ERCB Energy Resources Conservation Board

ST57-2011

Field Surveillance and Operations Branch Provincial Summary 2010

Acknowledgements

Thank you to the following Energy Resources Conservation Board (ERCB) personnel who played a role in compiling this report. This list is in no means exhaustive, as it does not include everyone who helped "behind the scenes":

Robin King, Greg Gilbertson, Mark R. Miller, Roy Graves, Rob Kennedy, Pat Smith, Duane Harding, Wes Peterson, Jodie McClinton, Joe Gormley, Shawn Woodford, Tom Pesta, Murray Barber, Rob Barber, Paula Kersch, Paul Saulnier, John Grant, Al Duben, Anna Rose, Fiona LeBlanc, Crystal Cassidy, Maria Skog, Carla Giesbrecht, Erin Maczuga, Grant Ireland, Gary Neilson, Jenny Miller, Quinn Eastlick, Catherine Thistlewaite, James Vaughan, Colby Ruff, Dave Gryzb, Dave Samuelson, Henry Ewa, Kevan van Velzen, Hal Knox, Karen Leussink, Don Burke, Anita Lewis, Tamatha Mitchell, April Wynne-Chesniak, and ERCB Communications.

Report Coordinator: Kari Hass

Statistical caveat re: *ST57- 2011: Field Surveillance and Operations Branch Provincial Summary 2010*

Statistical or data collection is an active process whereby number changes do occur from the time numbers are generated to the time they are published.

ENERGY RESOURCES CONSERVATION BOARD
ST57-2011: Field Surveillance and Operations Branch Provincial Summary 2010

November 2011

Published by

Energy Resources Conservation Board
Suite 1000, 250 – 5 Street SW
Calgary, Alberta
T2P 0R4

Telephone: 403-297-8311
Fax: 403-297-7040
E-mail: infoservices@ercb.ca
Web site: www.ercb.ca

For inquiries regarding this report, contact the Customer Contact Centre toll free at 1-855-297-8311.

Contents

Tables

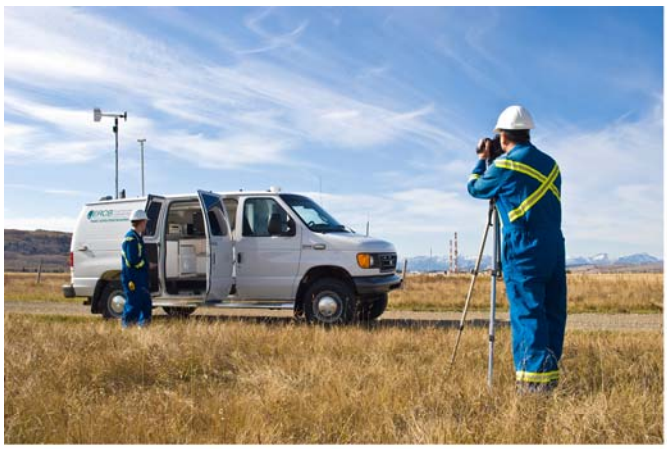
Figures

Foreword

As the new executive manager of the Field Surveillance and Operations Branch (FSOB), I am pleased to present this year's *ST 57-2011: Field Surveillance and Operations Branch Provincial Summary 2010.* This report summarizes FSOB achievements in providing regulatory oversight in technical operations and field surveillance for 2010.

The efforts of all FSOB personnel, as well as others in the Energy Resources Conservation Board (ERCB/Board) with whom we work, are greatly appreciated. The dedicated individuals in FSOB continue to play a pivotal role in the ERCB's commitment to managing energy development in Alberta in a manner that is fair, responsible, in the public interest, and above all, safe for Albertans and the environment.

Robin King
Executive Manager, Field Surveillance and Operations Branch
Energy Resources Conservation Board



Executive Summary

The ERCB is Alberta's upstream energy regulator and is committed to the following mission: to ensure that the discovery, development, and delivery of Alberta's energy resources take place in a manner that is fair, responsible, and in the public interest. In assessing the public interest, the ERCB has regard for public safety, resource conservation, environmental stewardship, and social and economic impacts.

To help fulfill this commitment, the ERCB's FSOB has assembled a team of highly trained field inspectors and technical personnel who undertake thousands of inspections and audits each year to ensure compliance.

Operating from the Calgary head office, and nine ERCB field centres throughout Alberta, FSOB personnel inspect and audit construction, operation, and abandonment activities at oil and gas facilities and pipelines. In addition, FSOB personnel respond to emergencies and public complaints on a 24-hour basis.

Stakeholder Engagement

The Community and Aboriginal Relations (CAR) Group delivered 180 presentations at 218 multistakeholder group meetings, and proactively and responsively engaged with 491 stakeholders in 2010. The CAR team also participated in 33 community/industry open houses.

CAR engaged with 99 people from Aboriginal communities in 2010, while field inspectors investigated 18 complaints, responded to 30 releases, and conducted 150 inspections on First Nations and Métis lands.

Inspections and Enforcement

The ERCB conducted 18 575 field inspections/audits in 2010, of which 263 (1.4 per cent) were high risk noncompliant. Industry brought all noncompliant events into compliance.

A total of 62 facilities and operations were suspended by the ERCB in 2010, which included 30 that related to pipelines, 12 to drilling operations, and 10 to well site inspections, and the remainder to other operations. The total duration of inactivity resulting from these suspensions was 28 357 hours.

Pipelines

The pipeline failure rate was 1.6 per 1000 km in 2010. This was lower than the 2009 rate of 1.7 per 1000 km. In 2010, 626 pipeline failures[1] occurred, a decrease from 668 in 2009.

In 2010, 1627 pipeline inspections were conducted compared with 1602 in 2009. There was a 94.3 per cent compliance rate with high risk requirements in 2010, compared with 93.3 per cent in 2009.

[1]This total does not include pipeline incidents resulting from Damage by other.

The ERCB carried out 205 pipeline operations inspections in 2010, of which 81.5 per cent were in compliance with high risk requirements.

Drilling Operations

A total of 9793 wells were drilled in 2010, an increase from the 7232 wells drilled in 2009. In 2010, 326 drilling operations inspections were conducted. There was a 94.5 per cent compliance rate with high risk requirements in 2010.

Forty-five kicks were reported in 2010. This was approximately 4.6 kicks per 1000 wells drilled, a slight increase over the average kick rate of 4.5 per 1000 wells drilled over the last five years.

In 2010, eight blowouts occurred during drilling operations, compared with four in 2009. This equated to 0.82 blowouts per 1000 wells drilled in 2010.

Well Servicing

In 2010, 236 well servicing operations were inspected, with 219 operations found to be in compliance and 17 in noncompliance. Of the 17 operations not in compliance, 13 were found to be low risk noncompliant and 4 high risk noncompliant.

Drilling Waste

Field personnel carried out 134 drilling waste disposal inspections in 2010, of which 115 were found to be in compliance with ERCB requirements. There was a 94 per cent compliance rate with high risk requirements.

Liquid Releases

In 2010, 1174 liquid releases were recorded—94 per cent of which had no impact on the public—a decrease from 1191 in 2009. Each spill was investigated to determine the cause and to identify preventive measures that may be required of the licensee to minimize the chances of a recurrence.

Sulphur Recovery

The efficiency at gas plants recovering sulphur was 98.9 per cent in 2010, compared with 99 per cent in 2009.

1 Introduction

This report covers FSOB activities in 2010, and the oil and gas industry's compliance with ERCB requirements that the FSOB administers. Key industry performance indicators are discussed in the Compliance Assurance Section of this report.

This annual report provides analysis of trends in industry activity, analysis the FSOB incorporates into its 2011/2012 Field Surveillance and Operations Branch Operational Plan. As the FSOB moves toward the ERCB vision—to be the best nonconventional regulator in the world by 2013—it will continue to report on regulatory change.

2 Stakeholder Engagement

This section presents ERCB activities aimed at educating stakeholders about ERCB procedures. As a part of outreach and interaction, activities included

- presentations,
- workshops,
- trade shows,
- operator awareness sessions,
- hearings, and
- responses to stakeholder complaints and concerns.

The purpose of stakeholder engagement is to educate industry and the public about regulations that address public safety, environmental protection, resource conservation, and enhance stakeholder confidence in the regulatory process.

The following 2010 stakeholder engagement activities were reported by CAR.

