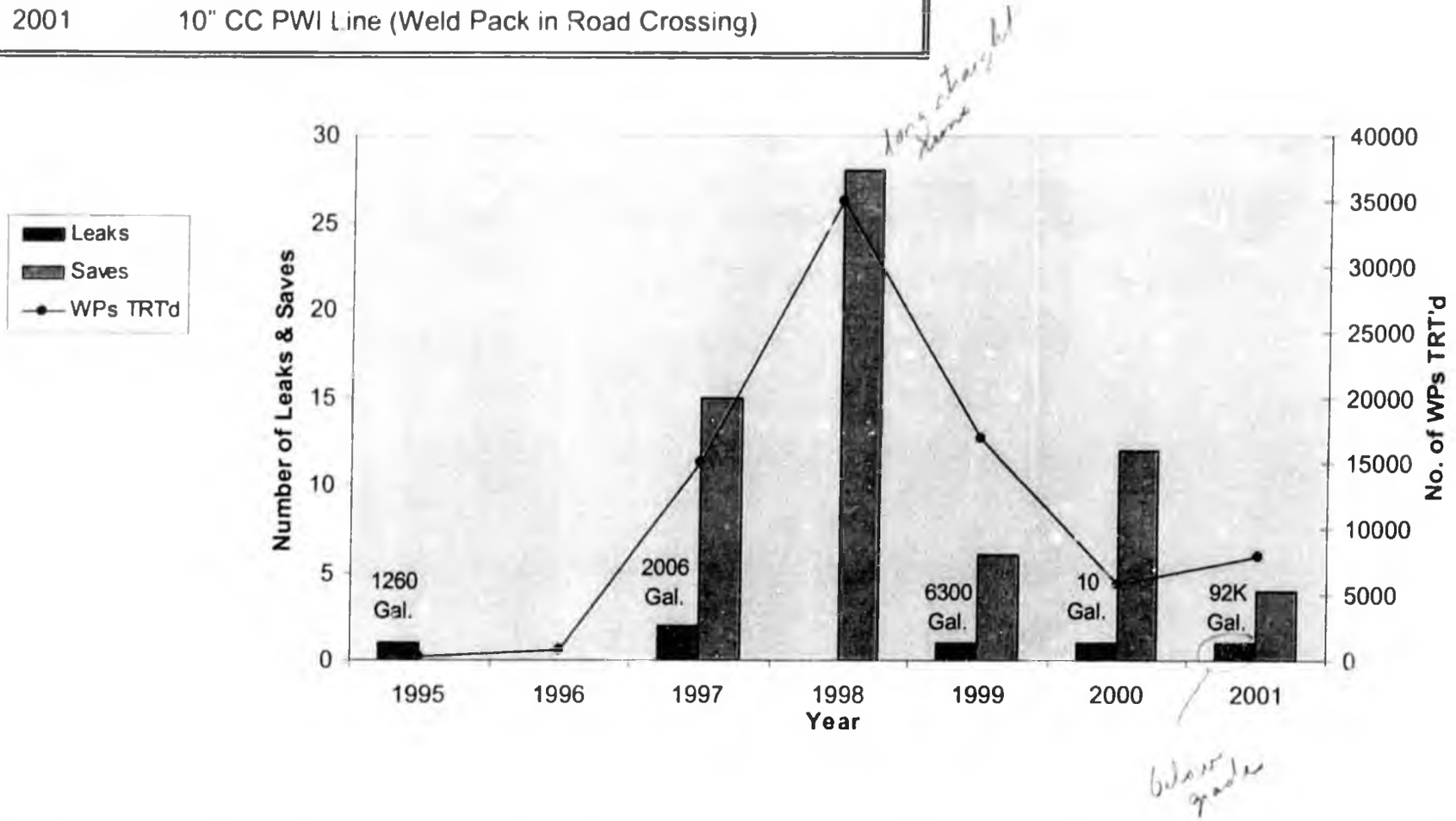
External Corrosion Line Failure History

1995	2C-04 Well Line
1997	2 ea. 24" Crude CC Lines (Weld Pack @ Saddle)
1999	1A-15 Well Line (Weld Pack @Saddle)
2000	2X-16 Well Line
2001	10" CC PWI Line (Weld Pack in Road Crossing)



GKBU Inspection - External Corrosion

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Accomplishments

2001 YTD

- External (Weld-Pack) Program
  - ✓ Complete inspection of remaining CCL Off-Pad weld packs by YE 2001
    - Inspection of all Off-Pad CCLines currently 99.9% complete
  - ✓ Concentrating on inspection of CCL On-Pad and well line weld packs
  - ✓ Increasing inspection efficiency of well line weld pack program
  - ✓ Buffer Spikes Pilot Program For Weld Packs Begun

Inspection Results

Below-Grade Piping

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➢ 2001 Program

- ✓ Inspected 220 new locations using PTI/TWI technologies
  - → (273 total locations including recurs)
- ✓ Had 2 TWI "Severe" indications
  - 1 was excavated - only minor damage found
  - 1 is shut-in pending inspection/testing plan
- ✓ Completed 9 excavations, YTD
  - 2 locations required repair
- ✓ Completed annual visual inspection of all 732 cased road crossings (ensures free flow of ground water)
  - → Found 52 partially obstructed, all have been cleared

GKBU Inspection - Below-Grade Piping

PHILLIPS 66 ALASKA

Accomplishments

2001 YTD

- ✓ Tripled Funding of Below Grade Piping Program
- ✓ Doubled PTI/TWI effort from ~100 to 220 new locations
- ✓ Expanded excavations from base plan of 4 to 9 YTD
- ✓ Completed annual visual inspection of all locations
- ✓ Completed field test of new technology - GUL (Wavemaker)
  - Results being evaluated
- ✓ 2001 data being used to adjust 2002 work plan
- ✓ 152 Significant Road Crossing Remain for Inspection
  - All to be Inspected by YE 2002
- ✓ Continuing efforts with Phillips R&D, BP, and vendors to refine latest technologies and establish more precise correlation between signal and corrosion damage

Structural Concerns

Primary Structural Concern Areas

- Piping deformation
  - Primary Causes
    - Subsidence
    - Frost Jacking
    - Snow Loading
- Wind Induced Vibration
  - Not currently an issue
    - Design/Use of weight dampeners

Plans & Proposals

- Evaluate, prioritize, and continue implementation of subsidence mitigation efforts at the drill sites
- Pipe Deformation Analysis - Ongoing
- Continue with heightened level of snowload monitoring and snow removal

Structural Concerns

Accomplishments

2001 YTD

Subsidence Mitigation at the Drill Sites

- ✓ Well Design Guideline Approved March 2001
  - new wells, well conversions (producer to injector)
  - existing wells, based on prioritization/need
- ✓ 2001 funding = $4MM+

Pipe Sagging/Jacking

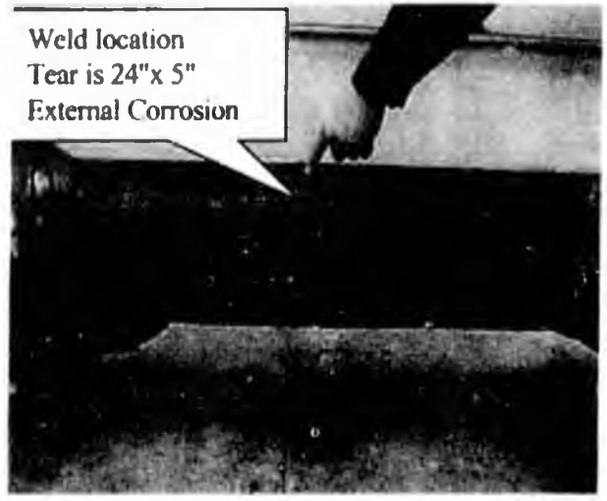
- ✓ Annual Summer Gravel Work ($500M)
- ✓ New Pipe Supports Being Installed
- ✓ VSM Leveling

Spills/Incidents

10" 1B Injection Line Leak 4/15/01

Scenario:

- Line Ruptured, pump shutdown alarm received
- Leak detected and isolated within 12 minutes
- Rupture located in road crossing just behind CPF1
- Spill area on tundra, just less than 1 acre
- Emergency Action Plan activated
- 92,000 gallons Produced Water



Findings:

- Caused by external corrosion at a below-grade weld-pack
- Location of leak (very close to the plant) resulted in high flow rate
- Had not yet been inspected for Below-Grade Corrosion
- Location subject to snow melt/water runoff
- One of oldest waterflood cross country injection lines
- Original Kuparuk piping design not cognizant of weld pack corrosion potential

Spills/Incidents

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10" 1B Injection Line Leak 4/15/01

- Inspection & Monitoring History
  - ✓ 149 weld packs out of 157 total had been inspected
    - ↳ No derating corrosion found
  - ✓ Coupon data indicated low internal corrosion risk
  - ✓ RTR'd in 1993, 1997, & 2001
    - ↳ No internal corrosion noted
  - ➡ Scheduled for Below-Grade Inspection in late 2001
- Post-Spill Inspections
  - ✓ 2nd 1B-WI culvert location excavated & inspected
    - Inspection completed prior to re-start of line
    - same risk ranking as failed location
    - ➡ no significant damage
  - ✓ All remaining weld packs inspected
    - ↳ no derating corrosion
  - ✓ 1 remaining culvert location inspected w/ PTI/TWI
    - ↳ no anomalies

Spills/Incidents

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10" 1B Injection Line Leak 4/15/01

ALL ITEMS COMPLETE

- Incident Corrective Actions
  - ⇒ **Replaced failed piping** with a design suitable for road crossing environment (coated with new weld pack design)
  - ⇒ Evaluate BGPP schedule and adjust priorities & pace based on lessons learned
  - ⇒ Install low discharge pressure shutdowns on the water injections pumps @ CPF1, 2, and 3 (more rapid and reliable shut-off in the event of a future leak)

Spills/Incidents

10" 1B Injection Line Leak 4/15/01

Lessons Learned:

- ➢ Reviewed BGPP program in detail
  - External damage @ weld packs highly random
  - Prioritization factors provide limited benefit
  - Had 4-5 more years to complete baseline inspection survey @ present level of effort (100/year)
- ➢ Acceleration of program most leveraging way to reduce future risk

Spills/Incidents

10" 1B Injection Line Leak 4/15/01

➢ Corrosion Program Corrective Action Taken

✓ Accelerated BGPP to 2-year program
- Doubled # of target inspections, both non-intrusive & line excavations
- Level of effort constrained by resources (not $)

✓ Reviewed all other elements of Corrosion Program to determine if adjustments were warranted
- Doubled Well Line Internal Inspection (RTR) effort to complete inspection of thin-walled lines

✓ $1.2 MM Incremental Funding

Closing

Topics for discussion ??

SPRING 2002

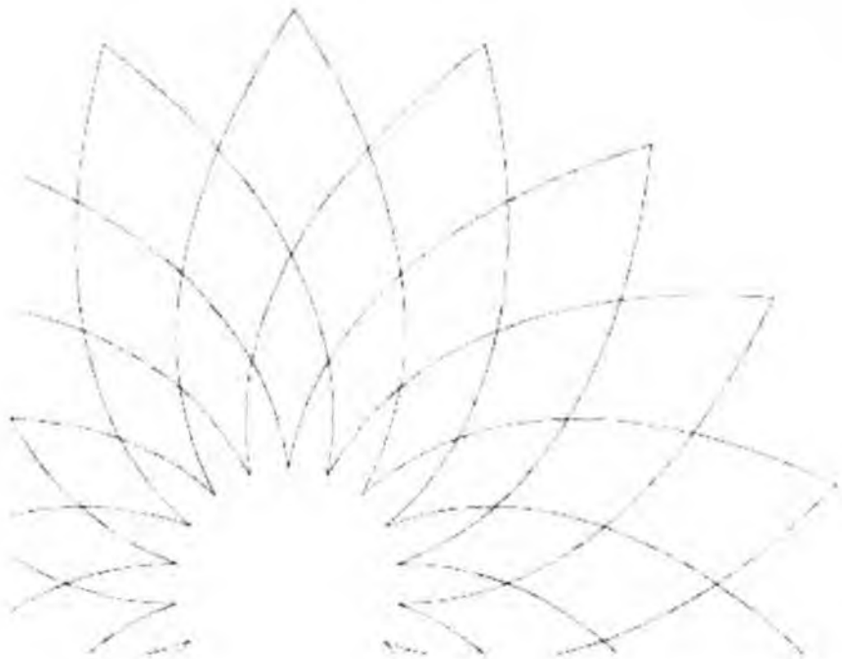
BP

BP and State of Alaska Charter Agreement

Corrosion Monitoring Review 2001

Meet and Confer III

April 29th, 2002



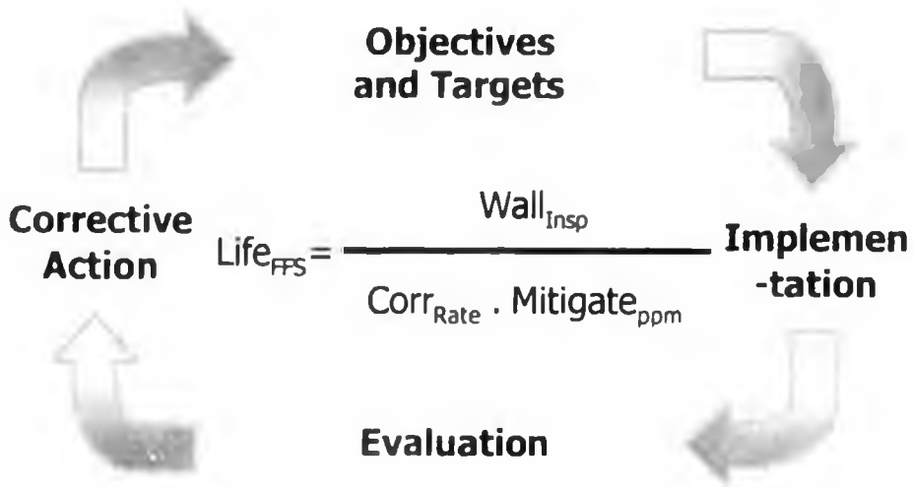
Outline

- **Strategic Objectives**
- **Corrosion Management Process**
  - Program Elements
- **Fitness-for-Service**
- **System Review**
  - 3-Phase (OWG)
  - Produced Water (PW)
  - Seawater (SW)
  - Weight Loss Coupons (WLC)
  - Internal/External Inspections
- **Program Performance**
  - Leaks
  - Repairs
  - Action Plan
- **2002 Overview**
- **Summary**

