

Statoil Canada Ltd. Solvent Co-Injection Pilot (SCIP) Project Approval No. 11834A

SCIP 2015 (January 1 – December 31, 2014)
Annual D054 Performance Presentation
Alberta Energy Regulator
March 9, 2015

SCIP PROJECT

Introduction and Overview

- **Introduction**
- **Subsurface Issues Related to Resource Evaluation and Recovery – Directive 054, Section 3.1.1**
- **Surface Operations, Compliance, and Issues Not Related to Resource Evaluation and Recovery – Directive 054, Section 3.1.2**



Statoil

Subsurface Issues Related to Resource Evaluation and Recovery

SUBSURFACE

Table of Contents

1. Brief Background
2. Geoscience Overview
3. Drilling and Completions (n/a)
4. Artificial Lift (n/a)
5. Instrumentation in Wells
6. 4D Seismic (n/a)
7. Experimental Scheme Performance
8. Future Plans

BRIEF BACKGROUND

Subsurface Section 1

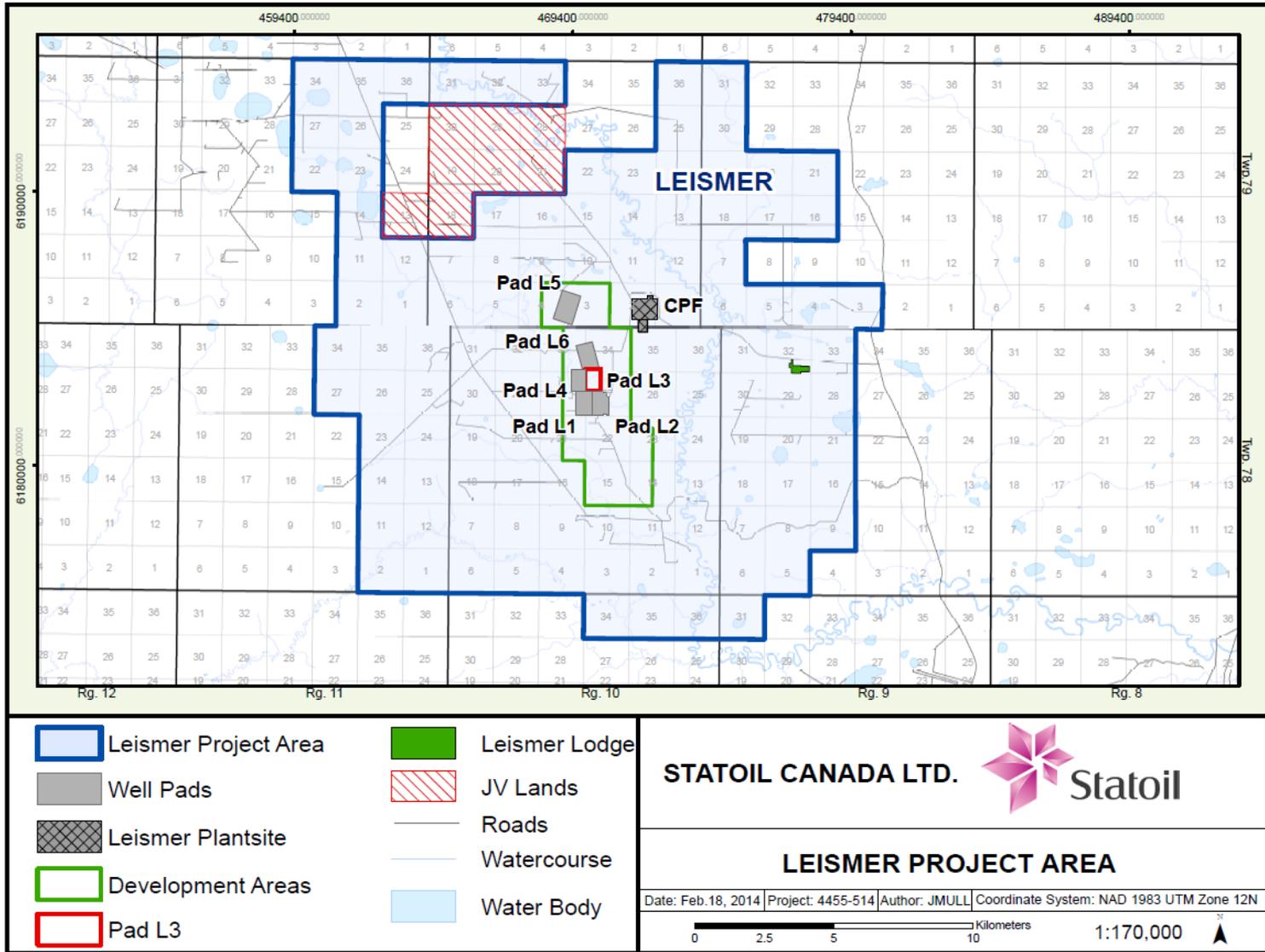
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BACKGROUND

SCIP Application History

Project	Application Number	Date Submitted	Approval Date	New Approval No.	Notes
Solvent Co-Injection Pilot at wells on Pad L3	1709858	2-Dec-11	11-Jun-12	11834	Initial application for the experimental scheme approval to co-inject solvent on 3 well pairs on Pad L3
Confidentiality request	1753179	13-Jan-13	6-Jun-13	11834A	Request for confidentiality for the project as well as a revised solvent start date
Steaming start date notification	n/a	18-Mar-13	n/a	n/a	Notification of new solvent co-injection start date of September 2013.