2.1 Community and Aboriginal Relations

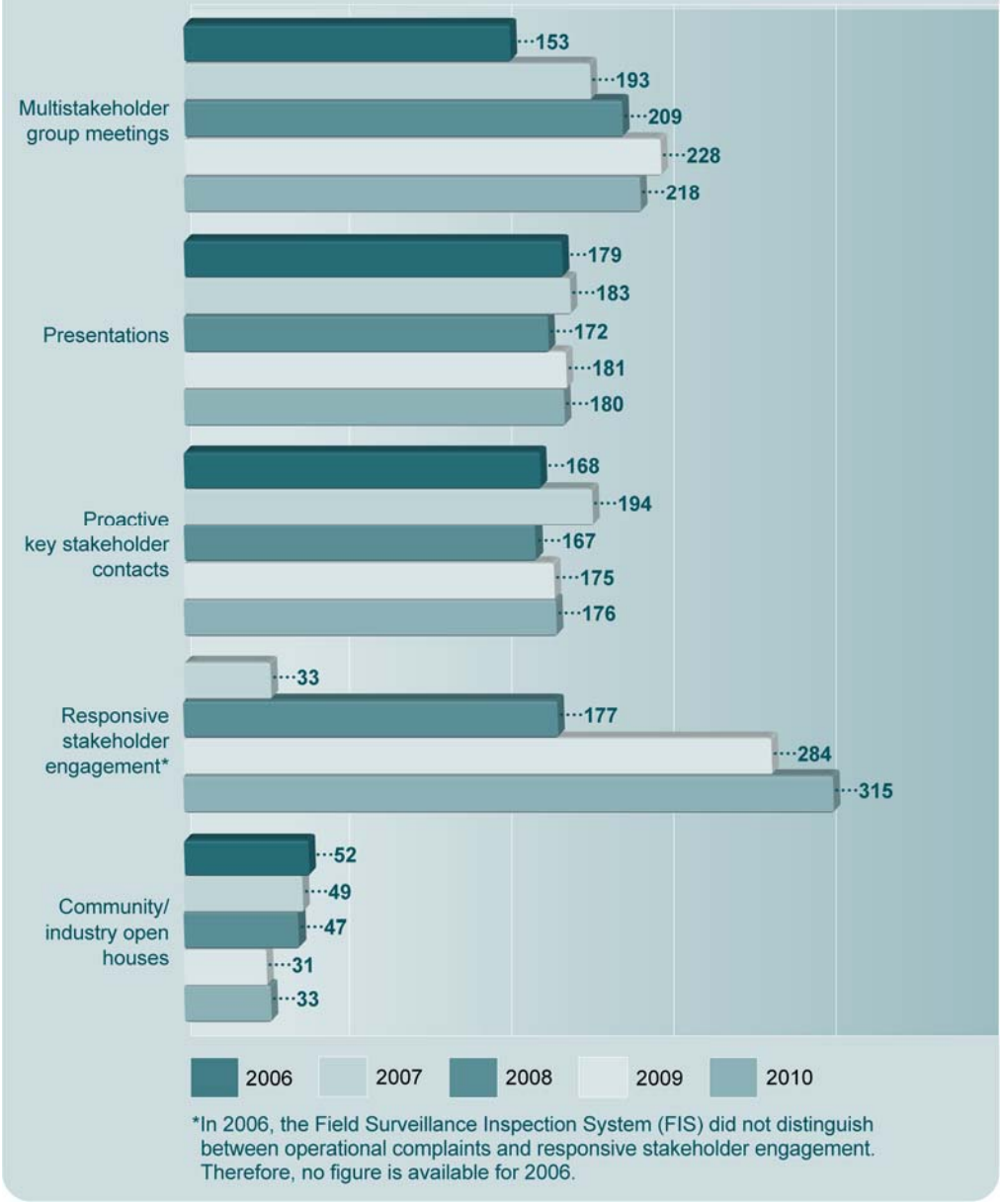
In 2010, CAR

- participated in 218 multistakeholder group meetings,[2]
- delivered 180 presentations,
- proactively engaged with 176 stakeholders,
- responsively engaged with 315 stakeholders, and
- participated in 33 community/industry open houses.

Figure 1 depicts CAR activities in 2010. This figure also depicts changes in participation rates from 2006 to 2010, showing that CAR activities have remained constant.

[2]Many multistakeholder groups are also members of Synergy Alberta. Its website is www.synergyalberta.ca.

Figure 1. Community and Aboriginal Relations activities, 2010



*In 2006, the Field Surveillance Inspection System (FIS) did not distinguish between operational complaints and responsive stakeholder engagement. Therefore, no figure is available for 2006.

Industry/Community Education and Hearing Support

Industry and community education (e.g., operator awareness sessions, community and industry open houses) promotes relationship building, provides consistent messaging, and identifies issues that require resolution.

The following were CAR activities in 2010:

- participated with field centre personnel in 20 operator awareness sessions
- participated in 25 trade shows
- participated in 8 emergency response plan exercises and visited 25 stakeholders residing within emergency planning zones (EPZs)
- supported 7 Board hearings

Aboriginal Relations

The FSOB actively works with 46 First Nation and 8 Métis communities in Alberta, as well as with Indian Oil and Gas Canada. In 2010, CAR engaged with 99 people from Aboriginal communities. FSOB inspectors investigated 18 complaints, responded to 30 releases, and conducted 150 inspections on First Nations and Métis lands in 2010.

3 Compliance Assurance

The goal of the ERCB Compliance Assurance program is to ensure compliance with regulatory requirements. *Directive 019: Compliance Assurance* is the guiding document that focuses on prevention and enforcement of compliance assurance, and it applies to all ERCB requirements.

Each compliance category is broken down into the following: a) voluntary self-disclosures (VSDs),[3] b) public complaints,[4] and c) compliance results.

3.1 Field Operations Group Compliance Categories[5]

The field centres share responsibility for conducting compliance assurance inspections in eight compliance categories:

- Oil Facilities
- Gas Facilities
- Pipelines
- Drilling Operations
- Well Servicing
- Well Site Inspections
- Drilling Waste
- Waste Facilities

1) Oil Facilities

The inventory of licensed oil facilities has continued to increase from previous years. The 2009 inventory was 23 896. Table 1 shows the 2010 inventory:

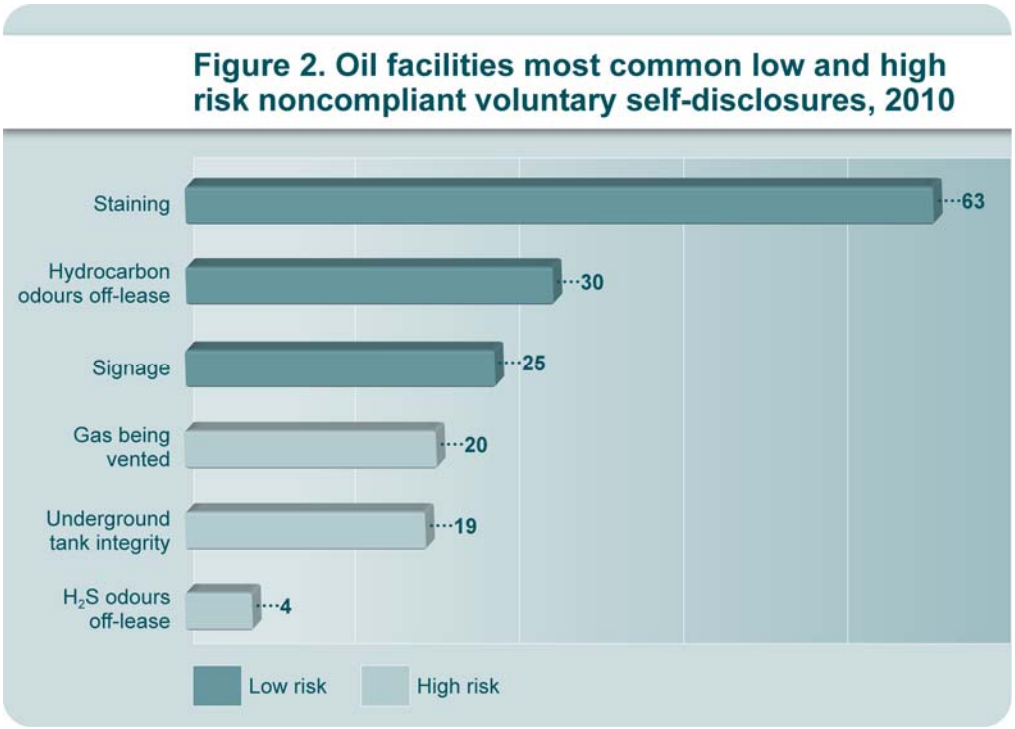
Table 1. Licensed oil facilities, 2010

Licensed oil facilities	Number
Sweet multiwell batteries	3 318
Sour multiwell batteries	1 174
Sweet single-well batteries	12 371
Sour single-well batteries	1 837
Sweet satellites	2 411
Sour satellites	2 644
Sweet injection/disposal facilities	825
Sour injection/disposal facilities	87
Sweet custom treating facilities	30
Sour custom treating facilities	3
Total	24 700

[3]Voluntary self-disclosure is defined in the glossary. A revised VSD process was introduced to industry in December 2009 and therefore, results cannot be trended prior to 2010.
[4]A complaint may include one or more concerns within any compliance category.
[5]Compliance category is defined in the glossary.

a) Voluntary Self-Disclosures

The Oil Facilities compliance category received 267 VSDs in 2010. There were 215 low risk noncompliant VSDs and 52 high risk noncompliant VSDs. The most common low risk noncompliant and high risk noncompliant VSDs are indicated in Figure 2.



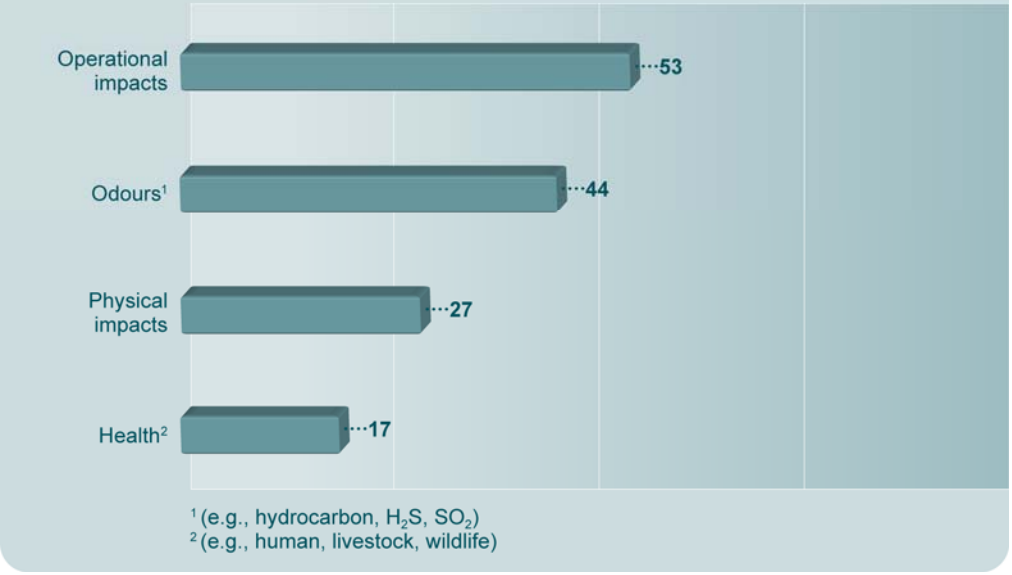
b) Public Complaints

In 2010, 121 oil facilities complaints were received by the ERCB, from which 141 concerns were identified—53 operational impacts, 44 odours, 27 physical impacts,[6] and 17 health concerns[7] (see Figure 3).