Corrosion Management Program

- **Strategic Objectives**
  - Minimize health, safety, and environmental impacts
    - Loss of containment due to corrosion
  - Fit-for-service infrastructure
    - Remainder of the life of the oilfield
    - Potentially 50+ years
  - Infrastructure with sufficient mechanical integrity
    - Needed to produce satellite fields and accumulations
    - Use of existing infrastructure
  - Support of future major gas development
    - Production and through current facilities
    - Gas sales demands longevity of infrastructure

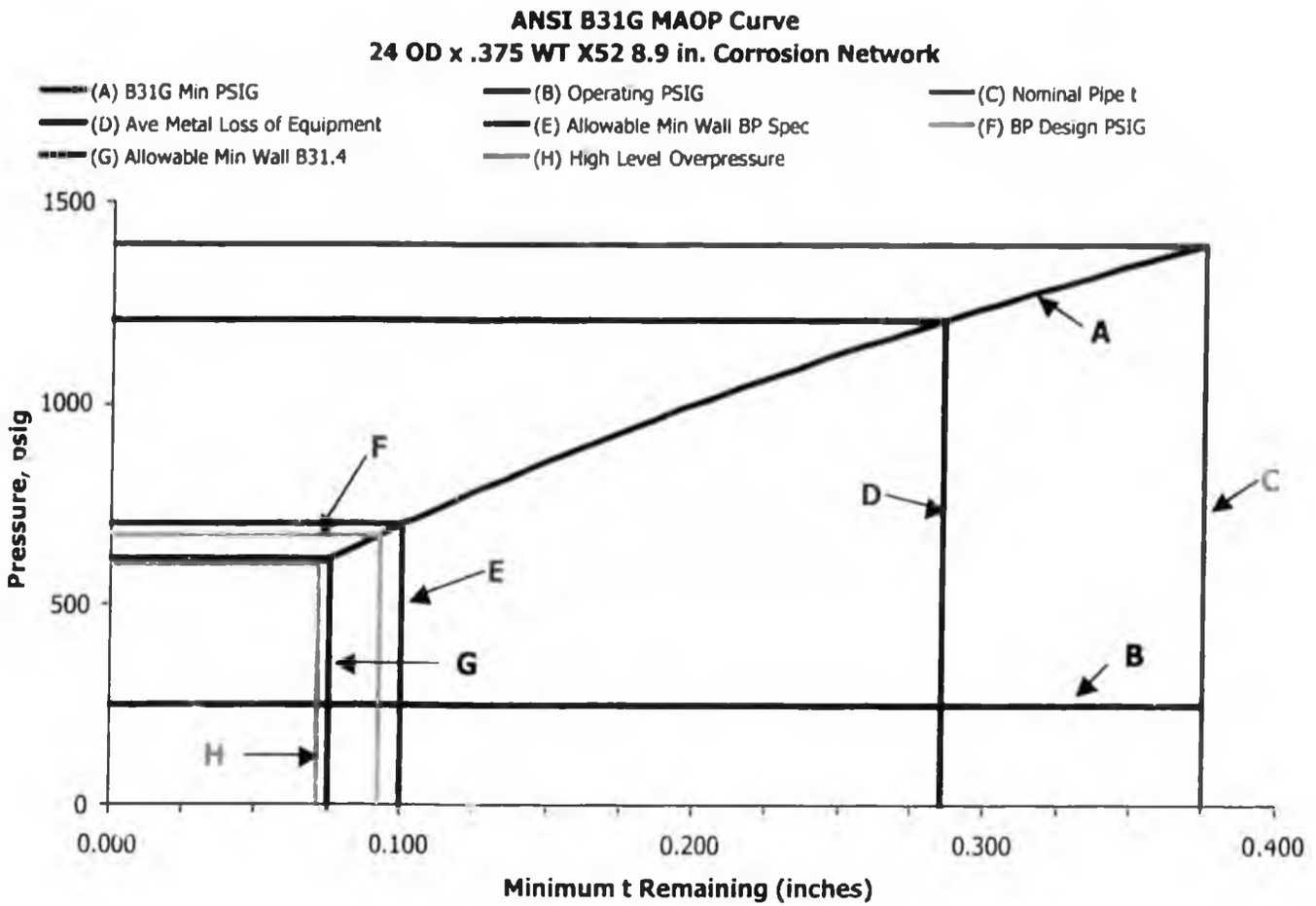
Corrosion Management Process



Corrosion Management Process

Step	Program Elements
Plan	**Objective** Program objective and purpose **Target** Performance metric
Do	**Implementation** Plan to achieve objective
Check	**Evaluation** Method to evaluate performance
Act	**Corrective Action** Correct deviation from target

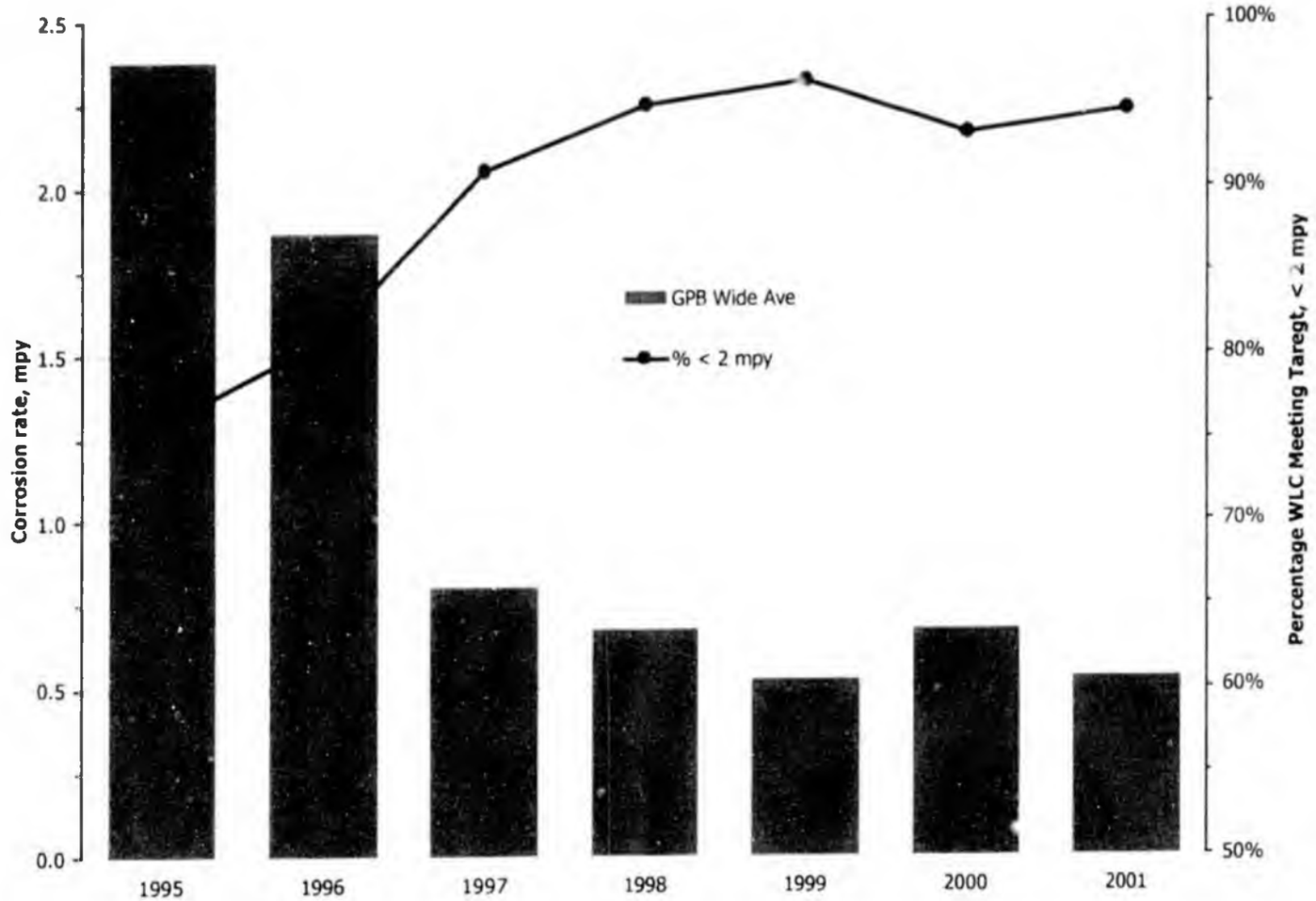
Fitness-for-Service Assessment



Fitness-for-Service Summary

Date	Thick(t) (inches)	MAOP (psig)	Notes/Comments
Install (1977)	0.375	1400	First oil 1977
Today (2002)	0.285	1200	Ave CR 4 mpy to date
EOFL (2050)	0.100	700	At historical Ave CR - 1st 25 years CR 4 mpy - Target CR 2 mpy - ½ the historical ave
BP Spec	0.100	700	
FFS(B31G)	0.095	614	80% of original wall
Overpressure		600	System relief setting
Operating P		250	Normal operations

Overall – Increasing Corrosion Control



Overall Activity Level

Corrosion and Inspection Activity Summary

			1995	1996	1997	1998	1999	2000	2001
Coupons		WL	6779	8183	8326	7837	7361	7322	5674
		FL	1569	1685	1729	1601	1650	1542	1426
ER Probes		FL						84	83
Inspection	Internal	WL	5919	8379	8174	7508	6224	7025	9780
		FL	21796	20680	21522	17995	14809	9602	11369
	External	WL	-	36	1682	946	2114	5283	12730
		FL	1508	11474	18009	10316	8139	5184	2675
Inhibition	CI	10^6 gpy	1.62	2.05	2.21	2.53	2.28	2.73	2.63
		ppm	85	106	115	141	130	148	157

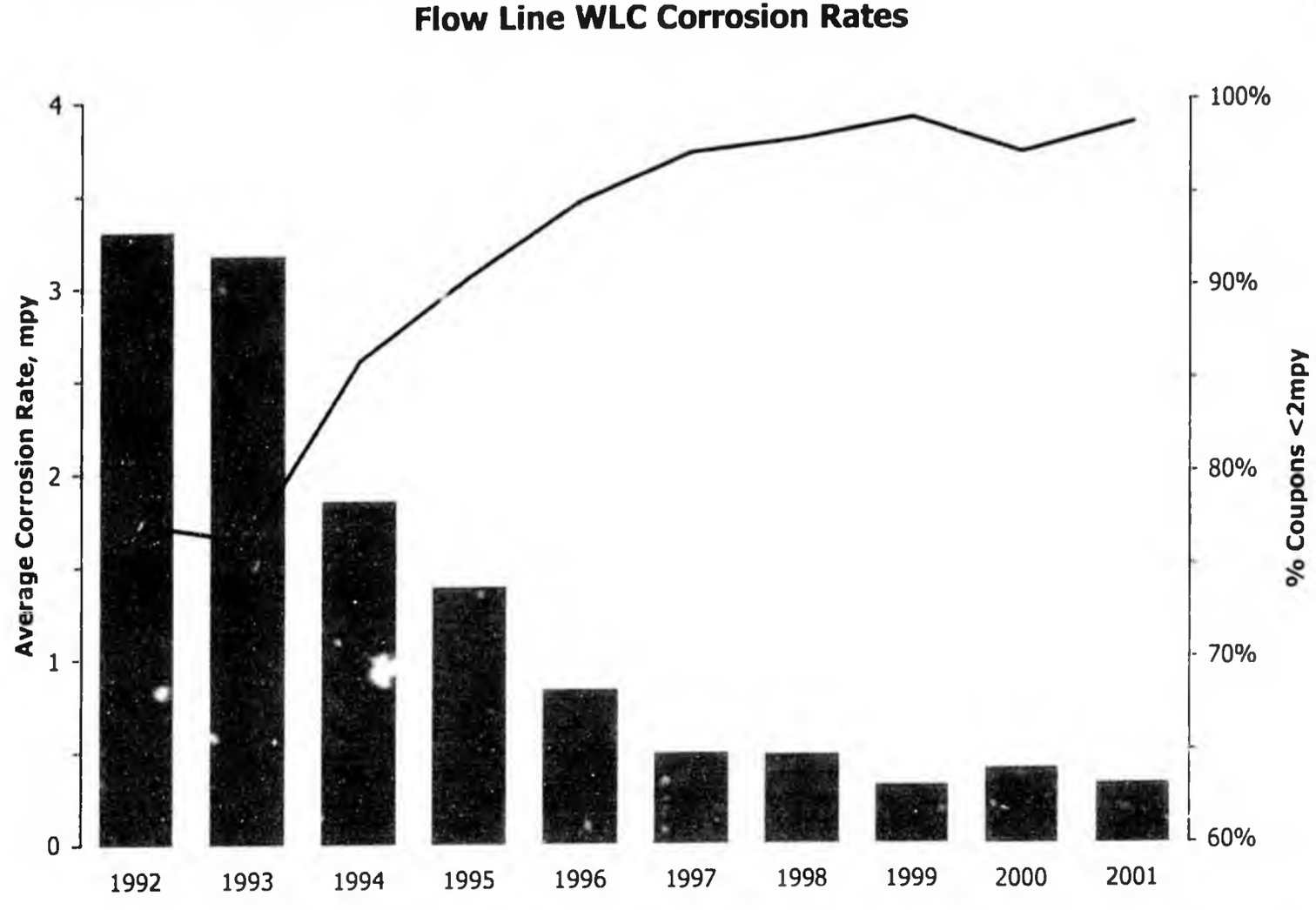
- **Substantially unchanged from prior years**
  - Chemical injection volumes/ppm
  - ER probe activity level