BACKGROUND



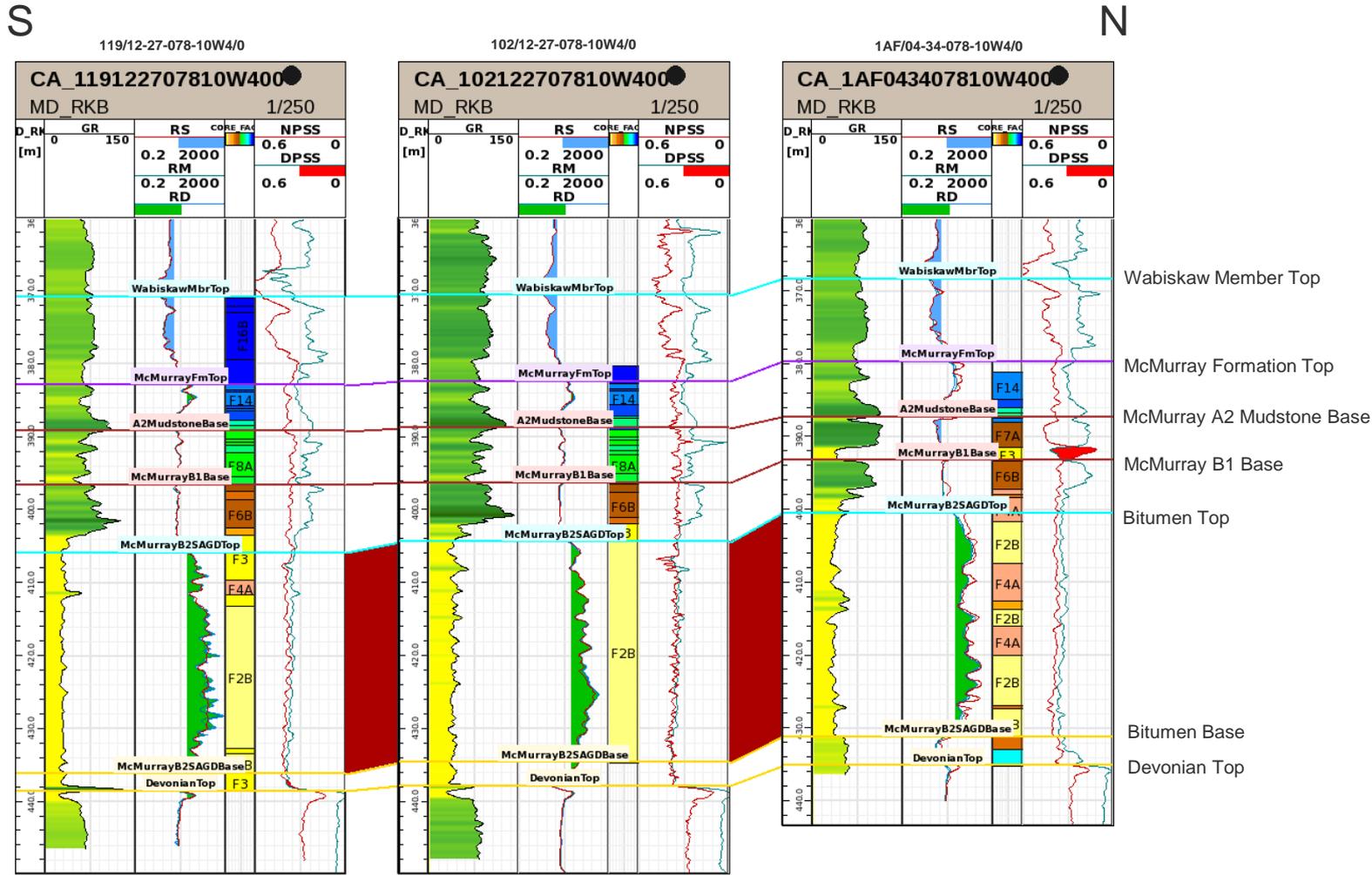
GEOSCIENCE OVERVIEW

Subsurface Section 2

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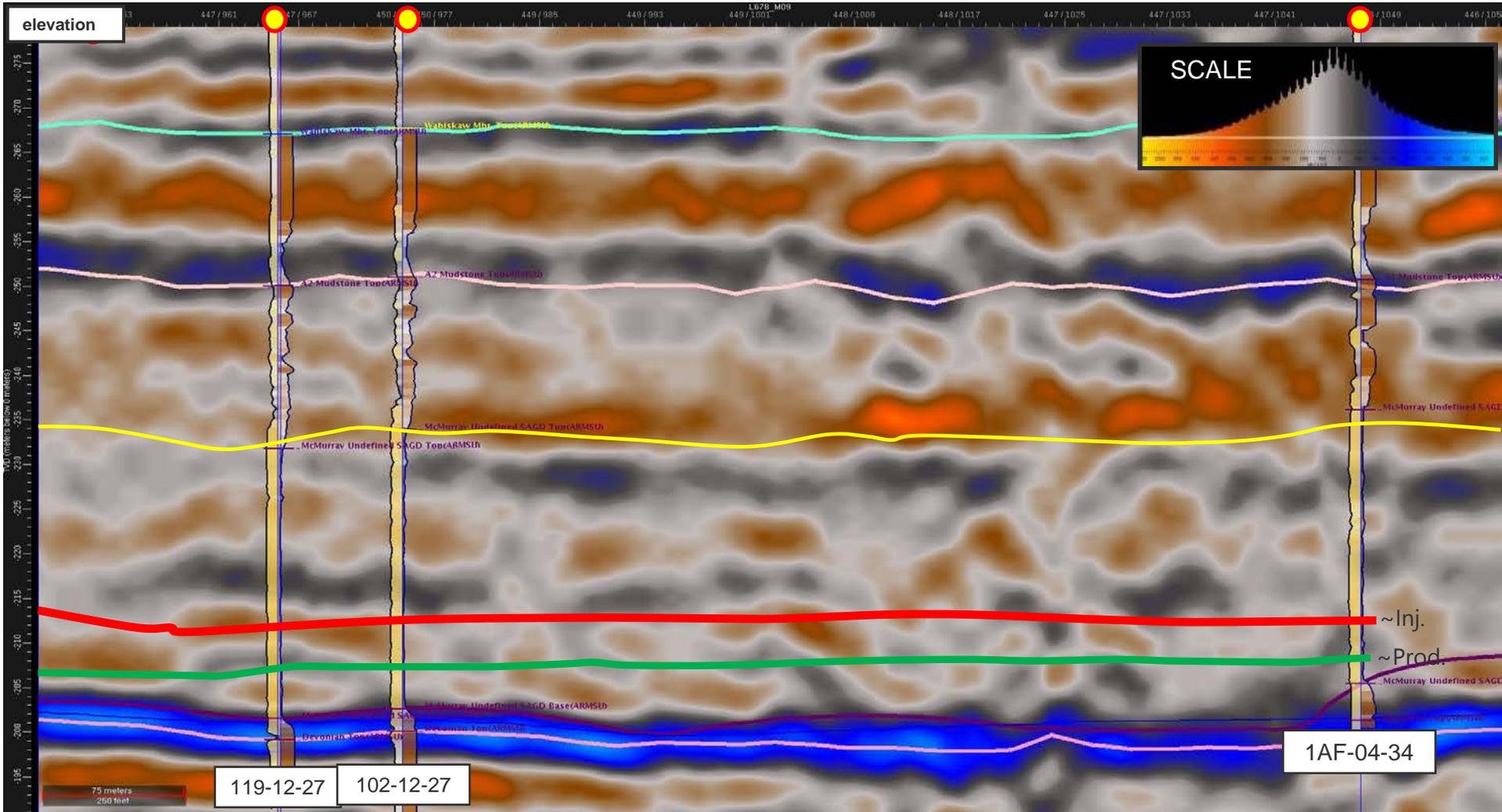
GEOSCIENCE OVERVIEW

Pad L3 - Petrophysical Log Cross-Section along L3P3



GEOSCIENCE OVERVIEW

Pad L3 - Petrophysical Log Cross-Section along L3P3



DRILLING AND COMPLETIONS

Subsurface Section 3

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DRILLING AND COMPLETIONS

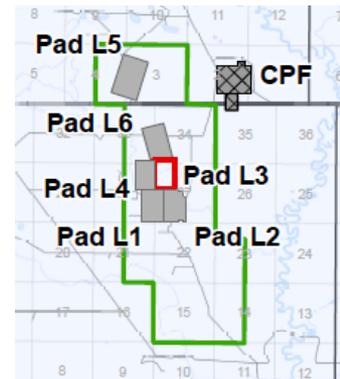
Well Location Map – Wellbore Design for Pad L3