[6]Operational impacts and physical impacts are defined in the glossary.

[7]Health concerns fall under the jurisdiction of the Government of Alberta and are not a part of the ERCB mandate. These concerns were acknowledged or redirected, or the complainant was advised to contact the appropriate health authority.

Figure 3. Concerns related to oil facilities, 2010



The most common concerns related to oil facilities were

- noise from operating equipment (e.g., compressors, pump jack engines),
- lease management related to truck traffic,
- black smoke from the flare stack, and
- odours from flaring and venting operations.

Over the five-year trending period, the number of concerns fell from 181 in 2006 to 141 in 2010.

c) Compliance Results

The total numbers of oil facilities inspections from 2006 to 2010 are in Table 2.

Table 2. Oil facilities total inspections conducted, 2006-2010

2006	2007	2008	2009	2010
3623	3818	3786	4698	3354

In 2010, 3354 oil facilities were inspected; of these, 2596 facilities (77 per cent) were in compliance. Of the 758 facilities (23 per cent) not in compliance, 729 facilities (22 per cent) were low risk noncompliant and 29 facilities (1 per cent) were high risk noncompliant[8]. There was a 99.1 per cent compliance rate with high risk requirements, compared with 98.5 per cent in 2009.

[8] Low risk noncompliant and high risk noncompliant are defined in the glossary.

The most common reasons for low risk noncompliance were housekeeping, gas measurement, and storage issues related to *Directive 055: Storage Requirements*. The most common reasons for high risk noncompliance were an inadequate 24-hour emergency number on the lease sign (the number did not initiate an immediate response from the licensee[9] or the number was not posted appropriately) and storage.

FSOB directed three oil facilities to suspend operations in 2010, for a total shutdown duration of 2173 hours, compared with 360 hours in 2009. Lack of adherence to *Directive 055* was the most common reason for a facility[10] to be suspended in 2010. The following were the specific reasons for the three suspensions:

- Two single-walled 400 barrel[11] production tanks were not equipped with a tank dike.
- At the time of inspection, the extent of pooled hydrocarbons and cumulative stainage constituted a spill, and cleaning operations required suspension.
- Underground storage tanks were not tested at the required three-year frequency, and "tags" reflected a last integrity-tested date of 2004.

None of the enforcement actions resulted in an enforcement appeal.

2) Gas Facilities

The inventory of licensed gas facilities has continued to increase from previous years. The 2009 inventory was 20 563. Table 3 shows the 2010 inventory:

Table 3. Licensed gas facilities, 2010

Licensed gas facilities	Number
Sweet gas single battery	7 498
Sour gas single battery	2 743
Sweet gas proration effluent battery	4 649
Sour gas proration effluent battery	832
Sweet gas test battery	4
Sweet gas plant	528
Sour gas plant acid gas flaring/injection	198
Sour gas plant, fractionation	3
Sweet gas plant, fractionation	5
Gas plant, sulphur recovery	43
Sweet gas plant, straddle	8
Sour gas plant, straddle	1
Sweet compressor stations	3 517
Sour compressor stations	813
Total	20 842

[9] Licensee is defined in the glossary.
[10] Facility is defined in the glossary.
[11] Note: 400 barrel = 64 m^3.

a) Voluntary Self-Disclosures

The Gas Facilities compliance category received 123 VSDs in 2010. There were 94 low risk noncompliant VSDs and 29 high risk noncompliant VSDs. The most common low risk noncompliant and high risk noncompliant VSDs are indicated in Figure 4.

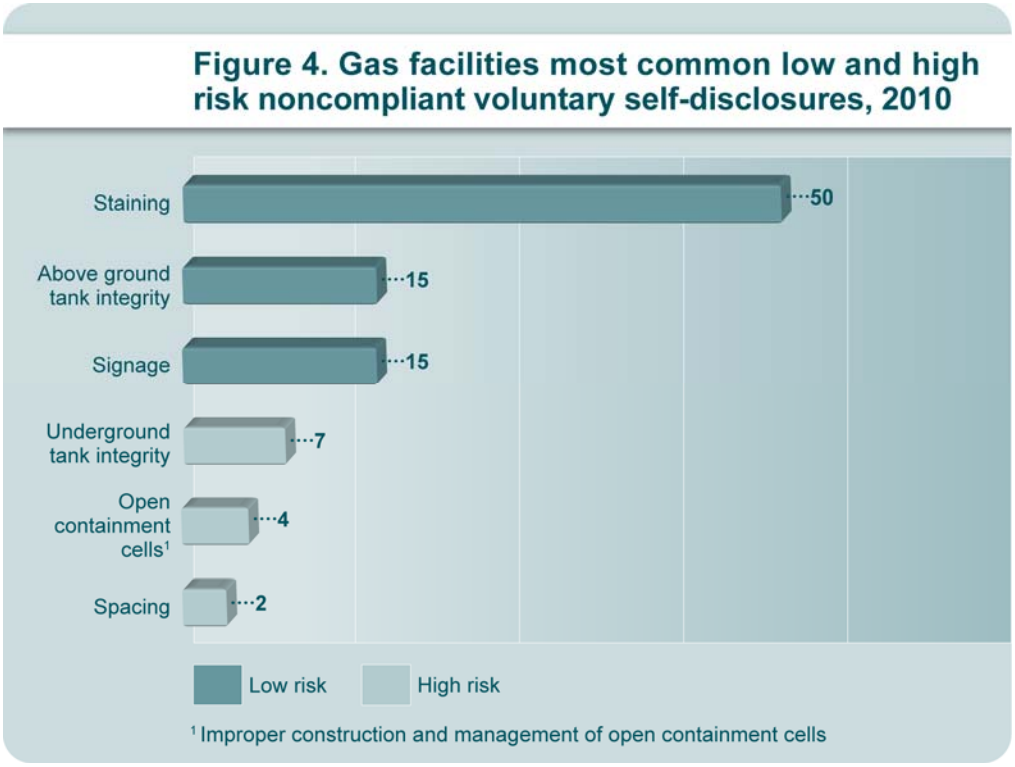
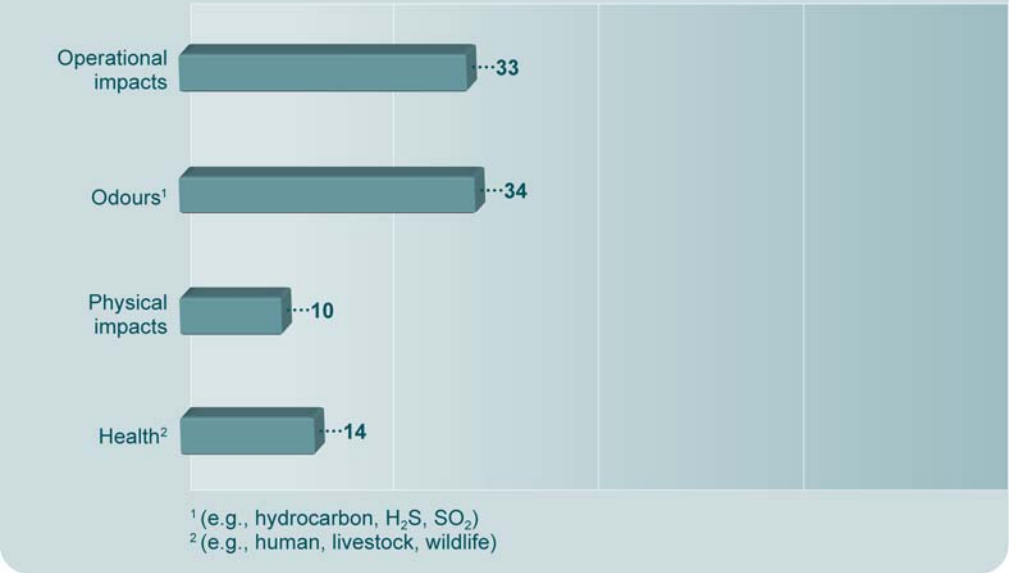


Figure 4. Gas facilities most common low and high risk noncompliant voluntary self-disclosures, 2010

b) Public Complaints

In 2010, 76 gas facilities complaints were received by the ERCB, from which 91 concerns were identified—33 operational impacts, 34 odours, 10 physical impacts, and 14 health concerns (see Figure 5).

Figure 5. Concerns related to gas facilities, 2010



The most common concerns related to gas facilities were

- noise from operating equipment (e.g., compressors),
- potential human and animal health concerns from routine and emergency flaring, and
- odours from flaring and equipment venting operations.

Over the five-year trending period, the number of gas facilities-related concerns fell significantly from 230 in 2006 to 91 in 2010.

c) Compliance Results

The total numbers of gas facilities inspections from 2006 to 2010 are in Table 4.