bp

System-by-System Review

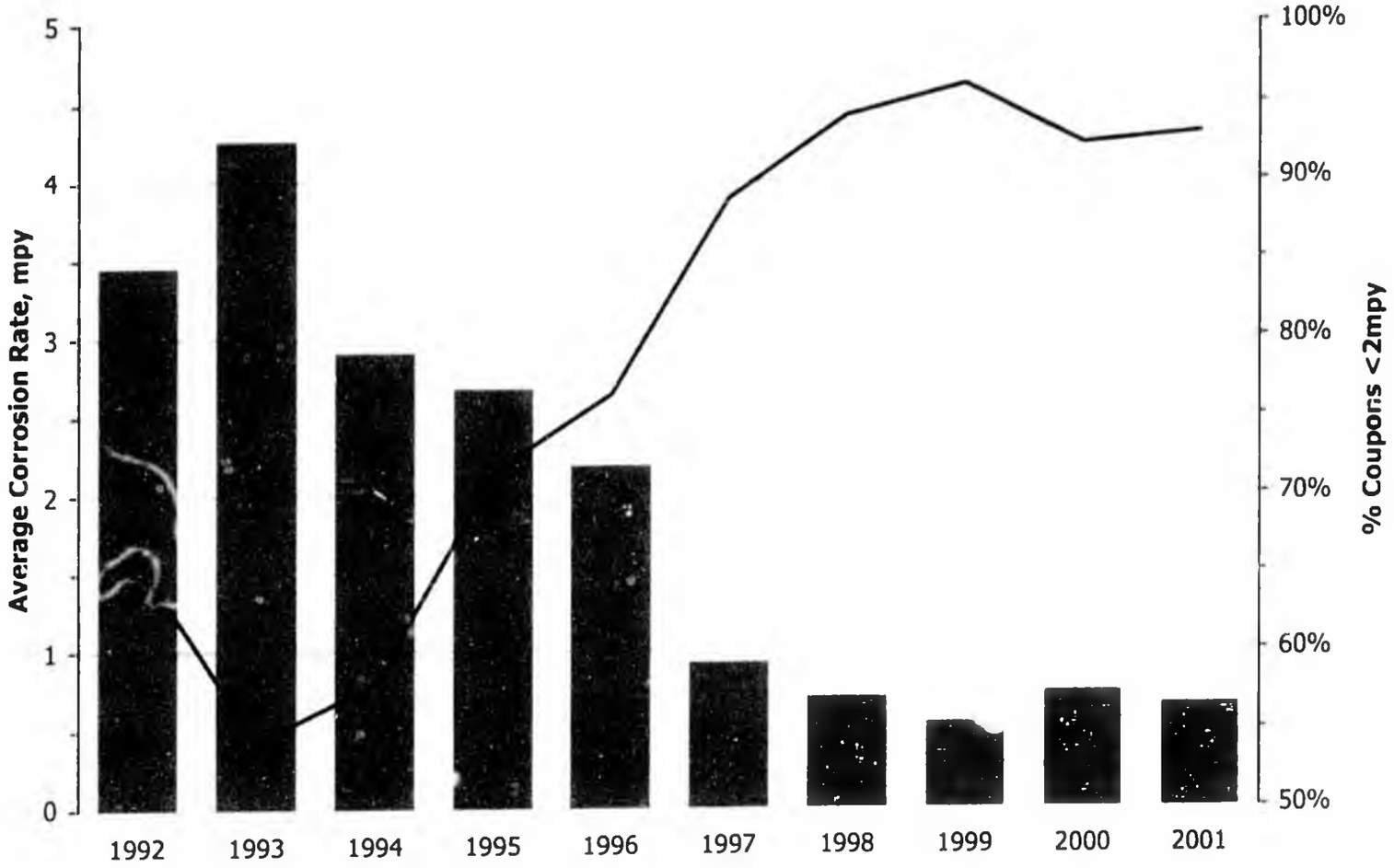
- **Elements of Long Term Fitness For Service**
  - Corrosion monitoring
  - Inspection
    - Condition
    - Increases
  - Mitigation/corrosion control
- **Weight Loss Coupons**
  - Flow Line
  - Well Line
- **Inspection Increases**
  - Correlation between inspection increases and WLC
- **Equipment Condition**
  - Increases and condition correlation
- **Mitigation**
  - Correlation between corrosion rate and CI concentration