INJECTORS

8-5/8" slotted liners

PRODUCERS

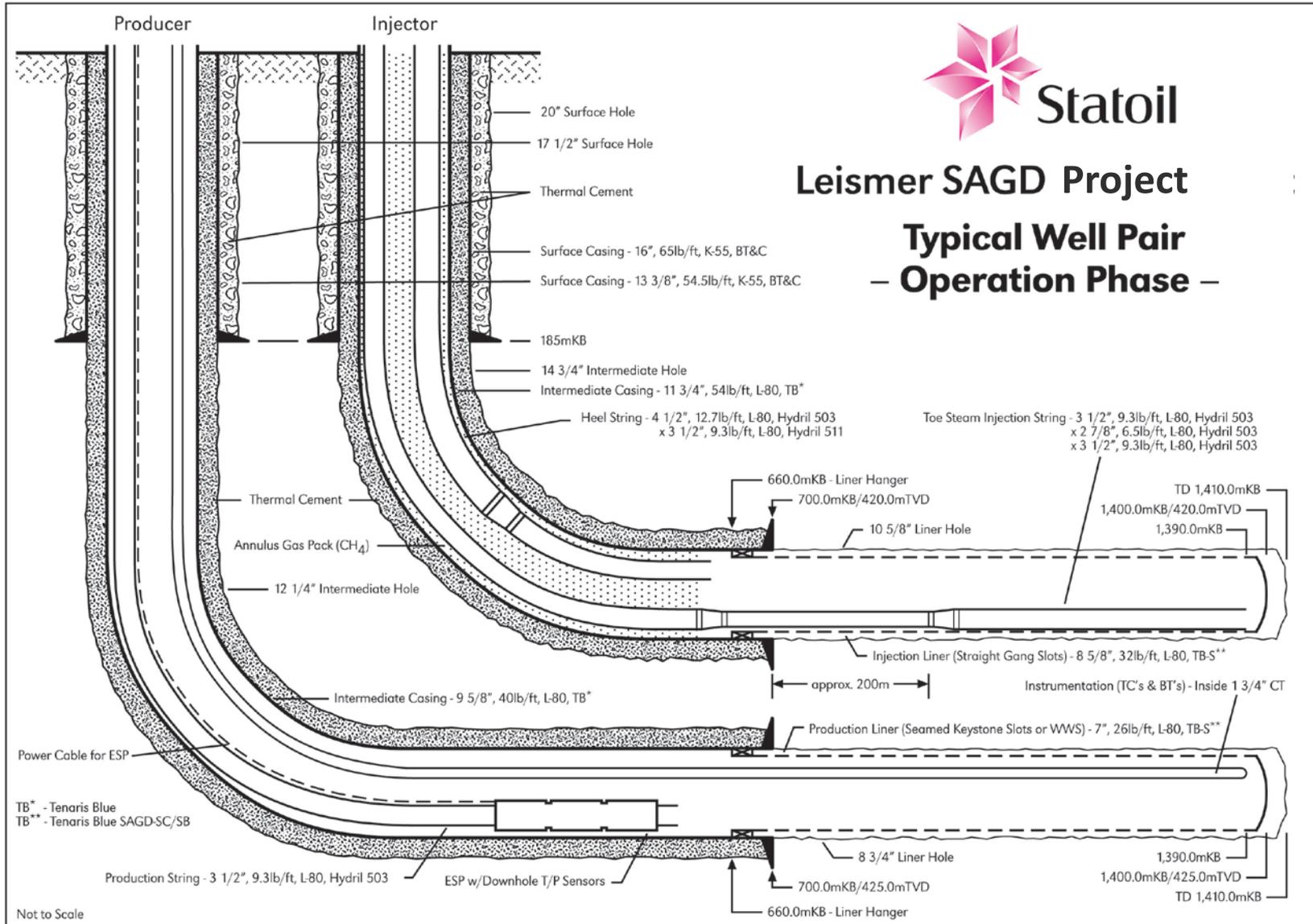
7" slotted liners





Leismer SAGD Project

Typical Well Pair - Operation Phase -



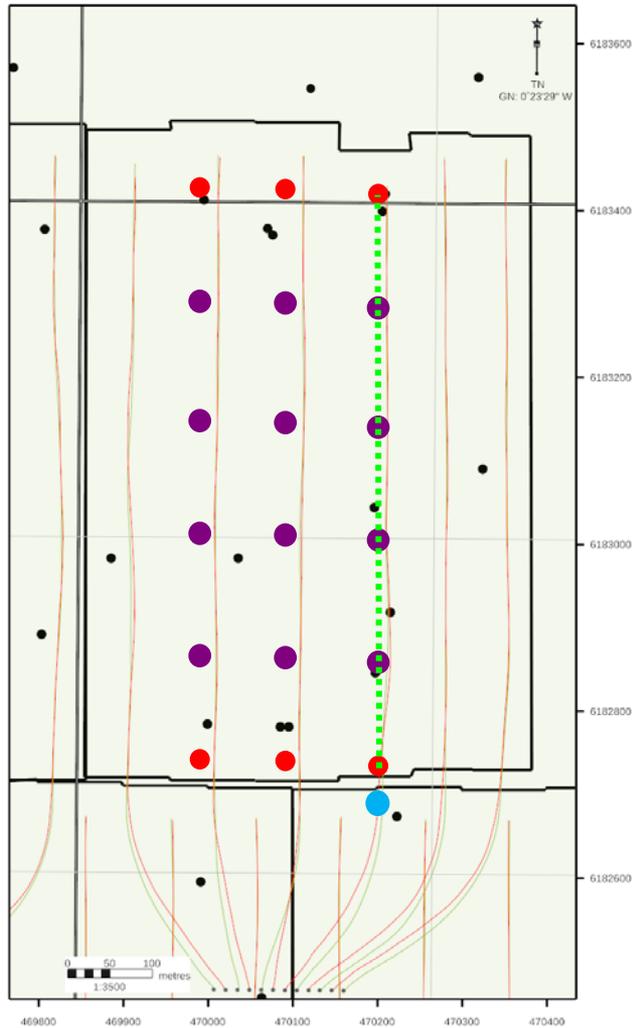
INSTRUMENTATION IN WELLS

Subsurface Section 5

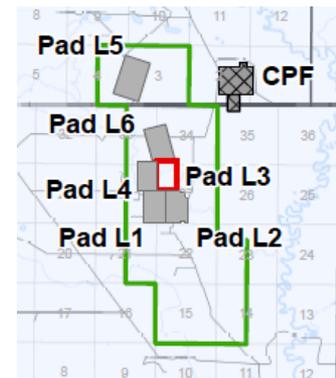