Table 4. Gas facilities total inspections conducted, 2006-2010

2006	2007	2008	2009	2010
2612	2990	2005	3720	2325

In 2010, 2325 gas facilities were inspected; of these, 1818 facilities (78 per cent) were in compliance. Of the 507 facilities (22 per cent) not in compliance, 484 facilities (21 per cent) were low risk noncompliant and 23 facilities (1 per cent) were high risk noncompliant. There was a 99 per cent compliance rate with high risk requirements, compared with 98.5 per cent in 2009.

The most common reasons for low risk noncompliance were housekeeping and gas measurement. The most common reasons for high risk noncompliance were related to storage and spacing.

FSOB directed three gas facilities to suspend operations in 2010, for a total shutdown duration of 2108 hours, compared with 271 hours in 2009.

Below were the specific reasons for each of the suspended facilities:

- A permanent compressor was located less than 25 metres (m) from a well.
- Flame-type equipment without a workable flame arrestor was less than 25 m from a process vessel.
- An underground storage tank had not been integrity tested since September 2006.

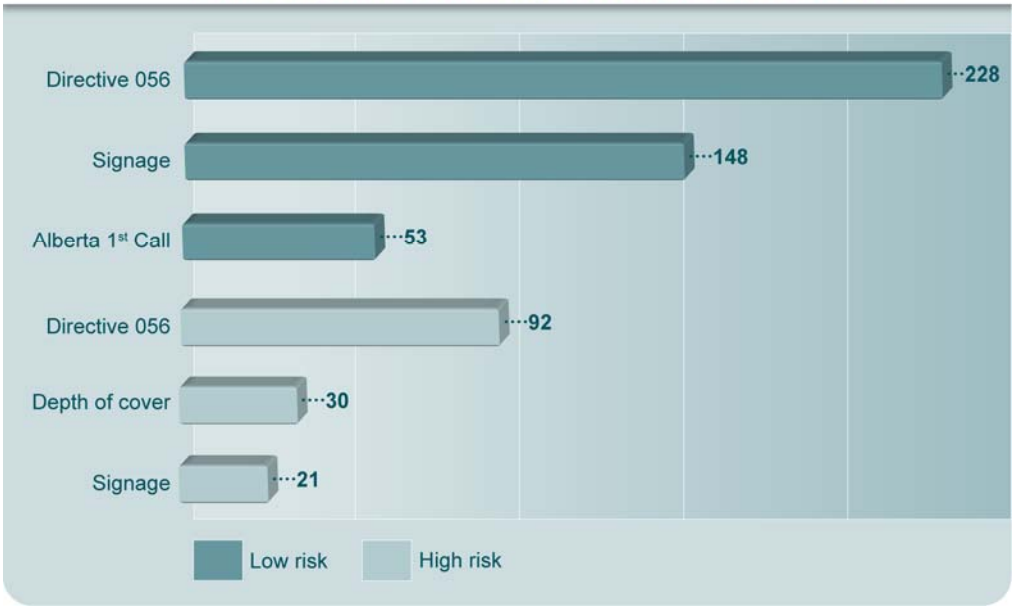
None of the enforcement actions resulted in an enforcement appeal.

3) Pipelines

a) Voluntary Self-Disclosures

The Pipelines compliance category received 651 VSDs in 2010. There were 491 low risk noncompliant VSDs and 160 high risk noncompliant VSDs. The most common low risk noncompliant and high risk noncompliant VSDs are indicated in Figure 6.

Figure 6. Pipeline most common low and high risk noncompliant voluntary self-disclosures, 2010



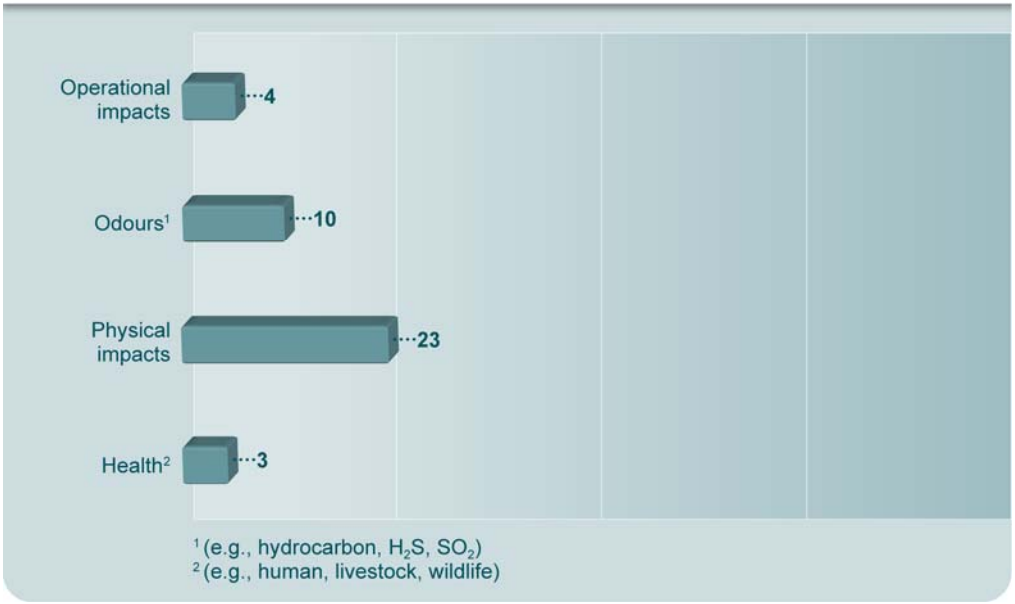
Examples of low and high risk noncompliance with respect to *Directive 056: Energy Development Applications and Schedule* include a change in pipeline status that has not been reported to the ERCB, and a pipeline carrying sour product that is not licensed for sour service.

Examples of low and high risk noncompliance with respect to signage include current licensee information that is not reflected on lease signage, and a 24-hour emergency number not appearing on lease signage.

b) Public Complaints

In 2010, 35 pipeline operations complaints were received by the ERCB, from which 40 concerns were identified—4 operational impacts, 10 odours, 23 physical impacts, and 3 health concerns (see Figure 7).

Figure 7. Concerns related to pipelines, 2010



The most common concerns related to pipeline operations were

- right-of-way maintenance,
- odour emissions from pipeline terminals,
- pigging operations, and
- pipeline failures.

c) Compliance Results

The total numbers of pipeline inspections from 2006 to 2010 are in Table 5.

Table 5. Total pipeline inspections conducted, 2006-2010

	2006	2007	2008	2009	2010
Pipeline Inspections	1562	1647	1611	1602	1627

In 2010, 1627 pipeline inspections were conducted compared with 1602 in 2009. There was a 94.3 per cent compliance rate with high risk requirements for pipeline inspections in 2010 (See Table 6), compared with 93.3 per cent in 2009.

Table 6. Pipeline compliance results, 2010

Type of inspections	Total number of inspections	Satisfactory compliance	Low risk noncompliance	High risk enforcement action	Compliance with high risk requirements (per cent [%])
Operations inspections	205	123	44	38	81.5% of inspections found compliant
Construction inspections	459	429	26	4	99%
Test inspections	54	51	2	1	98%
Failure/hit Inspections	311	286	10	15	95%
Failure/hit investigations	376	322	22	32	91%
Other inspections	222	187	32	3	99%
Total	1627	1398	136	93	94.3%

In 2010, there was one enforcement appeal which was denied. Table 7 shows the total number of pipeline enforcement appeals from 2006 to 2010.

Table 7. Total number of pipeline enforcement appeals, 2006-2010

2006	2007	2008	2009	2010
2	5	2	2	1

FSOB directed 30 pipeline operations to suspend activities in 2010. The total shutdown duration was 22 080 hours, compared with 708 hours in 2009. The increase in shutdown hours was due largely to one company being suspended for approximately eight months. Of the remaining 29 suspended pipeline operations, the suspension duration ranged from approximately 12 to 240 hours per suspension.

The most common reasons for pipeline suspensions were

- ground disturbance requirements were not followed and contact damage occurred, and
- corrosion integrity work was required following a failure to prove or establish integrity before resuming pipeline operations.

Pipeline Incidents[12]

The numbers of pipeline releases/hits in 2010 according to their priority rating are shown in Table 8. Of the 687 recorded pipeline failures, 626 were leaks/hits, 18 were ruptures, and 43 were hits with no release.

[12]Pipeline incident; release; priority rating 1, 2, 3; rupture; leak; and hit are defined in the glossary.

Table 8. Priority ratings for pipeline releases/hits, 2010

Release type	Priority rating	Number
Rupture	Priority 1	2
Rupture	Priority 2	1
Rupture	Priority 3	15
Leaks	Priority 1	30
Leaks	Priority 2	94
Leaks	Priority 3	484
Hit	Priority 1	1
Hit	Priority 2	8
Hit	Priority 3	9
Hit	No release	43
	Total	687

The reported causes of pipeline incidents in 2010 are shown in Table 9.

Table 9. Reported causes of pipeline incidents, 2010[1]

Incident causes reported—2010	Incident #[2]	Incident %	Leaks #	Inspections/ investigations #	Ruptures #	Inspections/ investigations #
Construction damage	61	9	59	59	2	2
Damage by other (hits with release)	18	2.6	9	9	9	9
Damage by other (hits no release)	43	6.2	0	43	0	0
Earth movement	10	1.5	9	9	1	1
Installation failure	5	0.7	5	5	0	0
Mechanical joint failure	24	3.5	24	24	0	0
Mechanical pipe damage	5	0.7	5	5	0	0
Miscellaneous	11	1.6	10	10	1	1
Miscellaneous joint	14	2	14	14	0	0
Operator error	14	2	13	13	1	1
Over pressure	13	2	13	13	0	0
Pipe body failure	25	3.6	24	24	1	1
Seam failure	9	1.3	8	8	1	1
Unknown	4	0.6	4	4	0	0
Valve or fitting failure	22	3.2	22	22	0	0
External corrosion	77	11.2	76	76	1	1
Internal corrosion	325	47.3	324	324	1	1
Girth weld	7	1	7	7	0	0
Total	687	100	626	669	18	18
% of incidents		100	91.1		2.6	

[1]Pipeline incident statistics include 106 pressure test failures, all the result of controlled test failures and not operating failures.
[2]For reporting purposes, pipeline hits are included in pipeline incident numbers.