3-Phase (OWG) – FL Coupons

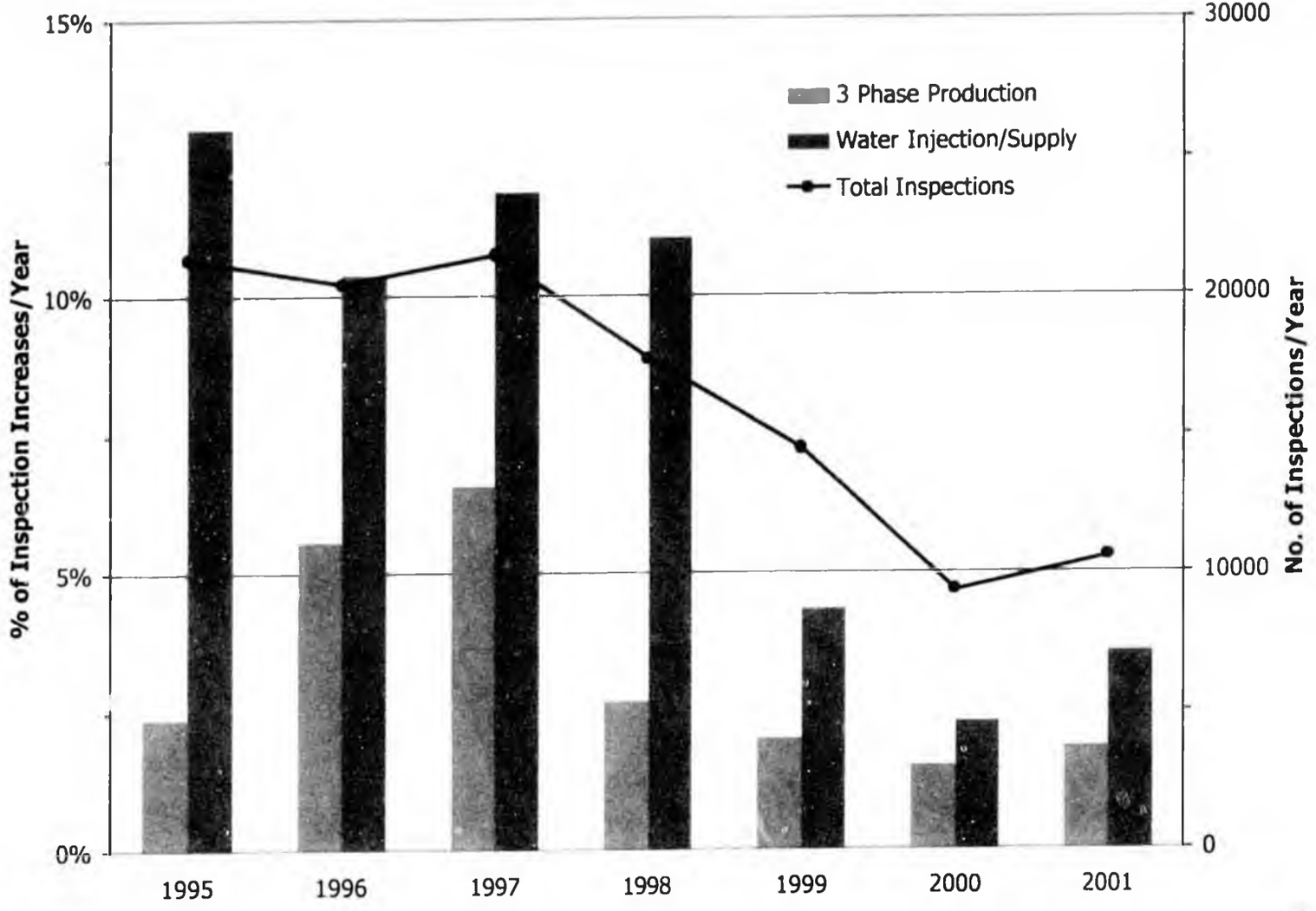


3-Phase (OWG) – WL Coupons

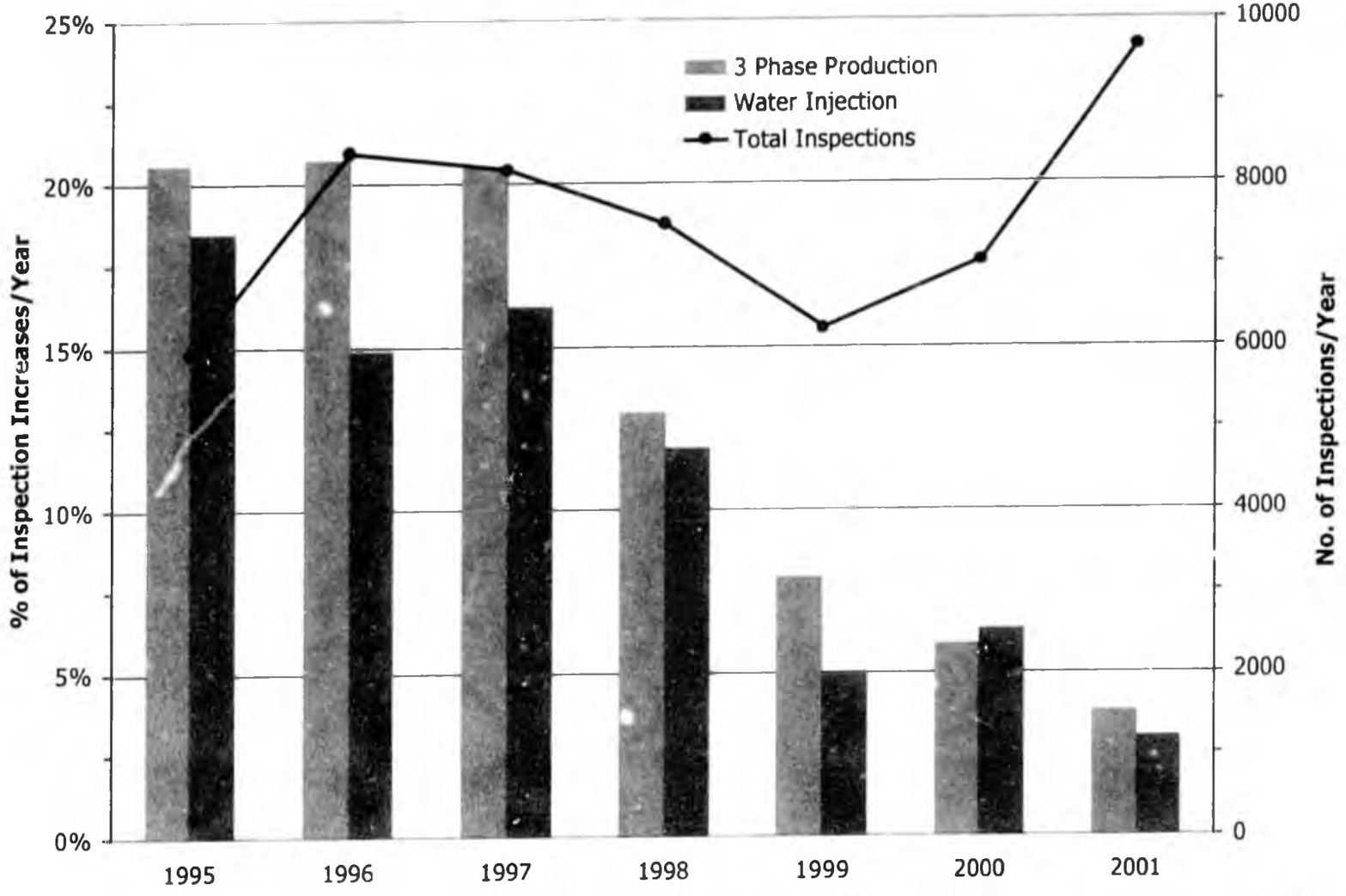
Well Line WLC Corrosion Rates



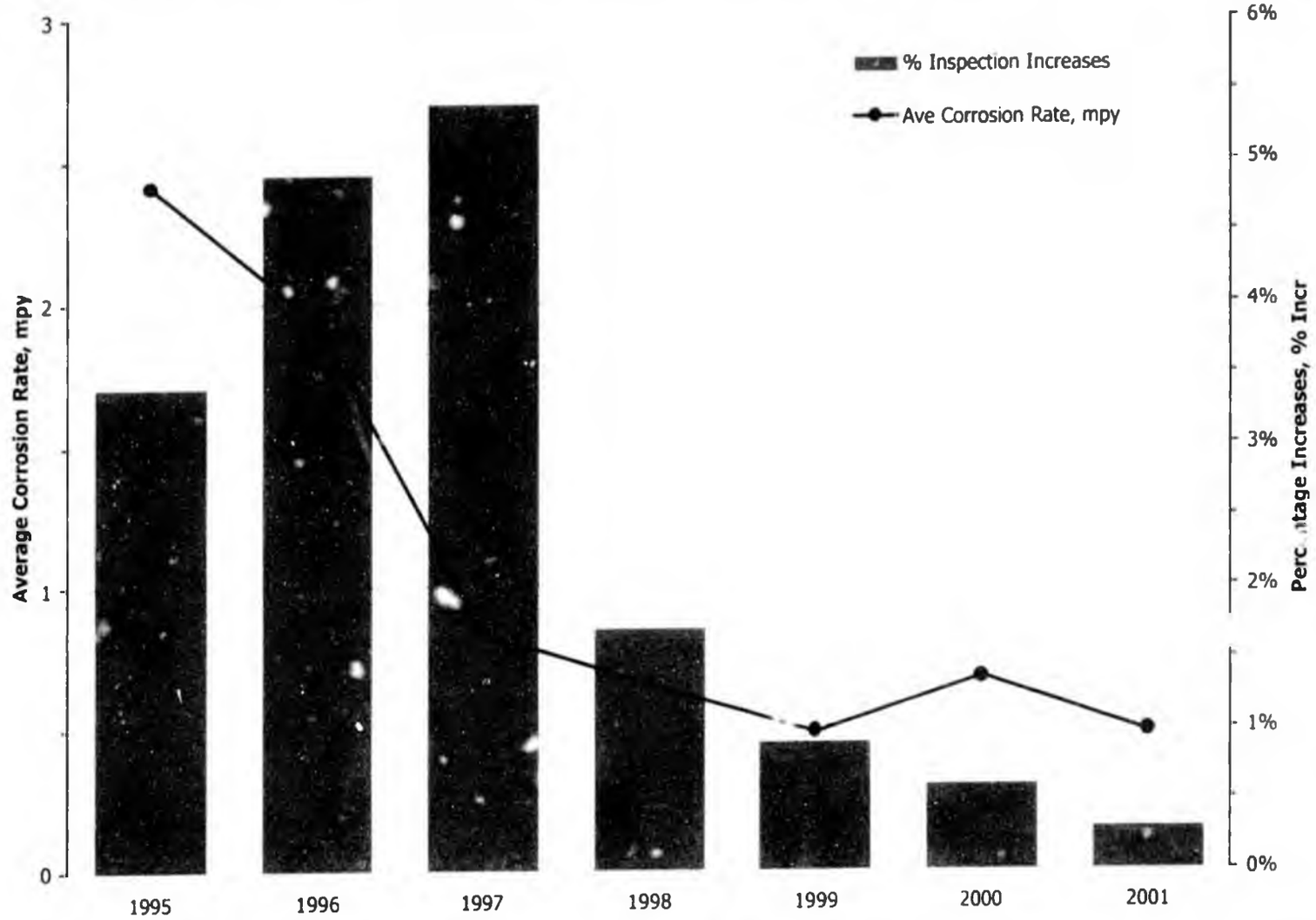
Flow Line Inspection Increases



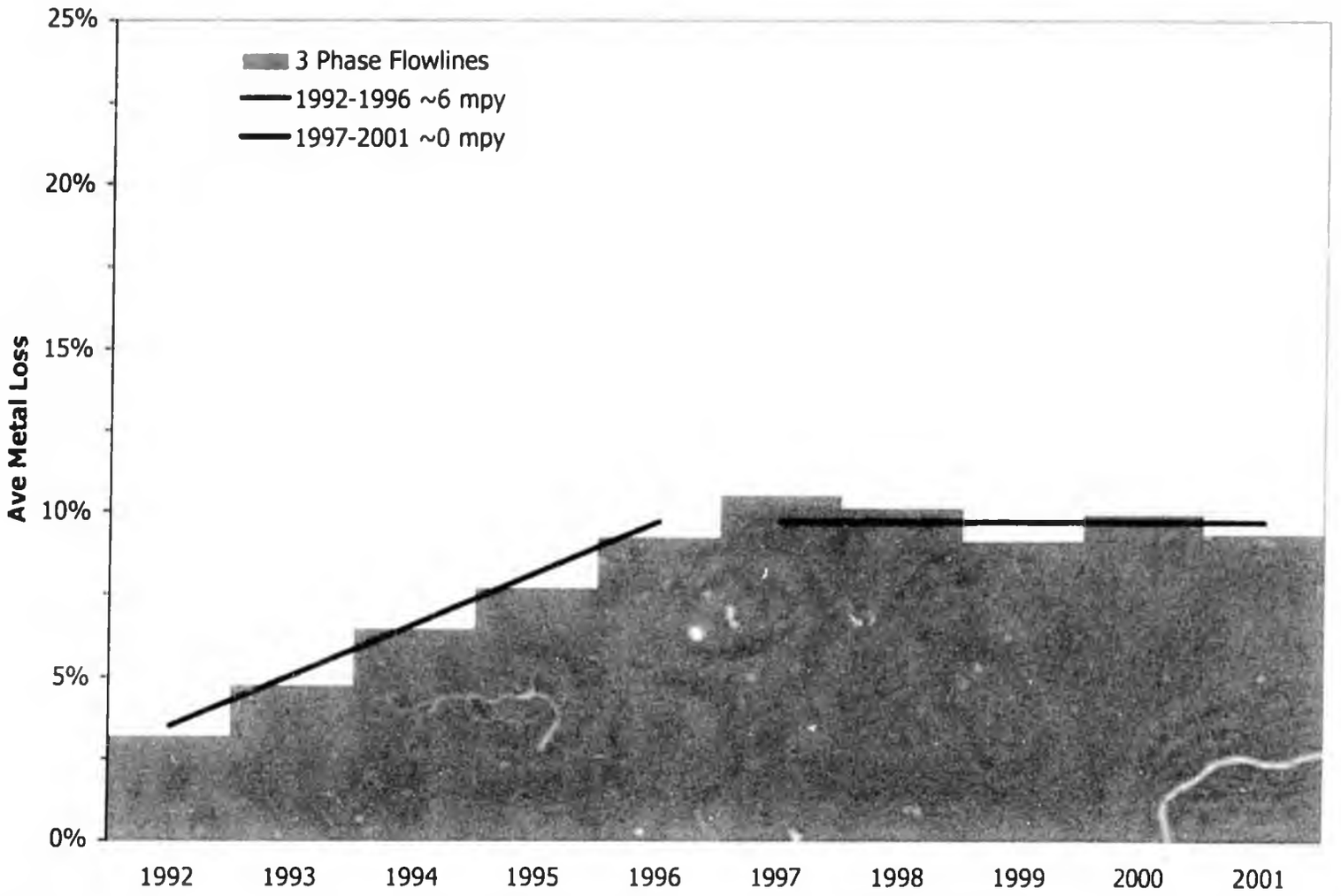
Well Lines Inspection Increases



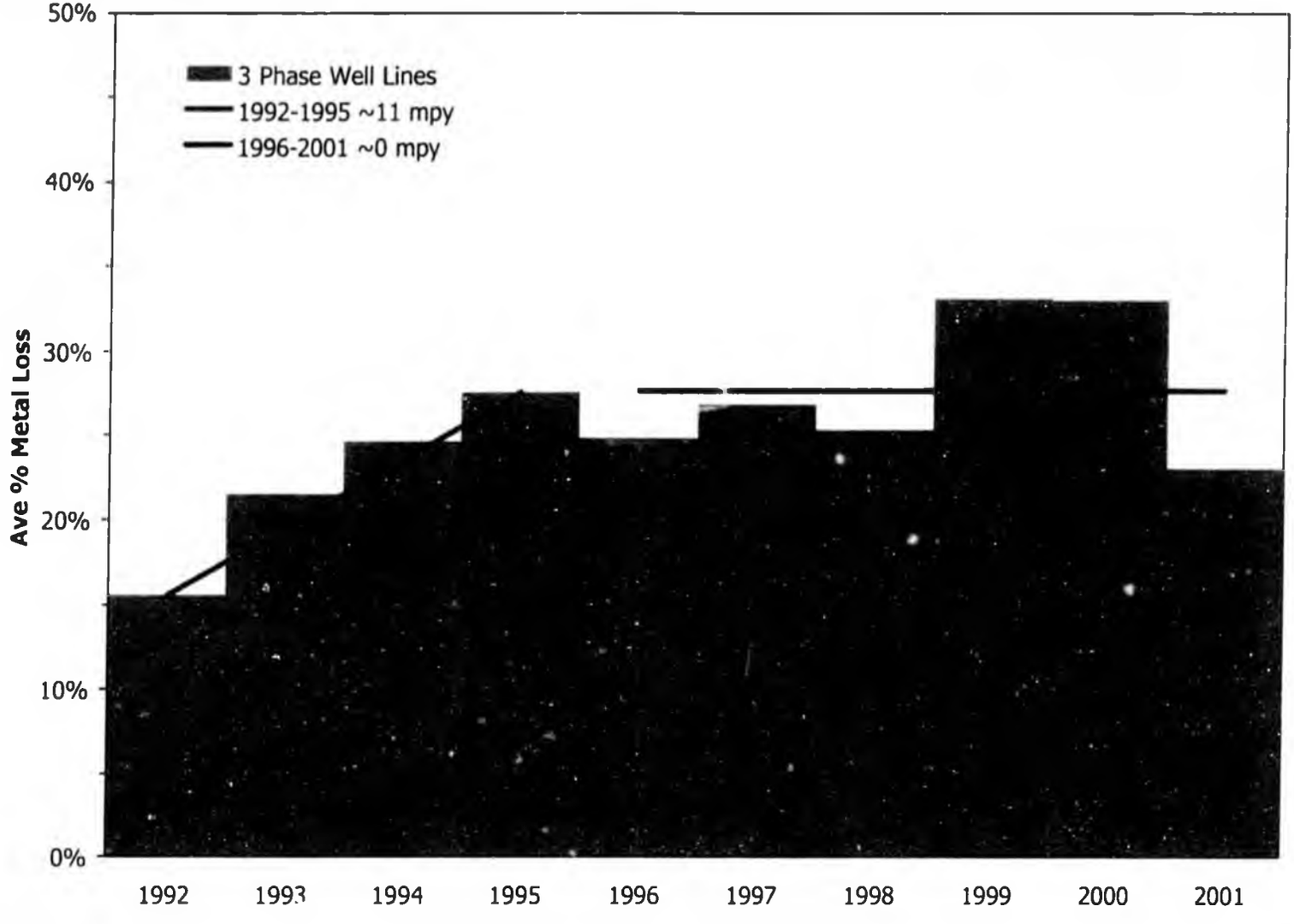
3-Phase WLC and Increases Correlation



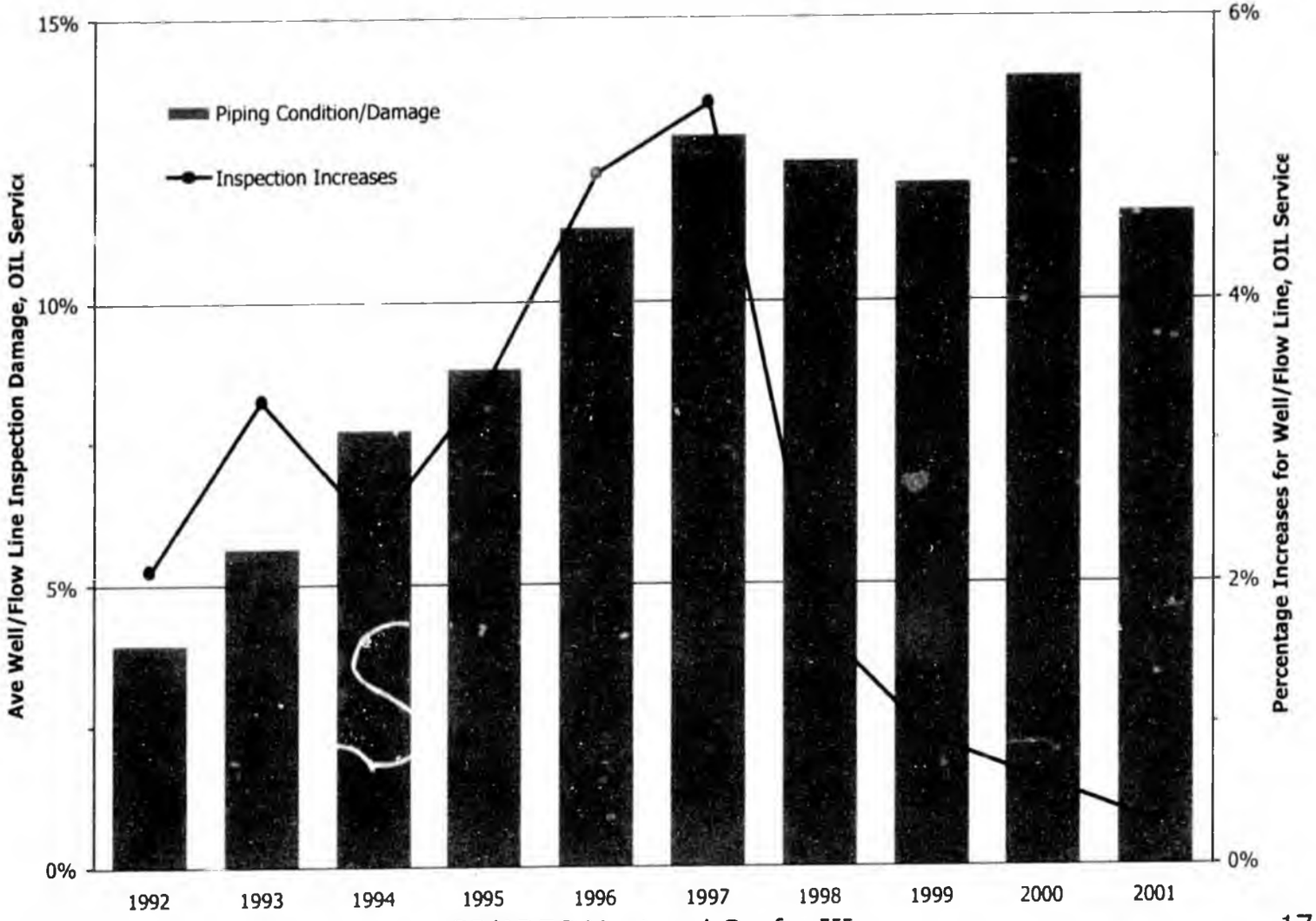
3-Phase Flow Line Condition



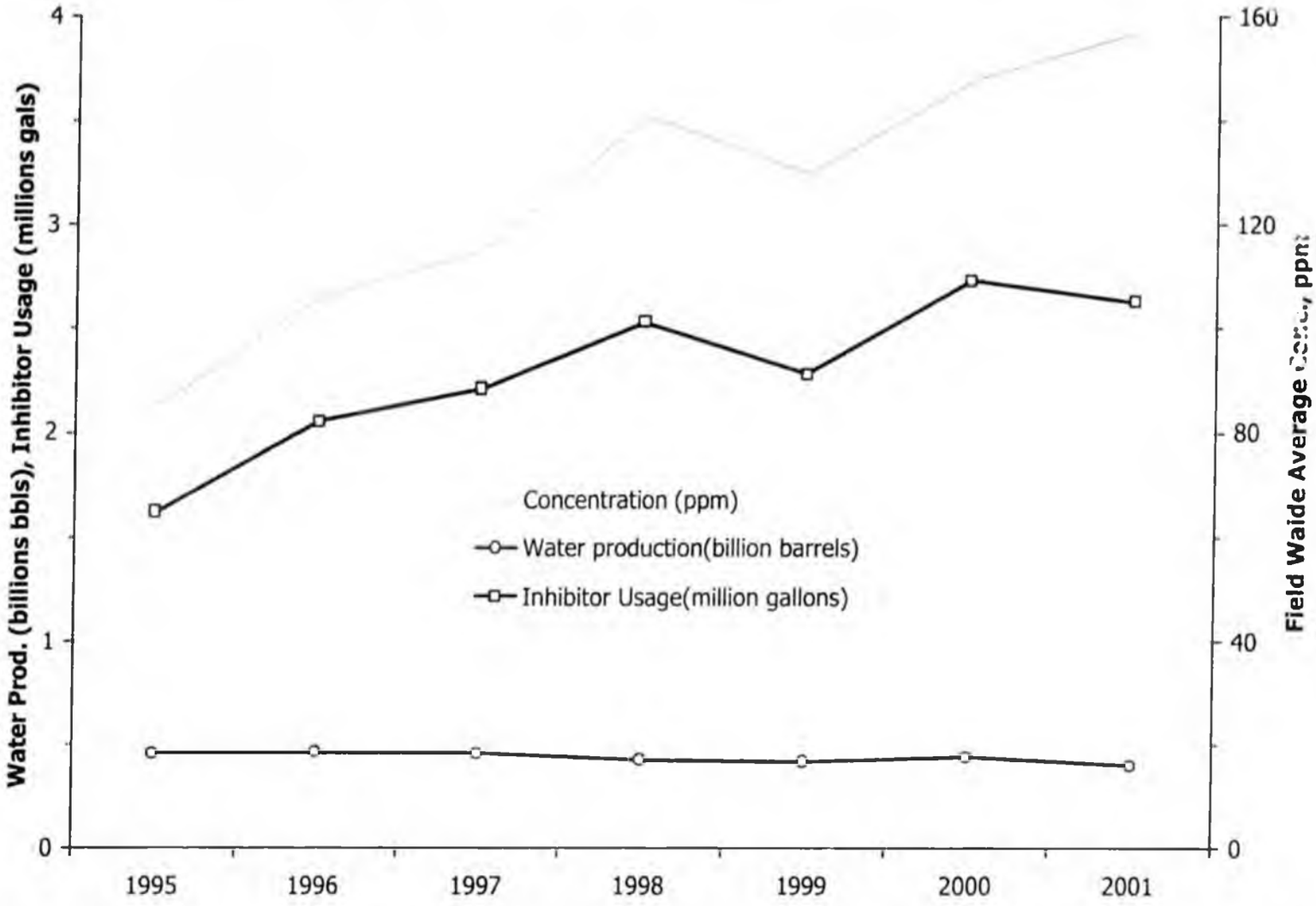
3-Phase Well Line Condition



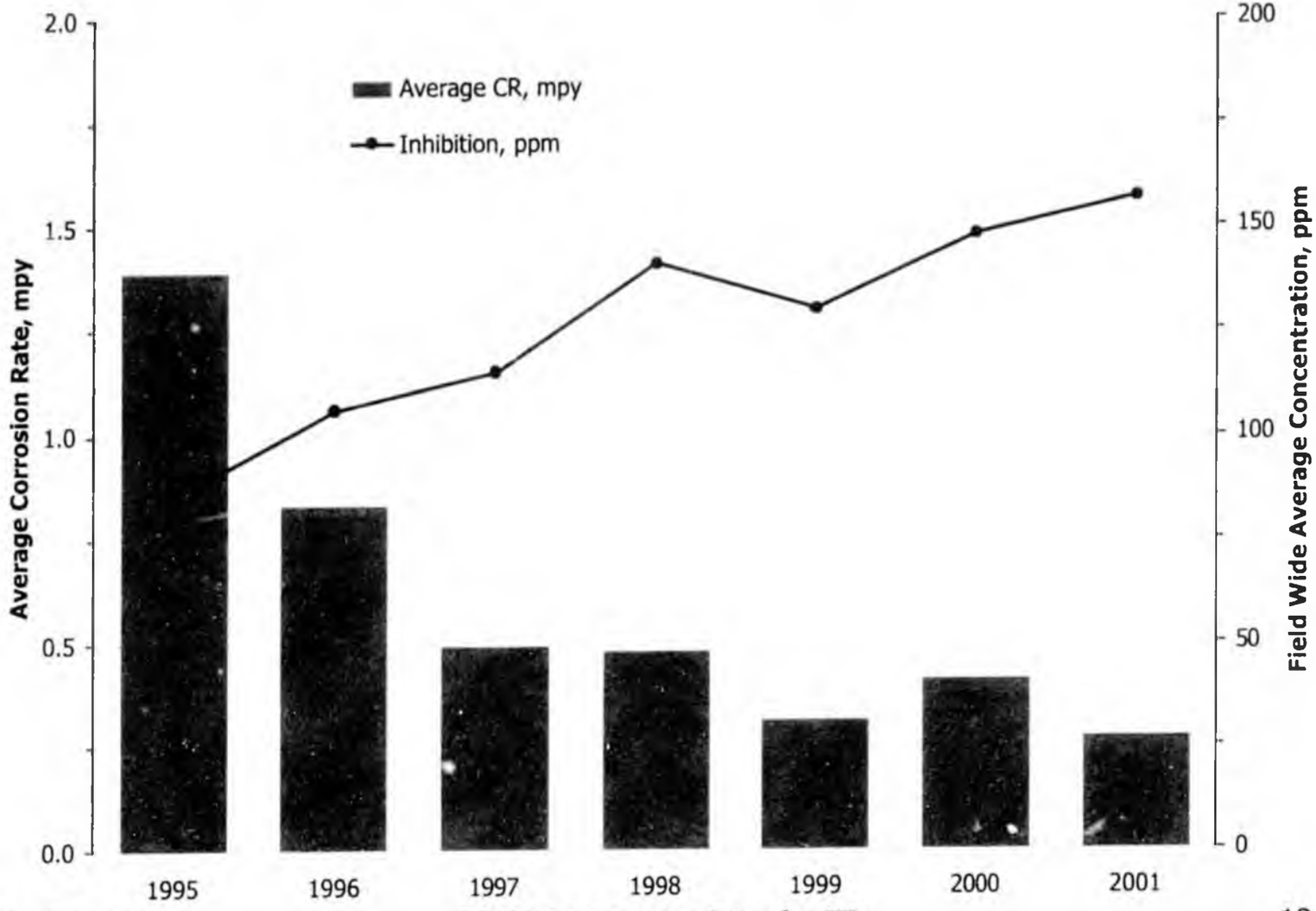
Inspection Condition and Increases



Mitigation – 3-Phase Corrosion Inhibition



Correlation Inhibition and Corrosion Rate



3-Phase System Corrosion Control

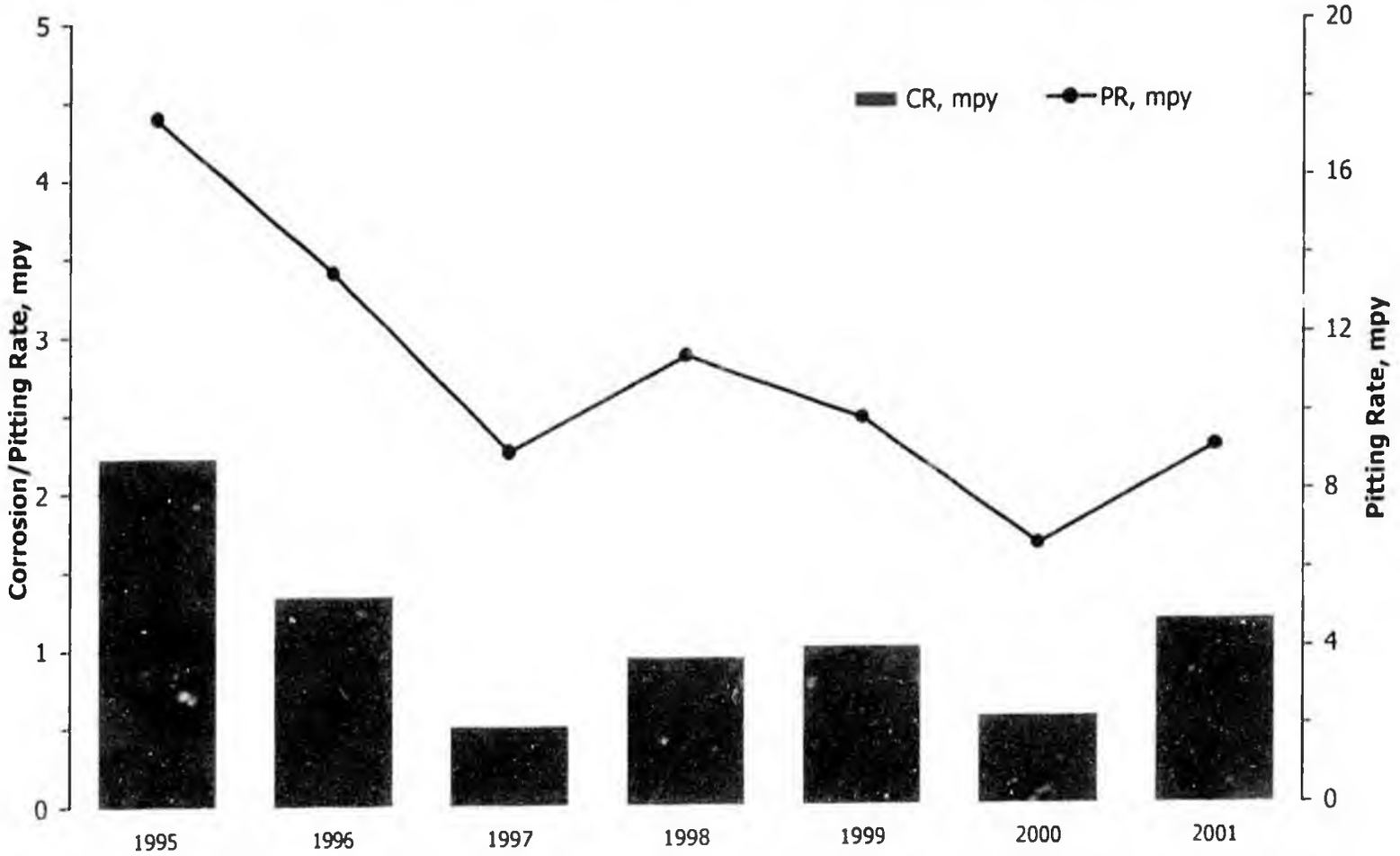
- **10 Year History**
  - Substantial reduction
  - Order of magnitude