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INSTRUMENTATION

Leismer Downhole Producer Instrumentation for Pad L3

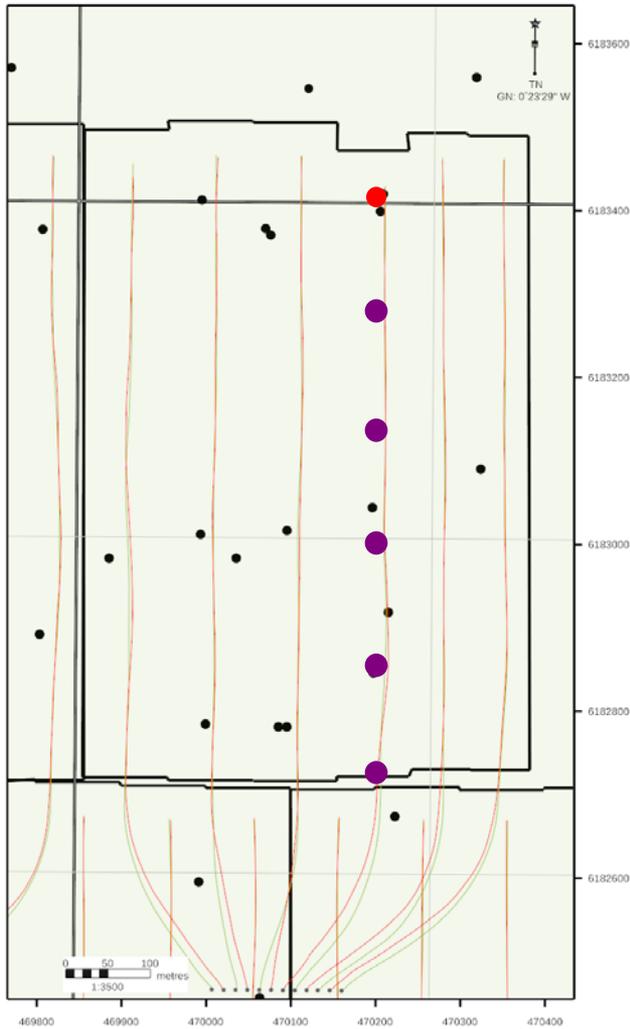


-  Fiber Bragg Grating (FBG) - 40 discrete temperature points
-  Bubble Tube and Thermocouple
-  Thermocouple
-  Fiber Optic (FO) Gauge, single temperature/pressure