The number of incidents reported for 2010 (687) decreased from 2009 (734). The three primary causes of pipeline failures reported in 2010 were internal corrosion, external corrosion, and construction damage. Pipeline materials fail for different reasons—steel pipeline typically fails due to corrosion, whereas composite pipeline typically fails due to construction-related causes or joint problems.

In 2010, the spill volumes of produced water and liquid hydrocarbon were 24 574 cubic metres (m^3) and 3417 m^3, respectively (see Figure 8).

Figure 8. Reported volumes of produced water and liquid hydrocarbon spills (1000s of m^3), 2006-2010

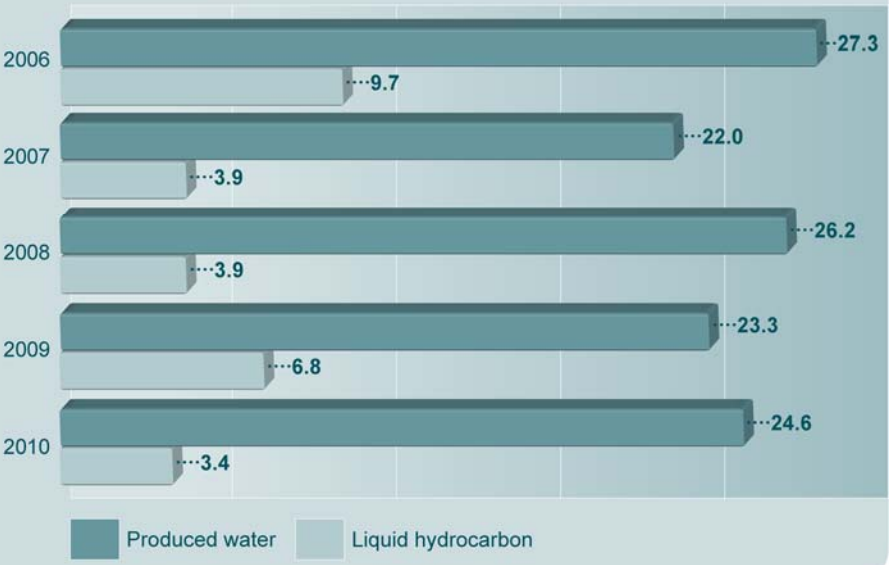
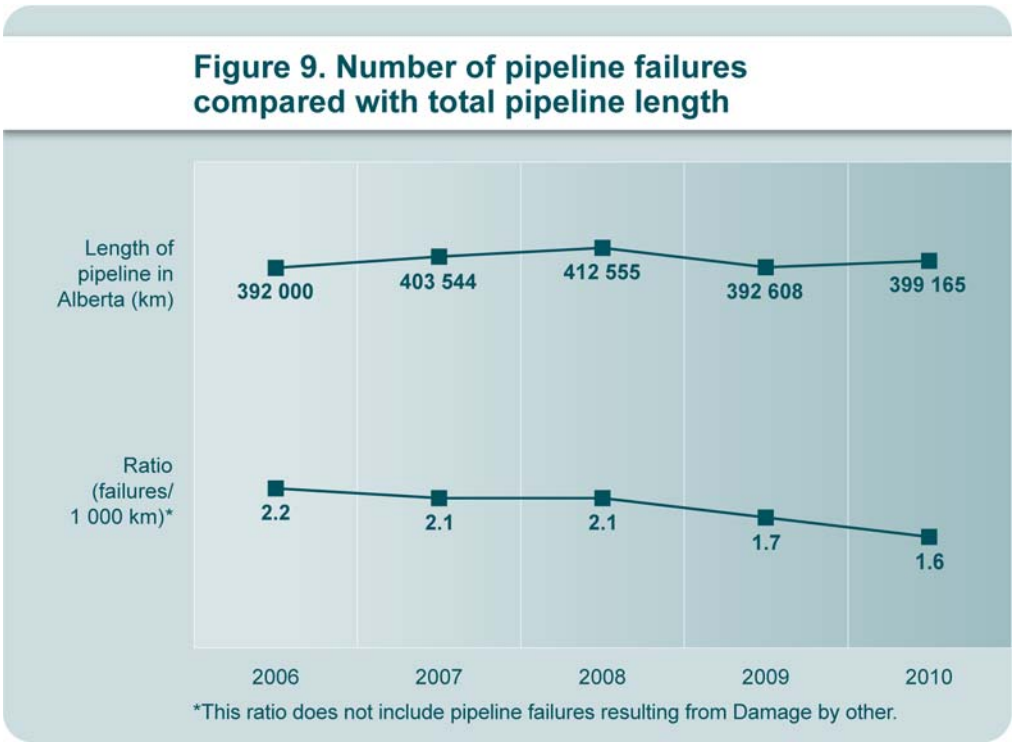


Figure 9 shows the number of pipeline failures compared with the total pipeline length. Pipeline length increased from 392 608 kilometres (km) in 2009 to 399 165 km in 2010.[13] The pipeline failure rate decreased from 1.7 per 1000 km in 2009 to 1.6 per 1000 km in 2010. The mean average pipeline failure rate since 2006 was 1.9 per 1000 km.

[13]In 2009, the number of pipelines under ERCB jurisdiction was reduced due to pipelines being transferred to the National Energy Board's jurisdiction.



Overall, corrosion is the leading cause of pipeline failures due to the number of carbon steel gathering lines still in existence. Construction-related failures and contact damage are the next highest contributors to pipeline failures. These causes have also remained constant over the five-year period 2006 to 2010.

The leading pipeline failures by product are shown in Table 10.

Table 10. Number of pipeline failures by product type

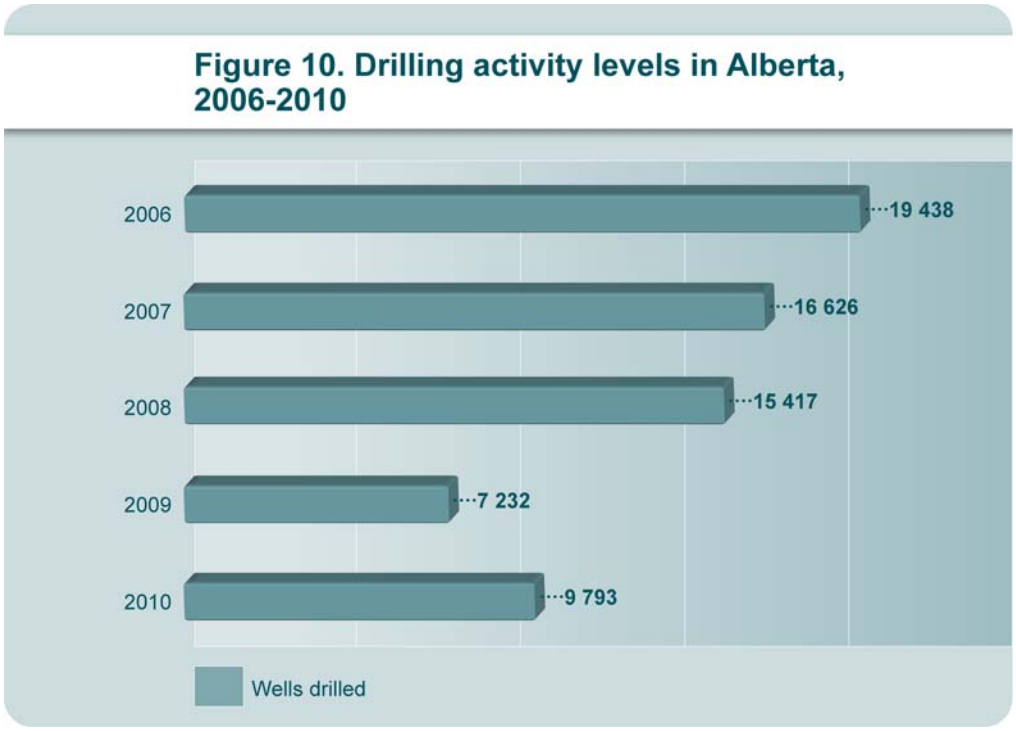
Product Type	2006	2007	2008	2009	2010
Multi-phase	337	350	338	272	241
Water	170	162	202	137	148
Natural gas <10 mol/km hydrogen sulphide[1] gas (H_2S)	317	308	276	211	179
Crude	28	27	15	19	20
Sour natural gas >10 mol/km	33	25	25	21	27
All other	10	8	9	8	11
Total[2]	895	880	865	668	626[3]

[1]Hydrogen sulphide is defined in the glossary.
[2]This total does not include pipeline incidents resulting from Damage by other.
[3]This total does not include the 61 pipeline incidents that resulted from Damage by other. See Table 9, Reported causes of pipeline incidents, 2010.

4) Drilling Operations

Drilling Activity

There were a total of 9793 wells drilled in 2010, compared with 7232 in 2009 (see Figure 10).