    - 3.3 to 0.3 mpy
- **Mitigation**
  - Increased concentration
  - Approximately 50%
- **Consistency/Correlation**
  - Inspection vs. monitoring
  - Monitoring vs. inhibition
- **Strategy**
  - Long term integrity
  - Target CR 2 mpy
- **2002 Objectives**
  - Maintain current performance

3-Phase Summary

	1992	1996	2001
WLC CR mpy	3.3	0.8	0.3
Condition	4%	11%	12%
Increases	2.1%	4.9%	0.3%
CI Usage 10^6 gpy	-	2.05	2.63
CI Conc. ppm	-	106	157

Produced Water (PW) Injection System – WLC

PW Injection System WLC Corrosion/Pitting Rates

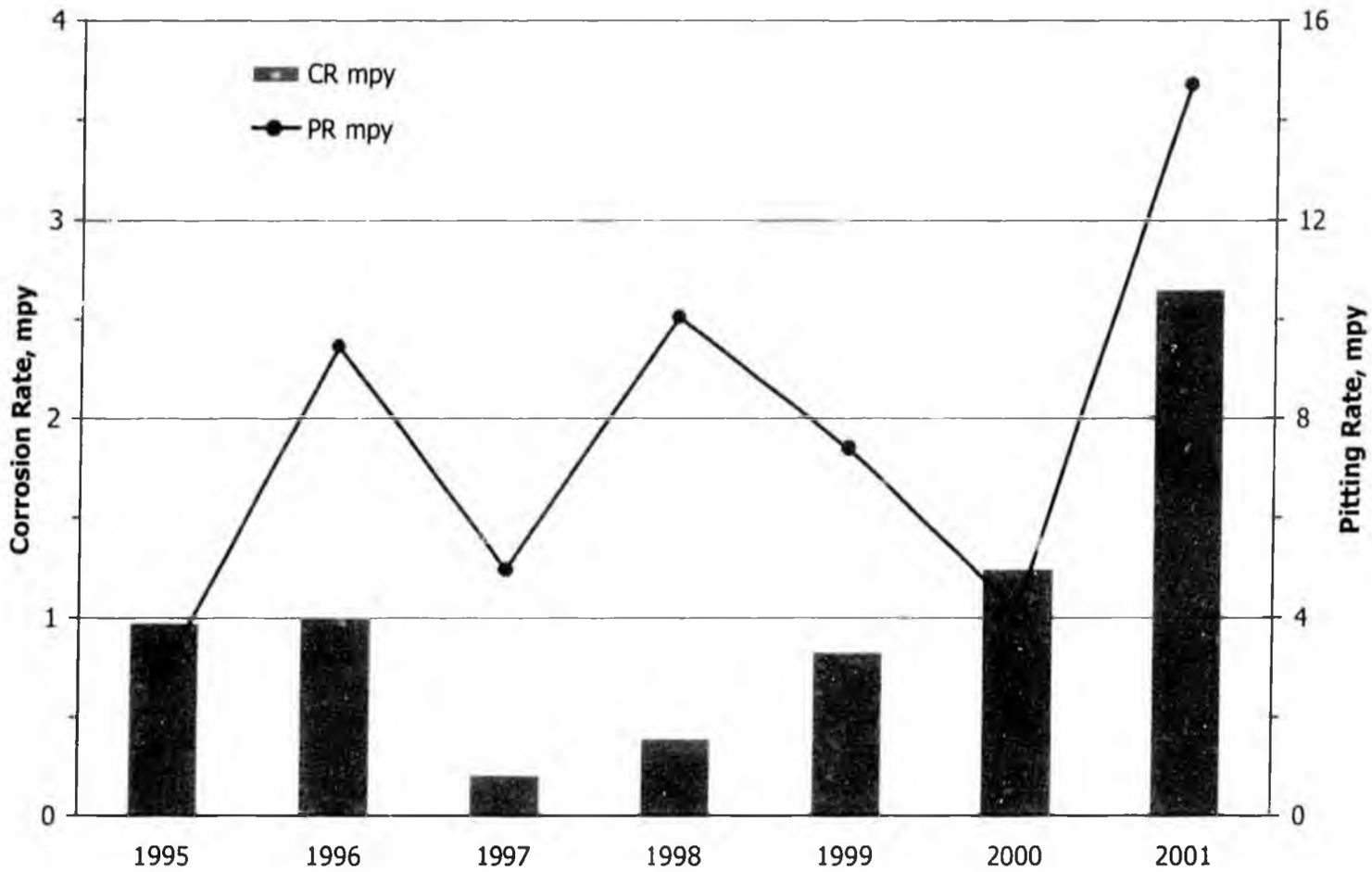


Produced Water (PW) Injection System

- **Corrosion Rate Trends**
  - Increasing general corrosion rate
  - Increasing pitting rate
- **Corrosion Inhibition**
  - Trials in 1999 and 2000
  - GC's 1, 2 and 3
- **Program Expansion**
  - Additional funding in 2002