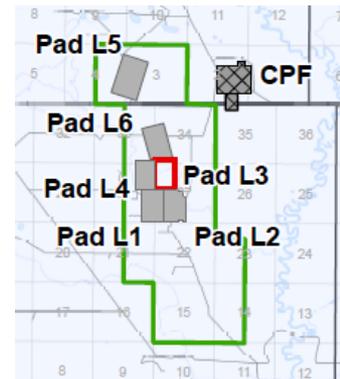


INSTRUMENTATION

Leismer Downhole Injector Instrumentation for Pad L3



- Bubble Tube and Thermocouple
- Thermocouple



SAGD PERFORMANCE

Subsurface Section 7

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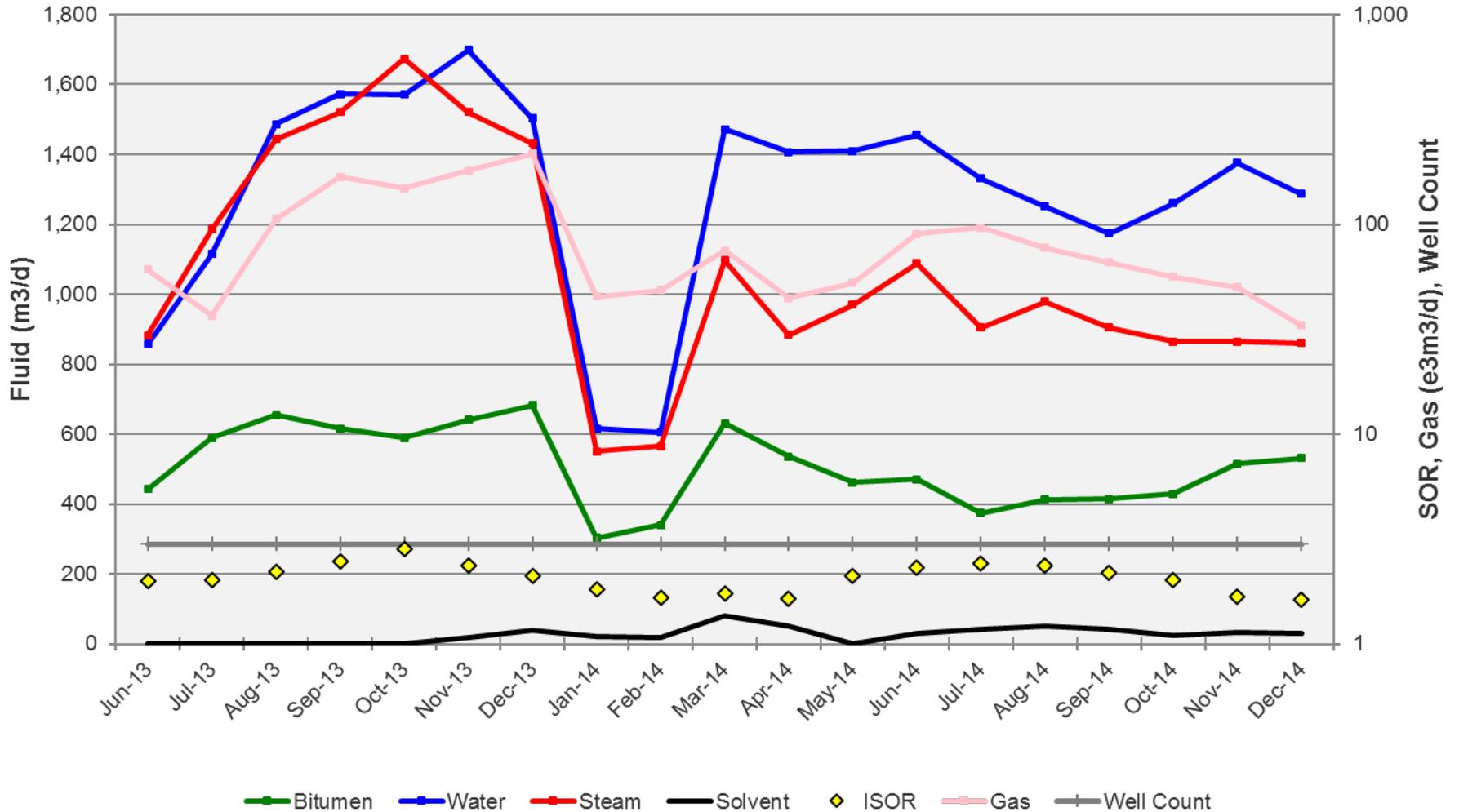
SCHEME PERFORMANCE

Pilot Operation

- Initial Solvent Co-Injection Start-Dates
 - L3I5: November 15, 2013
 - L3I4: January 7, 2014
 - L3I3: March 11, 2014
- Solvent Co-Injection Specifics
 - Concentration: 10% → 5% by volume
- Co-Injection Conclusion
 - L3I5, I4, I3: December 31, 2014

SCHEME PERFORMANCE

Pad L3 Solvent Co-Injection Production Performance



SCHEME PERFORMANCE

SCIP Co-Injection Summary

- 2014 Solvent Injection Period: January 1 to December 31, 2014
- Period of operation highlighted below captures first solvent (November 15, 2013 to December 31, 2014) to shut-in of co-injection
 - L3P2 and L3P6 represented control wells and produced solvent as a function of chamber coalescence