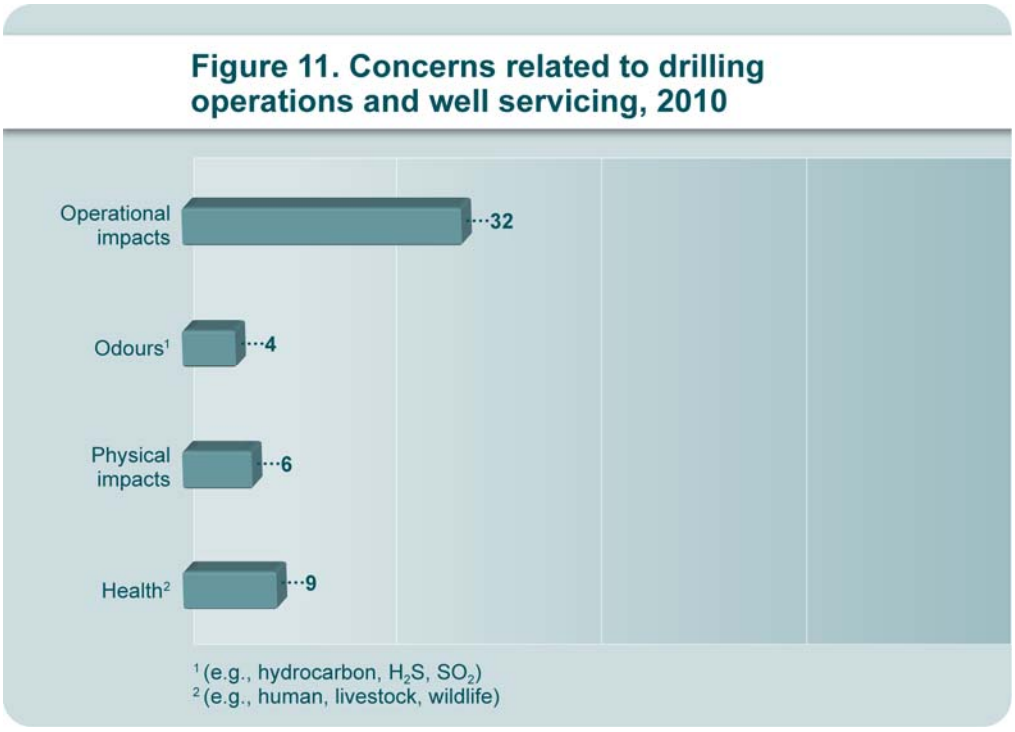


a) Voluntary Self-Disclosures

The Drilling Operations compliance category received no VSDs in 2010.

b) Public Complaints

In 2010, 37 drilling and servicing operations complaints were received, from which 51 concerns were identified—32 operational impacts, 4 odours, 6 physical impacts, and 9 health concerns (see Figure 11).



The most common concerns related to drilling and servicing were

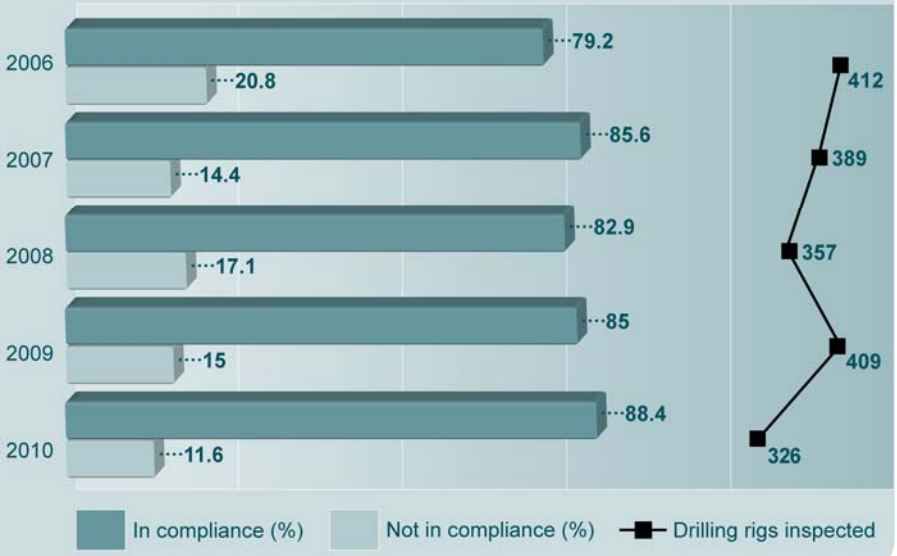
- no notification to adjacent residents regarding rig moves,
- noise from operating equipment, and
- potential human and animal health concerns from well test flaring.

c) Compliance Results

Over the last five years, compliance results have remained relatively constant despite variance in the total number of inspections.

Figure 12 shows the total number of drilling operations inspections and results from 2006 to 2010.

Figure 12. Drilling operations inspections and results, 2006-2010

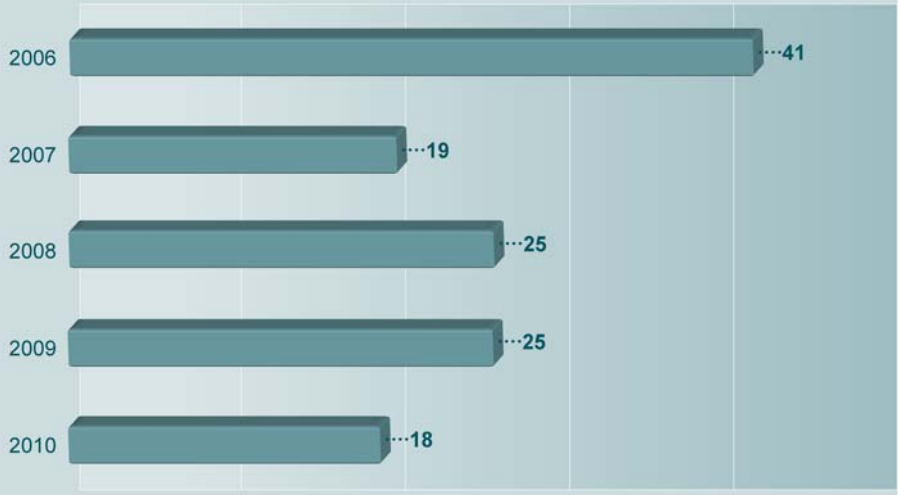


In 2010, inspectors conducted 326 inspections on well drilling operations. Of this total, 288 operations (88.4 per cent) were in compliance and 38 (11.6 per cent) were noncompliant—of which 20 (52.6 per cent) were low risk noncompliant and 18 (47.4 per cent) were high risk noncompliant (see Figure 13). The compliance rate with high risk requirements was 94.5 per cent, compared with 93 per cent in 2009.

In 2010, 10 critical sour well drilling operations inspections were conducted. Of these inspections, eight were in compliance, with two in low risk noncompliance.

None of the enforcement actions resulted in an enforcement appeal.

Figure 13. Drilling operations high risk noncompliance, 2006-2010



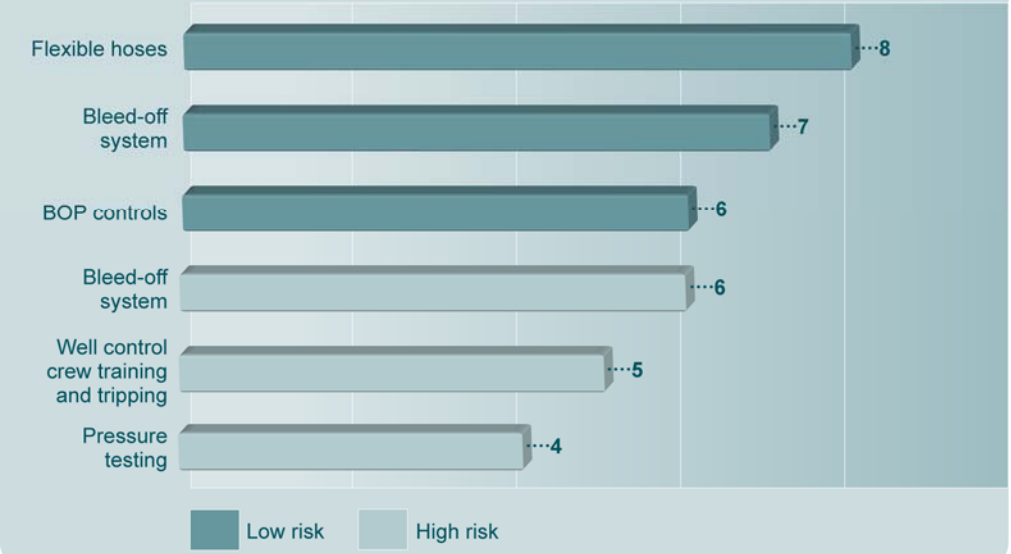
FSOB directed 12 drilling operations to suspend activities in 2010, for a total shutdown duration of 69 hours. This compares with 2009, when 28 drilling operations were suspended for a total shutdown duration of 145 hours.

The most common reasons drilling operations were suspended were

- noncompliance issues related to bleed-off systems,
- well control crew training and tripping, and
- pressure testing.

Figure 14 indicates the most common low risk and high risk noncompliance in drilling operations in 2010.