Seawater Injection System

SW System WLC Corrosion and Pitting Rates



SW Injection System – Corrective Actions

- **Corrosion Mechanisms**
  - Dissolved oxygen
  - Microbiological
- **Corrosion Trends**
  - Increasing corrosion and pitting rates
- **Corrective Action Plans**
  - Oxygen control
    - Residual dissolved oxygen (DO) target < 20 ppb
    - Upgraded DO meter
    - Antifoam added to the vacuum tower
    - O_2 scavenger performance improvement
      - Catalyzed for low O_2 concentrations and lower temperatures
  - Microbiological control
    - More effective biocide blend
    - Doubled frequency of maintenance pigging
  - Plant repair and maintenance
    - Preparation for SW volume ramp-up planned for 2002-2003

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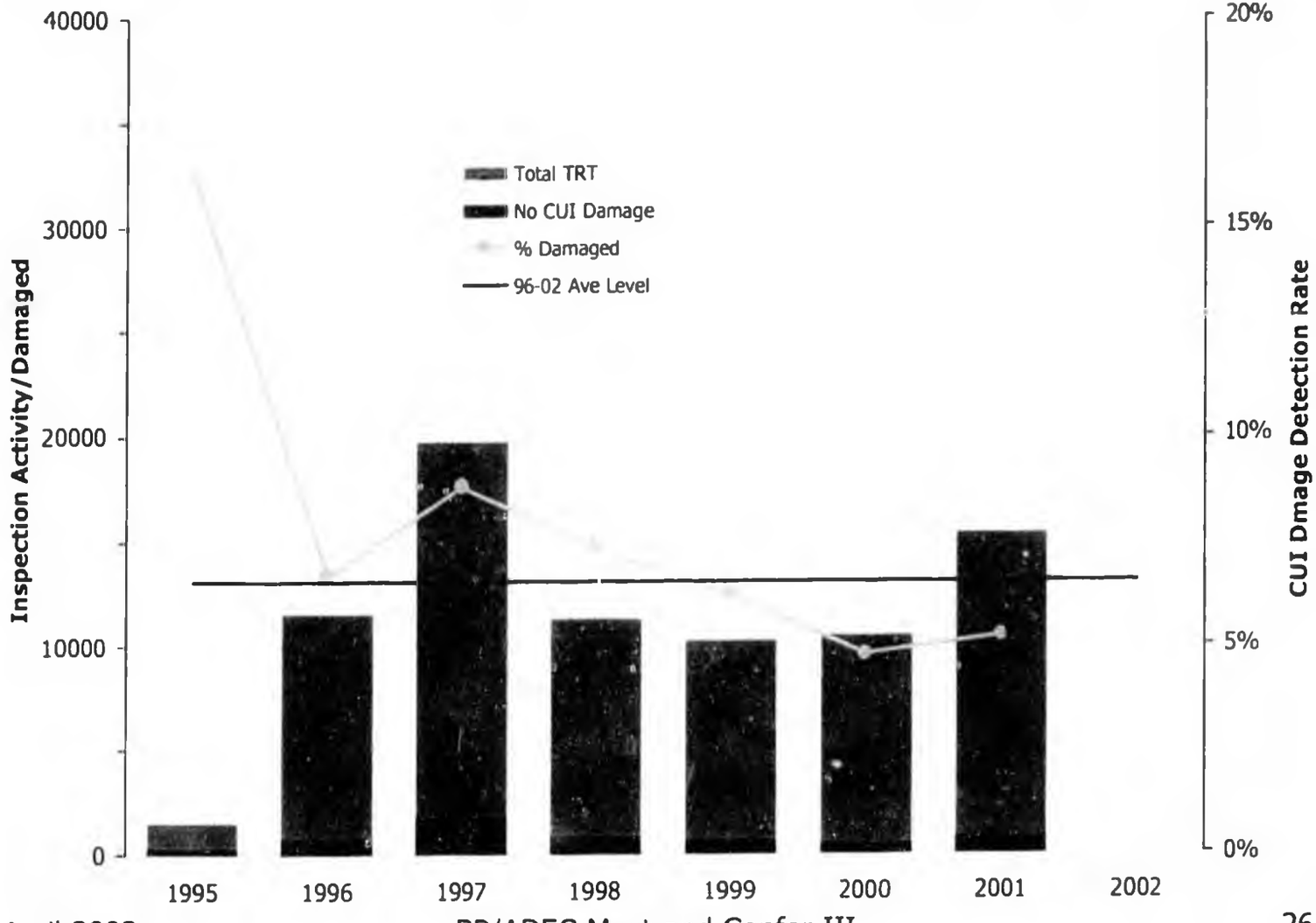
External Corrosion Program

- **External Corrosion**
  - Field applied insulation joints at weld packs
- **Scope**
  - All cross-country flow lines and well lines
  - ~200,000 weld packs off-pad
  - ~100,000 weld packs on-pad
- **Main Challenge**
  - Detection of external corrosion damage
- **Recurring Screening**
  - Prioritization
    - Configuration
    - Ave temperature
    - Age of equipment
    - Previous inspection

External Corrosion – Inspection Activity



External Corrosion – Way Forward

- **Activity Level**
  - ~13,000 locations/yr since 1996
- **Level of Risk**
  - Process review with GPB partners
  - Identified increasing risk as field ages
  - Joint configuration and location
    - Greater influences on occurrence of CUI
- **2002 Program Expansion**
  - Inspection scope increase to approx. 35,000 locations

Cased Piping Program

- **Scope**
  - 460 road/caribou crossings (GPB & ACT)
  - Complete initial baseline by 2003

- **Results**
  - ~60% of scope completed
  - 281 inspected in 2001(GPB & ACT)
  - GPB
    - 34 with 'minor' damage
    - 2 with 'moderate' damage
  - ACT
    - 30 digs on buried flow lines and/or headers at MPU
    - 3 locations repaired

2001 Program Performance I

- **6 Corrosion Related Leaks in 2002**

Corrosion Related Leak Summary

Service	Location	Type	Date	Mechanism	Volume
3 phase production	DS-01	WL	14-Jul-2001	Ext	200 gal
3 phase production	Pt Mac CL	FL	21-Jul-2001	Ext	420 gal
Produced Water	DS-14	WL	16-Aug-2001	Int	5 gal
3 phase production	DS-15	WL	23-Dec-2001	Int	5 gal
3 phase production	DS-07	WL	19-Feb-2001	Erosion	280 barrels
G&I Slurry	G&I	FL	6-Mar-2001	Erosion	400 barrels

	Surface		Service			Mechanism		
	Int	Ext	OIL	SW	PW	CO_2	Erosion	CUI
WL	3	1	3		1	2	1	1
FL	1	1	1	1			1	1

- **Repairs**
  - 31 repairs
    - 17 – external corrosion
    - 11 – internal/erosion
    - 3 – mechanical damage

2001 Program Performance II

ER Probe Corrective Actions

Equipment ID	Cause	Action
N-74	Increased Corrosivity	See Inspection CA
09A	Increased Corrosivity	See Inspection CA
12C	Increased Corrosivity	Increased CI by 10%
04B	Increased Corrosivity	Increased CI by 5%
03D	Increased Corrosivity	Increased CI by 10%
14D	Increased Corrosivity	See Coupon CA

Coupon Corrective Actions

Equipment ID	Cause	Action
U-384	Poor water values	New procedure for CI distribution
Y-74	Poor water values	New procedure for CI distribution
Q Pad	Increased Corrosivity	Increased CI by 20%
14D	Increased Corrosivity	Increased CI by 10%
07C/15C	Possible under injection	Now checking rates
N-74	Increased Corrosivity	See Inspection CA
07D (Pit Rate)	Possible under injection	Under investigation

2001 Program Performance III

Inspection Corrective Actions

Equipment ID	Cause	Action
09E	Increased Corrosivity	Increased CI by 10%
04C	Increased Corrosivity	Increased CI by 10%
E-46 (K Pad)	Increased Corrosivity	Increased CI by 75%
S-36	Increased Corrosivity	Increased CI by 10%
Z-74	Increased Corrosivity	Increased CI by 20%
N-74	Increased Corrosivity	Increased CI by 25%
09A	Increased Corrosivity	Increased CI by 10%
G-42	Increased Corrosivity	Increased CI by 150%
H-36	Increased Corrosivity	Increased CI by 10%
PW System	Change Upstream CI	Changed Upstream CI 1Q02
SW System	Increased O_2 Content	Increased O_2 Control

Program Improvement

- PW system – additional inhibition
- SW system – O_2 control

Program Continuity

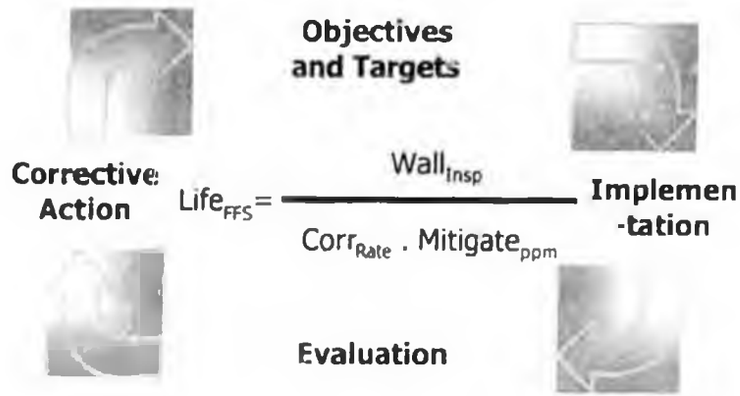
- 3-phase production

2002 Overview – Main Issues

- **Maintain Three-Phase System**
- **SW/PW Program Improvement**
  - Seawater
    - Performance improvement from implemented corrective actions
    - Additional actions as required
  - Produced water
    - Monitor effectiveness of supplemental corrosion inhibitor
    - Optimize as appropriate
- **Inspection Program**
  - Implementation of expanded External Corrosion Program
    - ~35,000 items
  - Baseline inspection of cased piping segments
    - ~200 segments to be inspected in 2002
    - On target to complete in 2003

Summary

- **Delivery of Objectives**
  - Long term Fitness For Service
- **Corrosion Management System**
  - Integration of key elements
    - Thickness – Inspection program
    - Rate – Corrosion monitoring
    - Mitigation – Corrosion inhibition
- **System Review**
  - 3-Phase – Improved from 2000
  - SW – Deteriorated from 2000
  - PW – Deteriorated from 2000
- **Focus for 2002**
  - 3-Phase – Maintain performance
  - SW – Dissolved oxygen control
  - PW – Additional inhibition