Well	Solvent Injected (m ³)	Approximate Recovery of Injected Solvent, Instantaneous (%)	Estimated Solvent Recovery (m ³)
PadL3 (L3P2-P6)	14,626.65	11.6	1700.43

SCHEME PERFORMANCE

SCIP Key Lessons Learned

- Optimal start-up time should occur within the ideal pressure-temperature envelope for the solvent system
- Understanding thief zone interactions helps mitigate risk
- High plant and field reliability has benefited pilot performance
- Integrated reservoir surveillance is a key factor in pilot monitoring and optimization:
 - Compositional data suite
 - Observation well data
 - 3D and 4D seismic
 - Production data
 - History matched reservoir models

FUTURE PLANS

Subsurface Section 8

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SUBSURFACE – FUTURE PLANS

Co-injection Strategy

- Co-injection of solvent with steam concluded on December 31, 2014 at 1200hrs
- Future solvent co-injection pilot-related activities:
 - Continue compositional sampling into Q3 2015

SURFACE

Table of Contents

1. **Facilities**
2. **Facility Performance (n/a)**
3. **Measurement and Reporting**
4. **Water Production, Injection and Uses (n/a)**
5. **Sulphur Production (n/a)**
6. **Summary of Environmental Issues (will NOT be presented today as per AER request) - (n/a)**
7. **Compliance Statement**
8. **Non-compliance Events**
9. **Future Plans**