Figure 14. Drilling operations most common low and high risk noncompliance, 2010

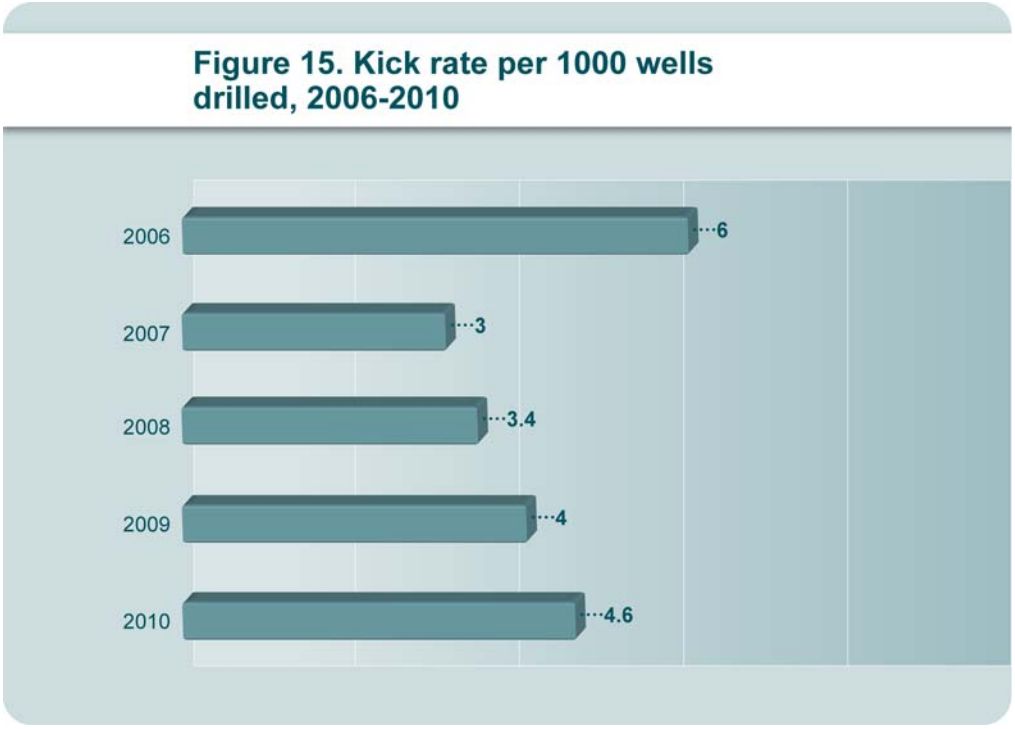


Examples of low and high risk noncompliant events with respect to bleed-off systems include when a hydraulic-controlled relief valve is in the open position, and when a hydraulic-controlled relief valve is not installed.

Well Control Occurrences:[14]

Drilling Kicks

There were 45 reported kicks in 2010 during the drilling of 9793 wells. This equates to a kick occurrence rate of approximately 4.6 kicks per 1000 wells drilled (see Figure 15). This rate represents a slight increase over the five-year average kick rate of 4.5 kicks per 1000 wells drilled.

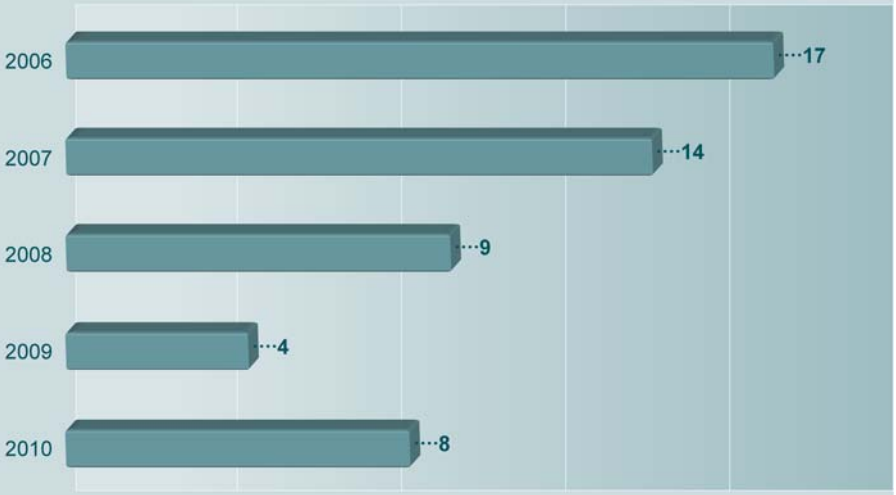


Blowouts

There were eight blowouts[15] during drilling operations in 2010, compared with four blowouts in 2009 (see Figure 16). This equates to 0.82 blowouts per 1000 wells drilled. Over the last five years, the number of blowouts has averaged less than one blowout per 1000 wells drilled, a figure that has remained relatively unchanged over this period. The causes of these blowouts were inadequate well design and insufficient mud density.

[14]Kick and blowout are defined in the glossary.
[15]A well incident is not considered a blowout if the flow of fluids (e.g., oil, gas, water, or other substance) into the wellbore can be circulated out or bled off through the existing wellhead and/or blowout prevention equipment.

Figure 16. Drilling blowout occurrences, 2006-2010



More than 92 per cent of drilling well blowouts in the last five years occurred while drilling surface hole, all resulting in freshwater flows. Seven of the eight blowouts in 2010 occurred while drilling surface hole, all resulting in freshwater flows. Investigation showed that the seven freshwater flows were of short duration and had no significant impact on the public or the environment.

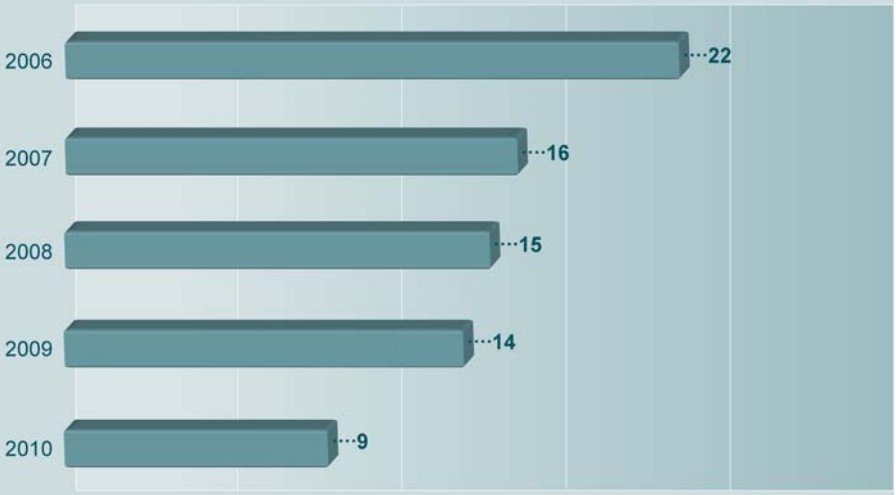
The remaining blowout occurred after a kick while an exploratory well was being drilled into the exploration target, with no resulting freshwater flow. Air was monitored throughout the duration of the blowout. No recorded exceedance of the Alberta ambient air quality guidelines was noted, and no member of the public was put at risk. The well took approximately 16 days to bring under control. High training standards for rig personnel have helped to keep the number of well control occurrences to a minimum during drilling operations.

Other Blowouts

The average number of other blowouts[16] resulting from "other operations" (i.e., a well that is producing, standing, suspended, or abandoned) over the last five years was 15 per year (see Figure 17).

[16]Other blowouts can be caused by casing failures, wellhead equipment failures, operator error, third-party damage (e.g., wellhead strikes, vandalism), or inadequate well design. Casing failure is defined in the glossary.

Figure 17. Other blowout occurrences, 2006-2010



In 2010, 9 other blowouts were recorded in the "other operations" category, compared with 14 in 2009. This significant decrease was partly due to the removal of casing failures (heavy oil area of Alberta) from "other operations" in 2010.

Of the nine blowouts under "other operations",

- three can be attributed to third-party damage by some type of vehicle (e.g., personal, service, construction, farm) striking the wellhead; and
- six were caused by equipment failure (e.g., casing corrosion, leaking wellhead equipment).

Seven of the nine blowouts under "other operations" were sweet gas releases and two were sour gas. One sour gas release contained less than 0.1 per cent H_2S (heavy oil well), and one contained 1 per cent H_2S (suspended sour gas well).

Most of these blowouts were of short duration.

5) Well Servicing

a) Voluntary Self-Disclosures

The Well Servicing compliance category received no VSDs in 2010.

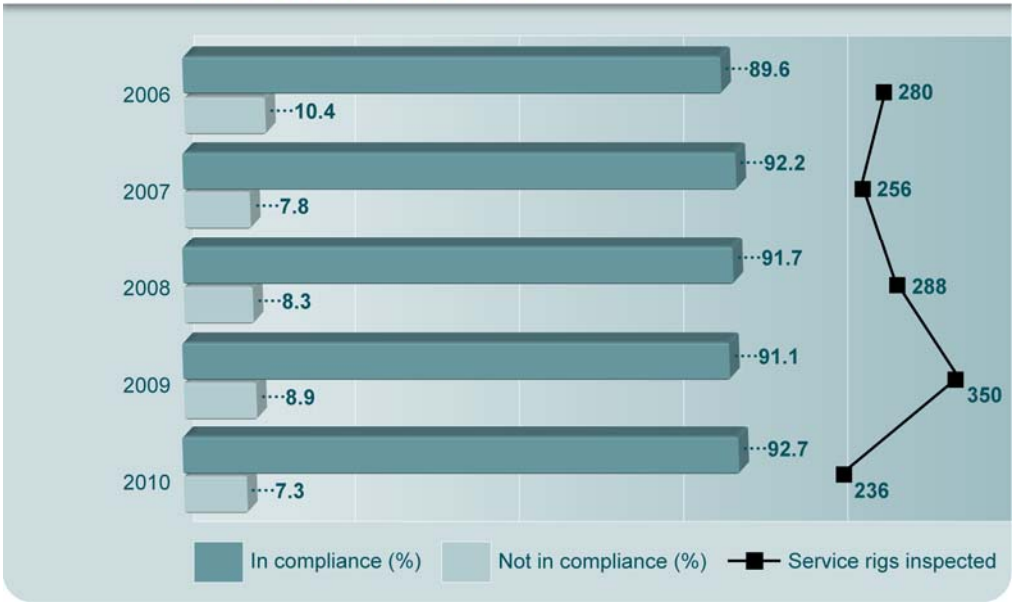
b) Public Complaints

Public complaints for the Well Servicing compliance category are recorded in the Drilling Operations compliance category (see Number 4—Drilling Operations—above).