CPA

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Greater Kuparuk Area

Commitment To Corrosion Monitoring Overview

presented to the

Alaska Department of Environmental Conservation

3rd Meet & Confer

April 29, 2002

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Inspection Results

Internal Corrosion

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Cross Country Lines

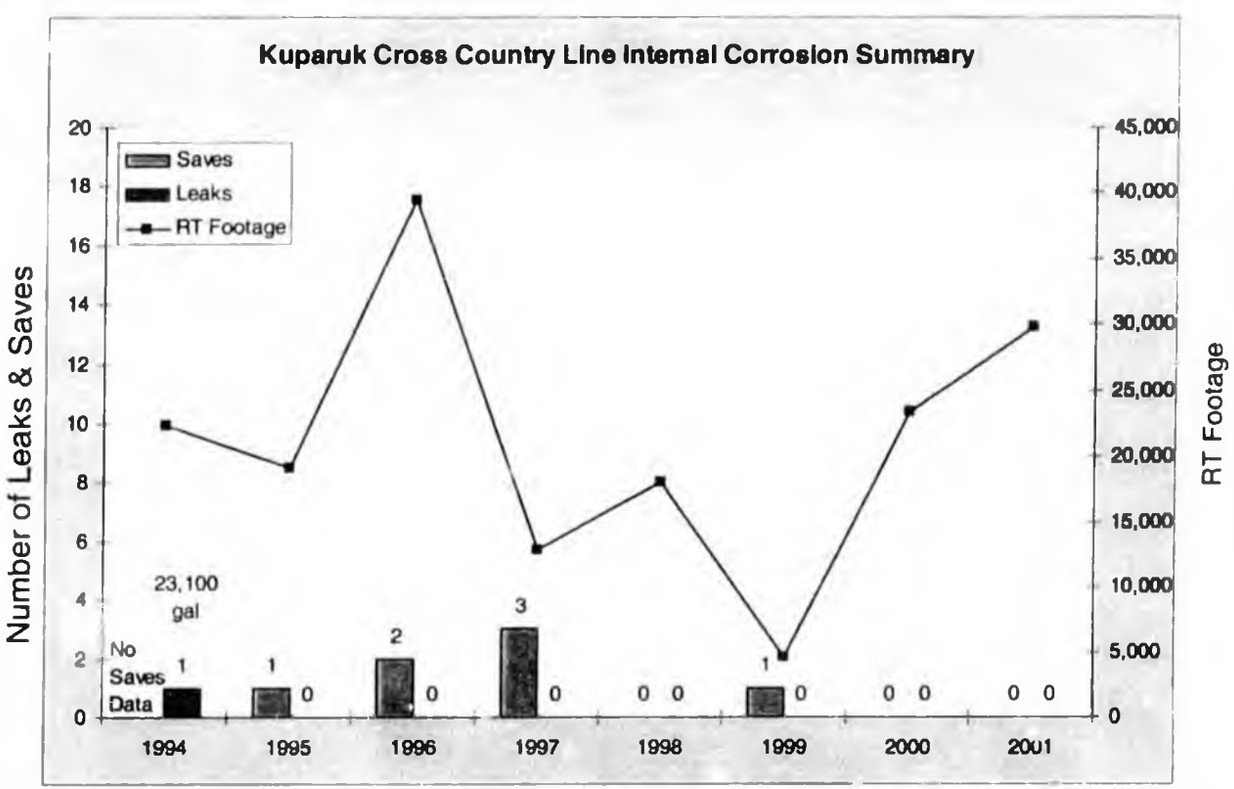
Corrosion Is Under Control

2001

- ✓ **Nearly tripled original RTR work scope (from 10M to 28M feet)**
- ✓ **Over 30,000 ft of over 100 lines inspected (RTR and RT)**
- ✓ **No significant damage noted**
- ✓ **0 Leaks, 0 Saves**

Internal Corrosion Spills - Cross Country Lines

1994 Spill 24" 1Y/R Crude CC Line



Inspection Results

Internal Corrosion

Well Lines

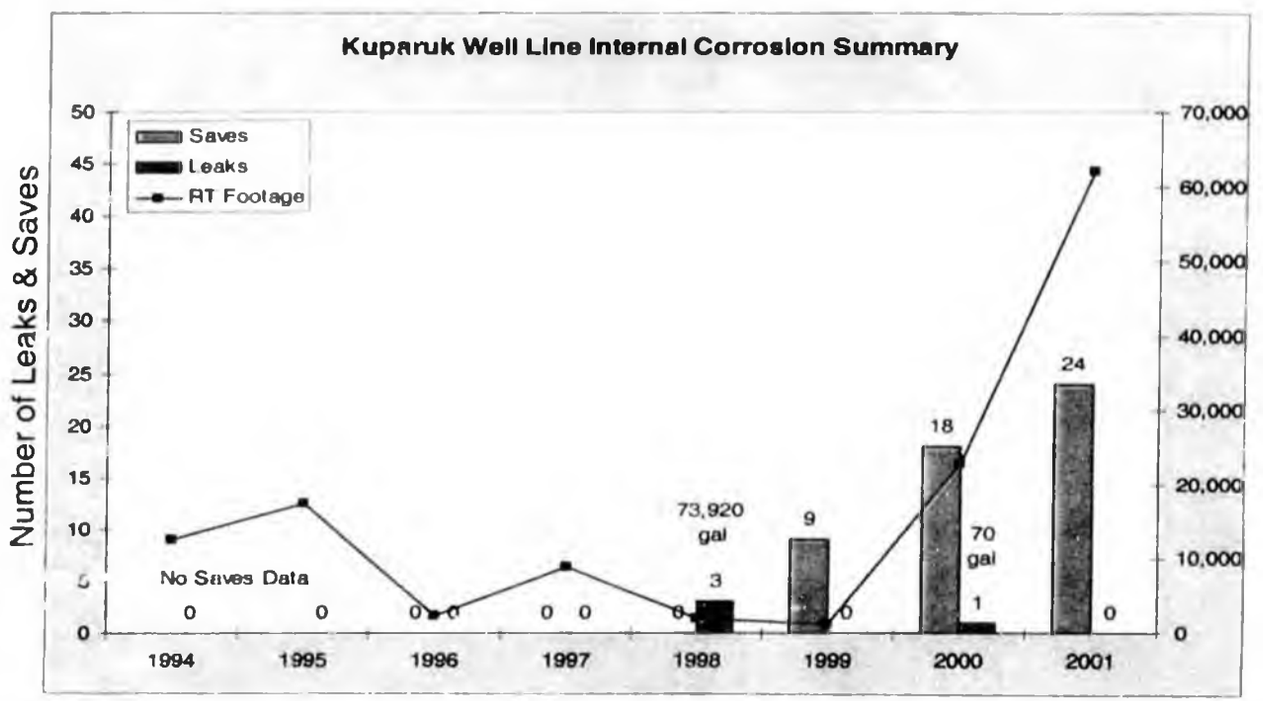
Internal Inspection Focus Area

2001

- ✓ **Tripled original RTR work scope (from 18M to over 58M feet)**
- ✓ **Roughly ½ of all GKA well lines RTR'd (431 of ~900 lines)**
- ✓ **Most .280" and .312" well lines inspected (remainder of .280" in Jan '02)**
- ✓ **24 well lines required repair (17 injectors, 7 producers)**
- ✓ **0 Leaks, 24 Saves**

Internal Corrosion Spills -Well Lines

1998 Spills	1L-1 6" WI Line
	1L-3 6" WI Line
	1A-9 6" WI Line
2000 Spill	1G-8 6" PC Line



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Inspection Results

Internal Corrosion

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- ✓ **Continue to Focus on and inspect Well Lines**
  (Priority Based on Wall Thickness and Age of Line)
  - Complete initial inspection of all remaining 0.312" well lines (~60 lines)
  - Target next group of 0.375" well lines
  - Similar effort as 2001 (footage will decrease due to pipe configurations)
- ✓ **Maintain Inspection of Cross Country Lines**
  - Similar effort and footage as 2001
  - Fully integrate Risk Based Elbow Program into CC Line inspection efforts
  - Evaluate possibility of smart pigging water injection CC Lines > 10in Diameter
    (these ≈ ½ of all CC lines)

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Monitoring/Mitigation

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Results & Accomplishments

2001

Monitoring:

- ✓ For ail service categories, coupon general and pitting rate averages remain under threshold limits
- ✓ Over 90% of 3-Phase Production CC lines with ER probe rates < 2 mpy
- ✓ Inspection of CC water lines shows routine maintenance pigging combined with residual corrosion inhibitor carryover controls corrosion

Mitigation:

- ✓ Inspection data shows corrosion is under control in the cross country lines
- ✓ All inhibited 3-Phase Production CC lines with probe, coupon, or inspection rates above thresholds had corrective action taken (inhibitor rates were increased)
- ✓ Continuous wellhead injection project at DS1G funded and proceeding – to be running before end of 2002
  - Additional Drill Sites installations funded; design & procurement in progress
- ✓ Field-wide corrosion inhibitor injection rate control improved

Monitoring/Mitigation

Three-Phase Cross Country Lines

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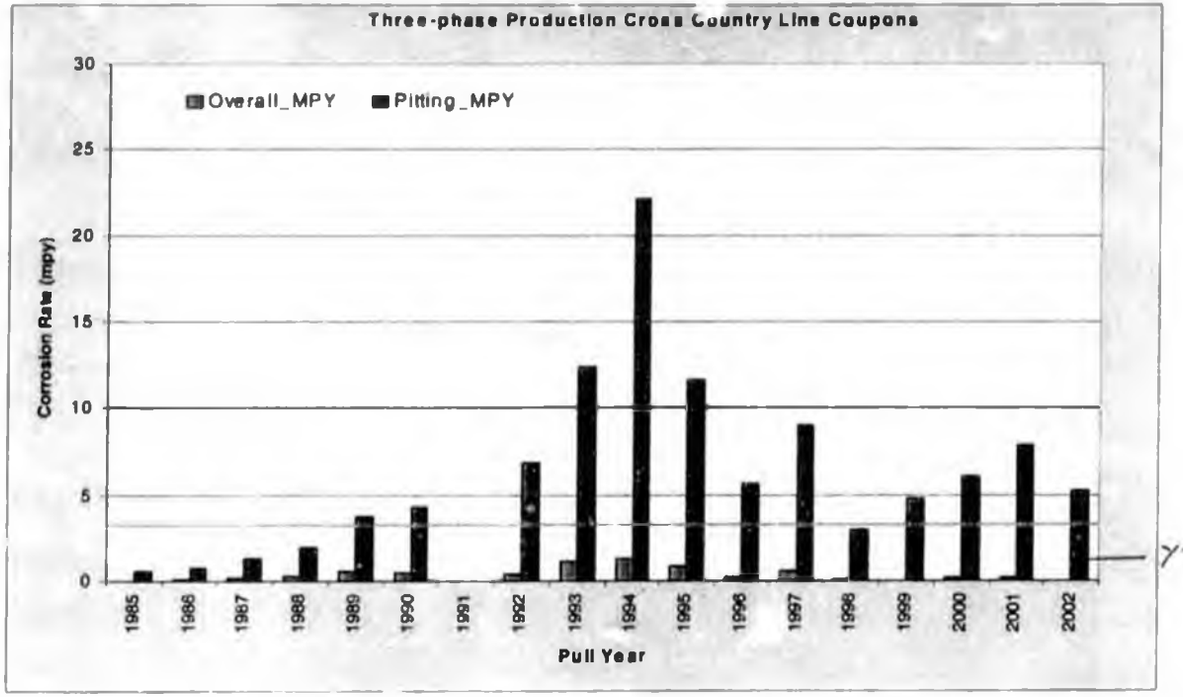
Summary

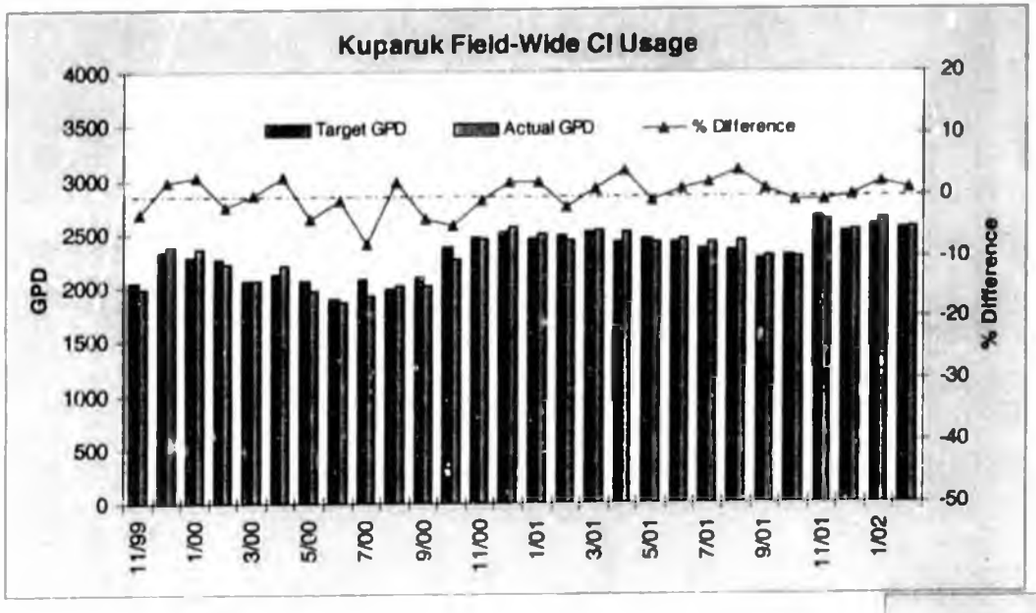
2001



- ✓ **Coupon average corrosion rates under threshold limits, but trends were increasing as of YE2001. <u>Note improvement due to inhibitor changes in late 2001…</u>**
- ✓ **Coupon corrosion rates are a conservative measure, and are a warning indicator**
  - –Inhibitor concentration increased on twice as many lines due to coupon/probe data than due to inspection increases
- ✓ **Inspection data shows corrosion is under control in the CC lines**
  - – Less than 3% of repeat inspections showed increases

Monitoring/Mitigation

Three-Phase Cross Country Lines

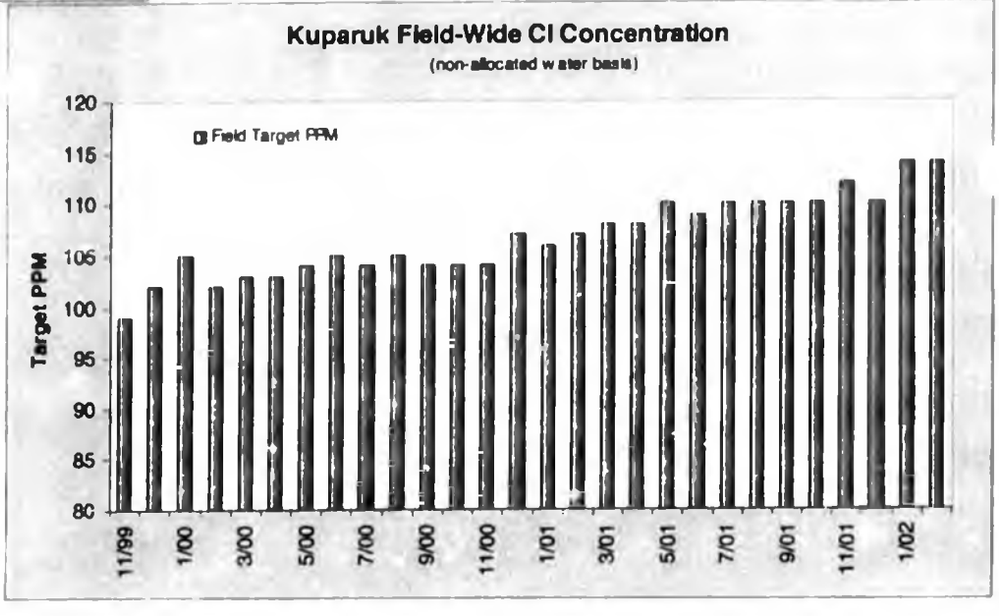


⇐⇐ Corrosion Inhibitor Usage:

- ✓ Goal is zero percent difference, with a bias toward staying above rather than below zero
- ✓ Using better reporting tools, field-wide corrosion inhibitor control improved during 2001

Corrosion Inhibitor Concentration: ⇒⇒

- ✓ Field-wide corrosion inhibitor target concentration has increased in response to monitoring/inspection feedback



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Monitoring/Mitigation

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2002 Goals

- ✓ **Find more effective corrosion inhibitors**
  - Implement RU-276 field-wide by end of 1st quarter (Complete)
  - Although coupon average corrosion rates are under threshold limits, the trends are moving up
  - New field testing protocol will accelerate the development/screening of new CI chemistries
- ✓ **Implement wellhead continuous injection**
  - Start pumping corrosion inhibitor at DS1G well head locations. Evaluate effectiveness in well lines
- ✓ **Develop cost effective approach to reduce solids in WI well lines**
  - Test Schmoo-Be-Gone in the water injection system at a Drill Site (cleaning surfactant)

Inspection Results

External Corrosion

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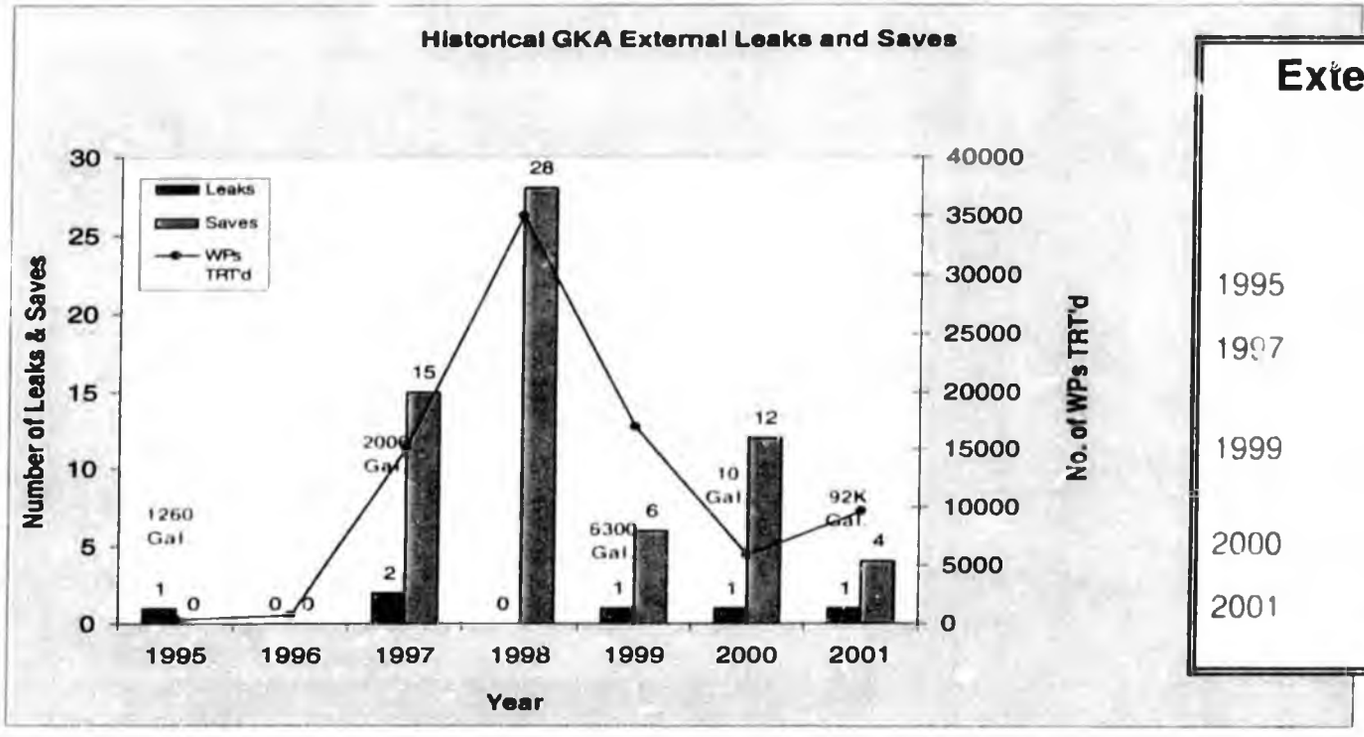
Summary 2001

Type of Equipment	Number of Locations Inspected	Number of Corroded Locations	Percentage of Locations Corroded	Number of Locations Refurbished
Cross-Country Lines On Pad	3919	102	2.6	257
Cross-Country Lines Over Tundra (Off-Pad)	292	13	4.5	338
Well Lines	5489	64	1.2	227
Total	**9700**	**179**	**1.9**	**822**

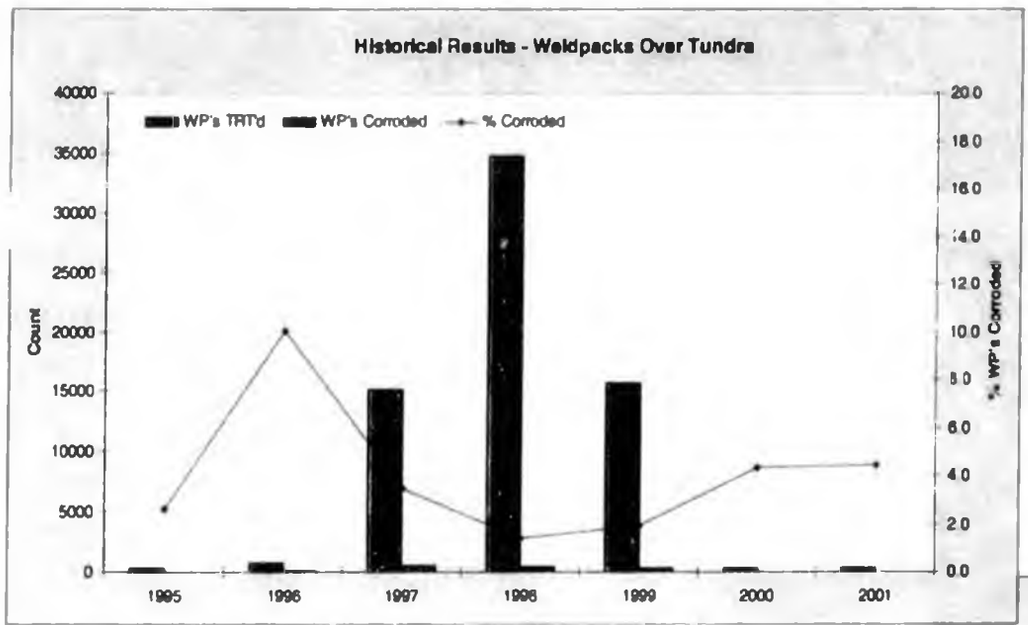


External Corrosion Line Failure History

1995	2C-04 Well Line
1997	2 ea. 24" Crude CC Lines (Weld Pack @ Saddle)
1999	1A-15 Well Line (Weld Pack @Saddle)
2000	2X-16 Well Line
2001	10" CC PWI Line **(Weld Pack in Road Crossing)**

Inspection Results

Cross Country Lines External Corrosion



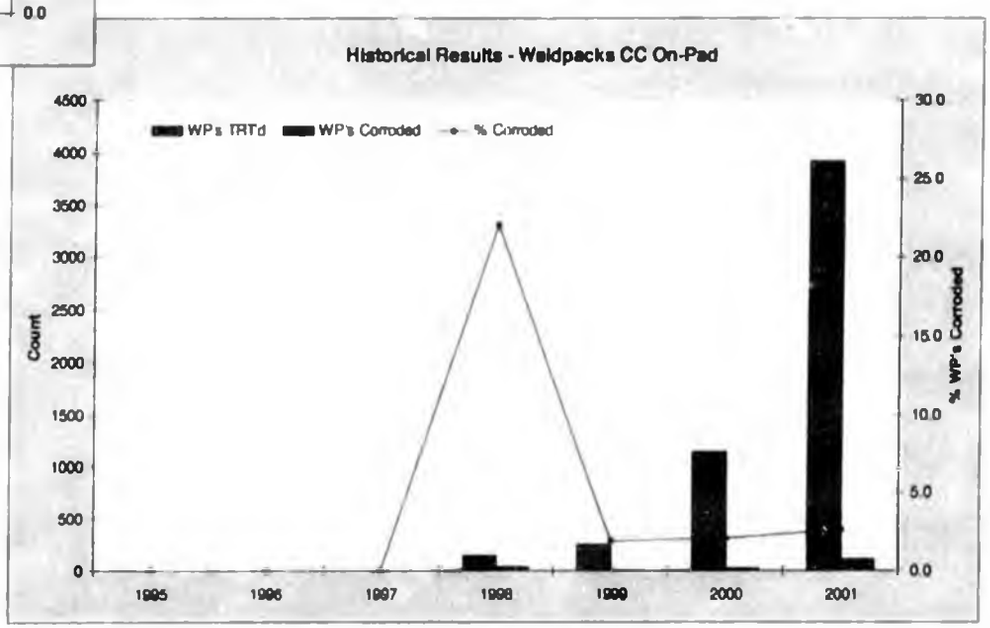
Prioritizing Lines Has Helped Effort

⇐⇐ CC Lines Over Tundra:

- ✓ All over-tundra cross country weld packs were TRT'd by YE 2001
- ✓ All over tundra cross country weld packs found with corrosion were refurbished by YE 2001

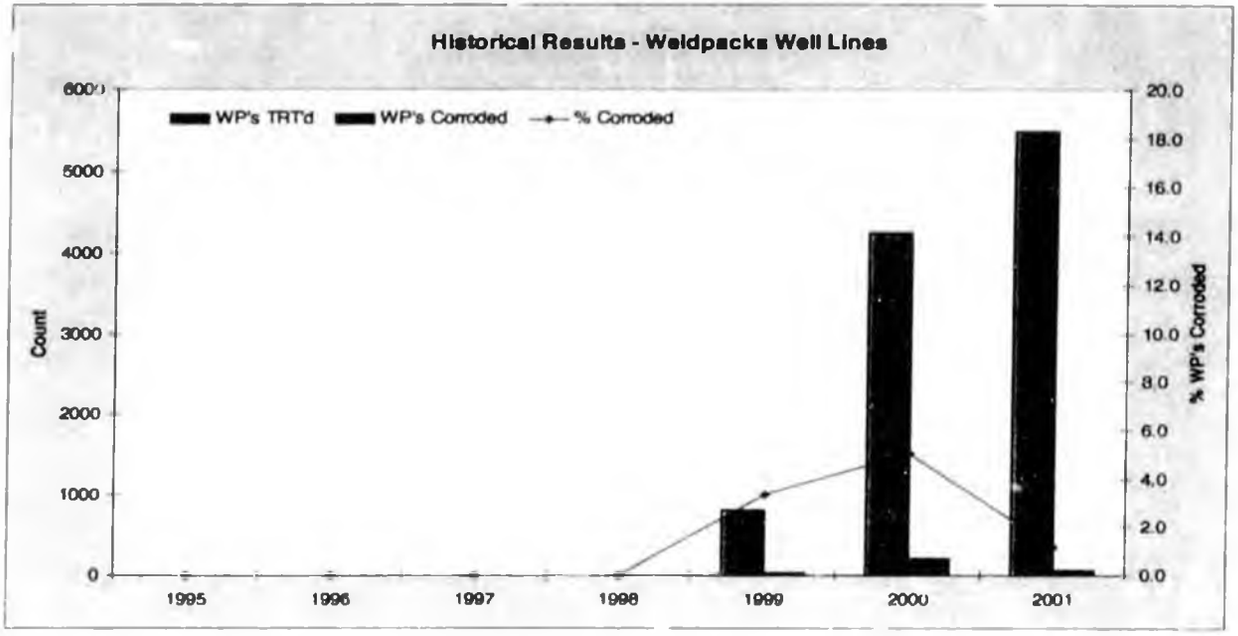
CC Lines On Pad: ⇒⇒

- ✓ TRT'd 3919 on pad cross country weld packs (44% of total) exceeding the goal by 120%
- ✓ 62% of all on pad cross-country line weld packs have been TRT'd YE 2001
- ✓ The % corroded weld packs found has remained nearly the same, ~ 2.6%



Inspection Results

Well Lines External Corrosion



External Corrosion Program is Maturing as expected – Delivering desired results

Well Lines :

2001

- ✓ **TRT'd 5489 well line weld packs (22% of total)**
- ✓ **Exceeded 2001 goal of 16.7%**
- ✓ **43% of the well line weld packs have been TRT inspected vs. 33% originally planned**
- ✓ **Goal is to have all well line weld packs TRT'd by 2005**
- ✓ **Inspection priority - oldest, hottest and thinnest wall lines**
- ✓ **The % of corroded weld packs dropped from 5% to 1.2% in 2000 and 2001, respectively**

Inspection Results

External Corrosion

Well line External Corrosion Programs:

- ✓ Inspect (TRT) 17% of well line weld packs ~ 4,000 weld packs
  - 2002 YE inspection total to over 14000 weld packs (60% of total)
- ✓ Continue to prioritize older and hotter lines.
- ✓ Continue policy of refurbishing all corroded and heavy wet weld packs.

Cross County Line Corrosion Programs:

- ✓ Inspect (TRT) 20% of on pad weld packs ~ 1,780 weld packs
  - 2002 YE inspection total to 80% of the total; ahead of the 2004 completion target
- ✓ Continue policy of refurbishing all corroded and heavy wet weld packs.