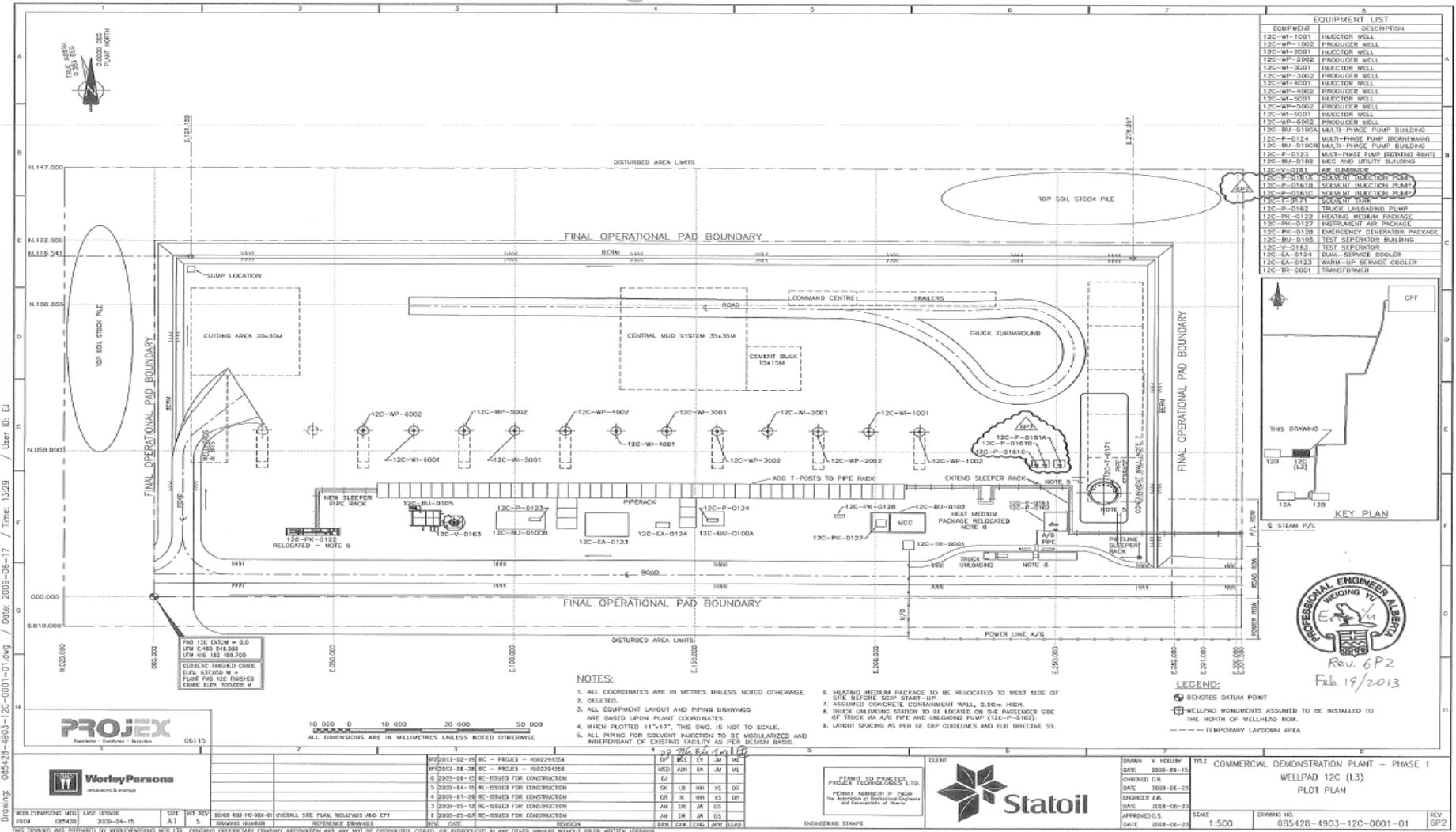
FACILITIES

Surface Section 1

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FACILITIES

Pad L3 Plot Plan – no changes in 2014



EQUIPMENT	DESCRIPTION
12C-WI-1001	WATER WELL
12C-WP-1002	PRODUCER WELL
12C-WI-2001	WATER WELL
12C-WP-2002	PRODUCER WELL
12C-WI-3001	WATER WELL
12C-WP-3002	PRODUCER WELL
12C-WI-4001	WATER WELL
12C-WP-4002	PRODUCER WELL
12C-WI-5001	WATER WELL
12C-WP-5002	PRODUCER WELL
12C-WI-6001	WATER WELL
12C-WP-6002	PRODUCER WELL
12C-BU-0100A	MULTI-PHASE PUMP BUILDING
12C-BU-0100B	MULTI-PHASE PUMP BUILDING
12C-P-0124	MULTI-PHASE PUMP (BONNEVILLE)
12C-BU-0100B	MULTI-PHASE PUMP BUILDING
12C-P-0123	MULTI-PHASE PUMP (BONNEVILLE)
12C-BU-0100B	MULTI-PHASE PUMP BUILDING
12C-P-0123	MULTI-PHASE PUMP (BONNEVILLE)
12C-BU-0100B	MULTI-PHASE PUMP BUILDING
12C-V-0101	AIR EXHAUSTER
12C-P-0118A	SOLVENT INJECTION PUMP
12C-P-0118B	SOLVENT INJECTION PUMP
12C-P-0161C	SOLVENT INJECTION PUMP
12C-T-0171	STOCK TANK
12C-P-0162	TRUCK UNLOADING PUMP
12C-PK-0122	HEATING MEDIUM PACKAGE
12C-PK-0127	HEATING MEDIUM PACKAGE
12C-PK-0128	EMERGENCY GENERATOR PACKAGE
12C-BU-0100	TEST SEPARATOR BUILDING
12C-V-0118	TEST SEPARATOR
12C-CA-0124	DUAL-SERVICE COOLER
12C-CA-0123	WARM-UP SERVICE COOLER
12C-TR-0001	TRUCK TURNDOWN

NOTES:

- ALL COORDINATES ARE IN METRES UNLESS NOTED OTHERWISE.
- DELETED.
- ALL EQUIPMENT LAYOUT AND PIPING DRAWINGS ARE BASED UPON PLANT COORDINATES.
- WHEN PLOTTED 11"x17", THIS DWG IS NOT TO SCALE.
- ALL PIPING FOR SOLVENT INJECTION TO BE VERTICALIZED AND INDEPENDENT OF EXISTING FACILITY AS PER DESIGN BASIS.
- HEATING MEDIUM PACKAGE TO BE RELOCATED TO WEST SIDE OF SITE BEFORE SCOP START-UP.
- ASSUMED CONCRETE CONTAINMENT WALL, 0.50m HIGH.
- TRUCK UNLOADING STATION TO BE LOCATED ON THE PASSENGER SIDE OF TRUCK VAN A/O PPE AND UNLOADING PUMPS (12C-P-2162).
- LAYOUT SPACING AS PER GEP GAP GUIDELINES AND ERM DIRECTIVE 55.

LEGEND:

- ⊕ DENOTES DATUM POINT
- ⊕ WELLPAD MONUMENTS ASSUMED TO BE INSTALLED TO THE NORTH OF WELLPAD BORE
- TEMPORARY LAYOUT AREA

PROJEX
Project • Estimate • Track

WorleyParsons
Services & Energy

AWB/PS/MS/MSD LAST UPDATE 2009-04-15
PS/J 08/04/10

SITE A1
WIT RW 3

3008-483-10-001-01 OVERALL SITE PLAN, WELLPADS AND CTF
CONTRACT NUMBER 3008-483-10-001-01

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NO	DATE	BY	DESCRIPTION
1	2009-04-15	AWB	ISSUED FOR CONSTRUCTION
2	2009-04-15	AWB	ISSUED FOR CONSTRUCTION
3	2009-04-15	AWB	ISSUED FOR CONSTRUCTION
4	2009-04-15	AWB	ISSUED FOR CONSTRUCTION
5	2009-04-15	AWB	ISSUED FOR CONSTRUCTION

ENGINEER: STAMPS

CLIENT: STATOIL

PROJECT: WELLPAD 12C (L3)

PERMIT NUMBER: P 7309
The Association of Professional Engineers and Geoscientists of Alberta

ENGINEER: STAMPS

DESIGNER: H. HEBBLY

DATE: 2009-03-15

CHECKED: J.A.

DATE: 2009-08-20

ENGINEER: J.A.

DATE: 2009-06-23

APPROVED: J.S.

DATE: 2009-06-23

TITLE: COMMERCIAL DEMONSTRATION PLANT – PHASE 1
WELLPAD 12C (L3)
PLOT PLAN

SCALE: 1:500

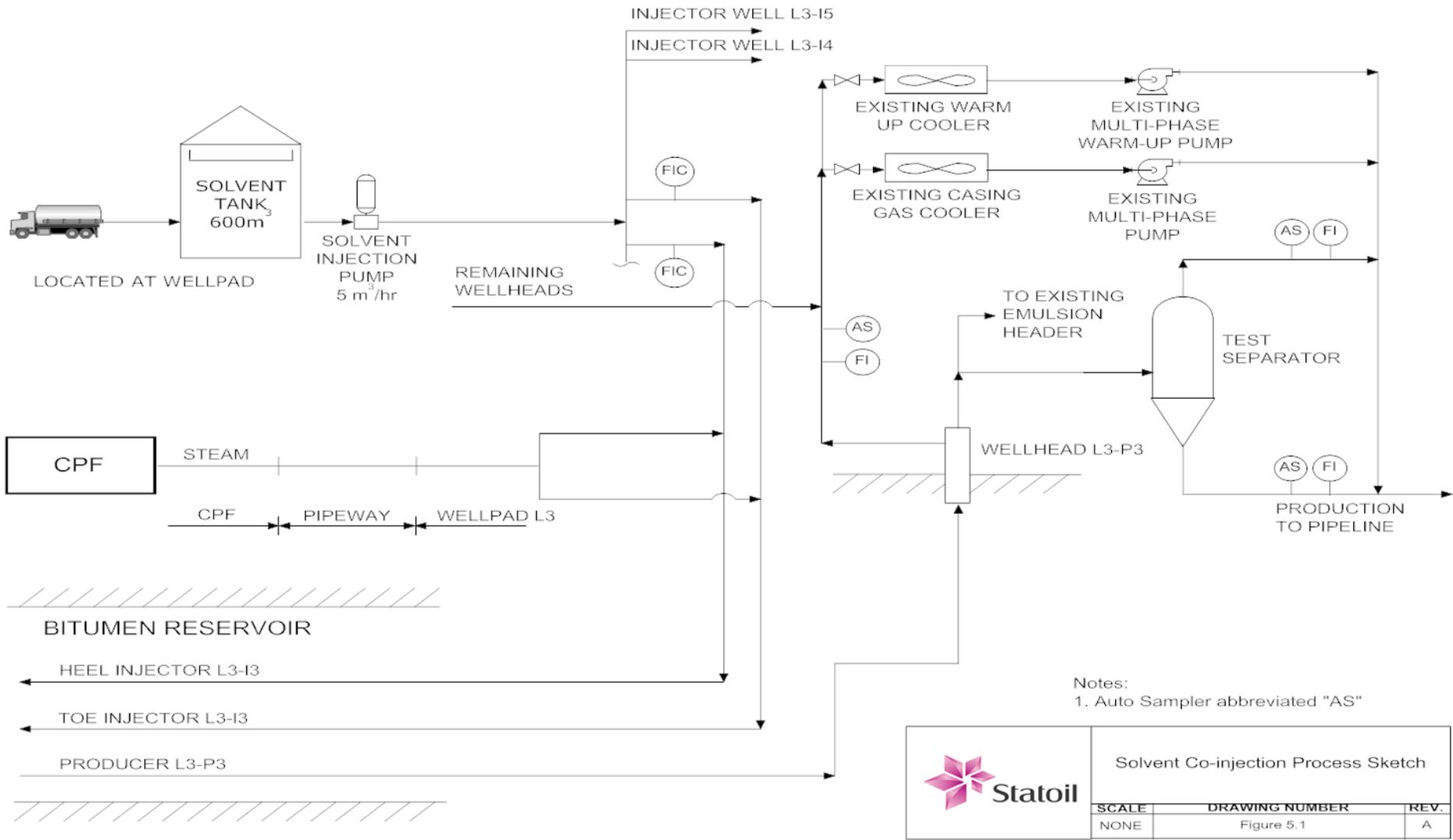
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REV: 5/2



FACILITIES

Simplified SCIP Schematic



MEASUREMENT AND REPORTING

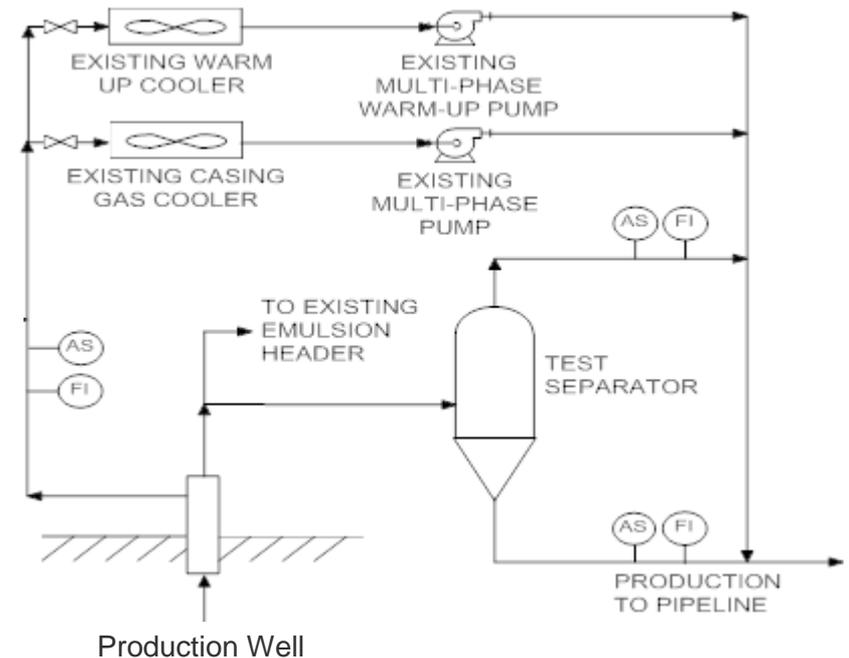
Surface Section 3

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MEASUREMENT AND REPORTING

SCIP Well Testing

- Test separator used to calculate daily bitumen and water production (since February 2014)
- Well test duration: 11 hours with 1 hour purge
- Typical frequency is 6 – 7 tests per well for a given month
- Auto-samplers used to measure and monitor solvent recovery
 - Flexibility in sampling from casing, test separator overheads, and test separator bottoms



COMPLIANCE STATEMENT

Surface Section 7

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COMPLIANCE STATEMENT

AER Compliance Statement

- Statoil believes that it is in compliance with all conditions of the AER scheme approval and regulatory requirements

NON-COMPLIANCE EVENTS

Surface Section 8

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NON-COMPLIANCE EVENTS

AER Non-Compliance Events

- None in 2014

SURFACE REVIEW - FUTURE PLANS

Surface Section 9

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SURFACE REVIEW

Future SCIP Plans

- Future solvent co-injection pilot-related activities:
 - Decommission upstream facilities, related to storage and co-injection of solvent

There's never been a better
time for **good ideas**

Presentation: SCIP 2015 Annual
Performance Presentation (D054)
to Alberta Energy Regulator

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Presenters title: VP Operations,
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