c) Compliance Results

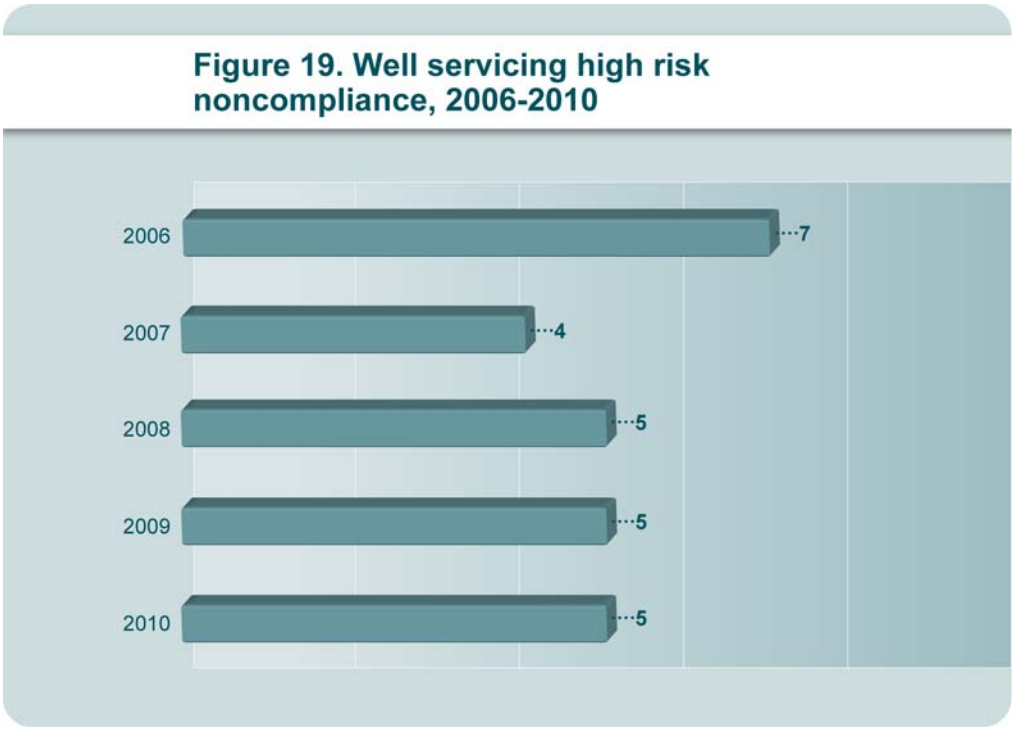
Figure 18 shows the total numbers of well servicing inspections and results from 2006 to 2010.

Figure 18. Well servicing inspections and results, 2006-2010



Well servicing operations increased in activity in 2010 compared to 2009. This was due in large part to an increase in the number of wells drilled in the province.

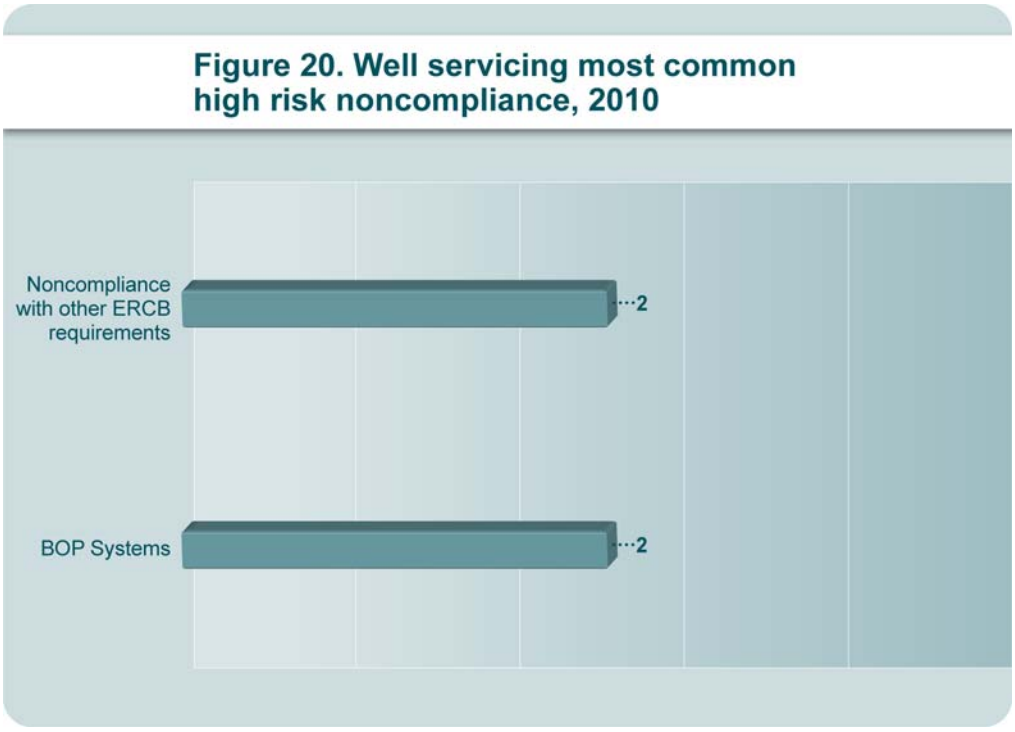
In 2010, inspectors inspected 236 well servicing operations and found 219 (92.7 per cent) operations in compliance and 17 (7.3 per cent) in noncompliance. Of the 17 operations (76.5 per cent) not in compliance, 13 (76.4 per cent) were found to be low risk noncompliant and 4 (23.6 per cent) high risk noncompliant. The compliance rate with high risk requirements was 98.3 per cent, compared with 99 per cent in 2009. None of the enforcement actions resulted in an enforcement appeal (see Figure 19).



FSOB directed four well servicing operations to suspend activities in 2010, for a total shutdown duration of 28 hours. This compares with 2009, when shutdown duration was 27 hours.

The most common reasons well servicing operations were suspended in 2010 were for noncompliance with "other ERCB requirements"[17] and for noncompliant blowout preventer (BOP)[18] systems. These reasons were similar to years 2006 to 2009 (see Figure 20).

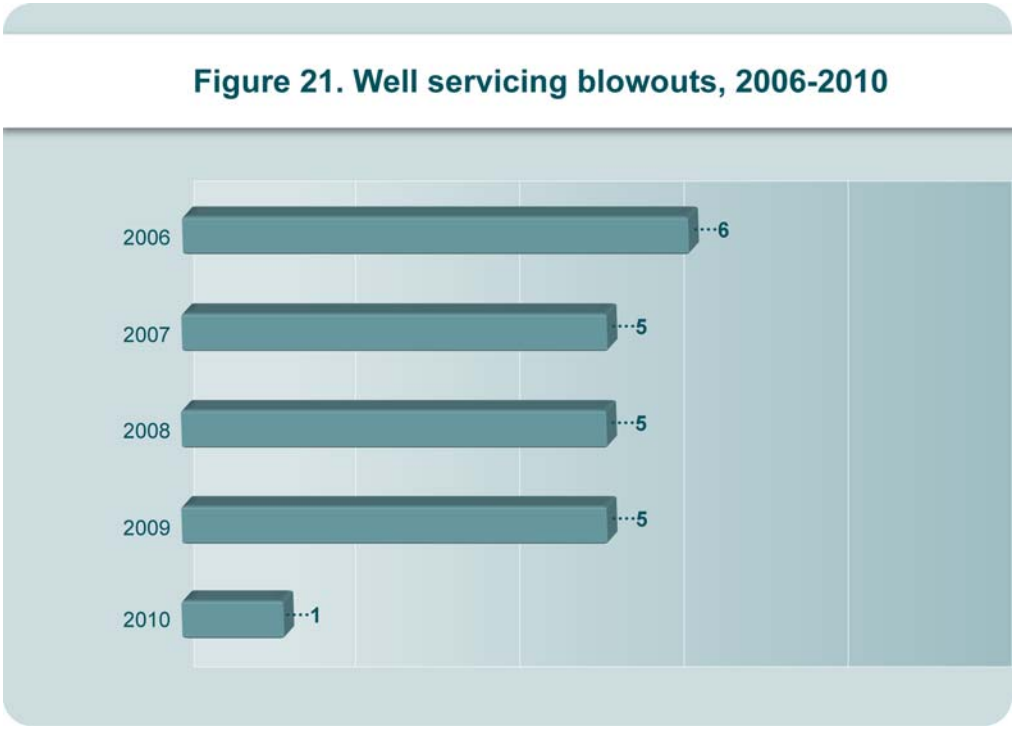
[17]Compliance with "other ERCB requirements" includes any new requirement that is not reflected in *Directive 064: Requirements and Procedures for Facilities*.
[18]Blowout preventer is defined in the glossary.



Well Control Occurrences:

Blowouts

Figure 21 shows the total number of well servicing blowouts from 2006 to 2010.



In 2010, well servicing operations recorded one minor sweet gas well blowout. This blowout was attributed to operator error and was of short duration (0.75/day). This compares to 2009, when well servicing operations recorded five blowouts. Over the last five years, industry has averaged approximately five blowouts per year during well servicing operations.

6) Well Site Inspections

The inventory of licensed wells has continued to increase from previous years. The 2009 inventory was 393 359. Table 11 shows the 2010 inventory:

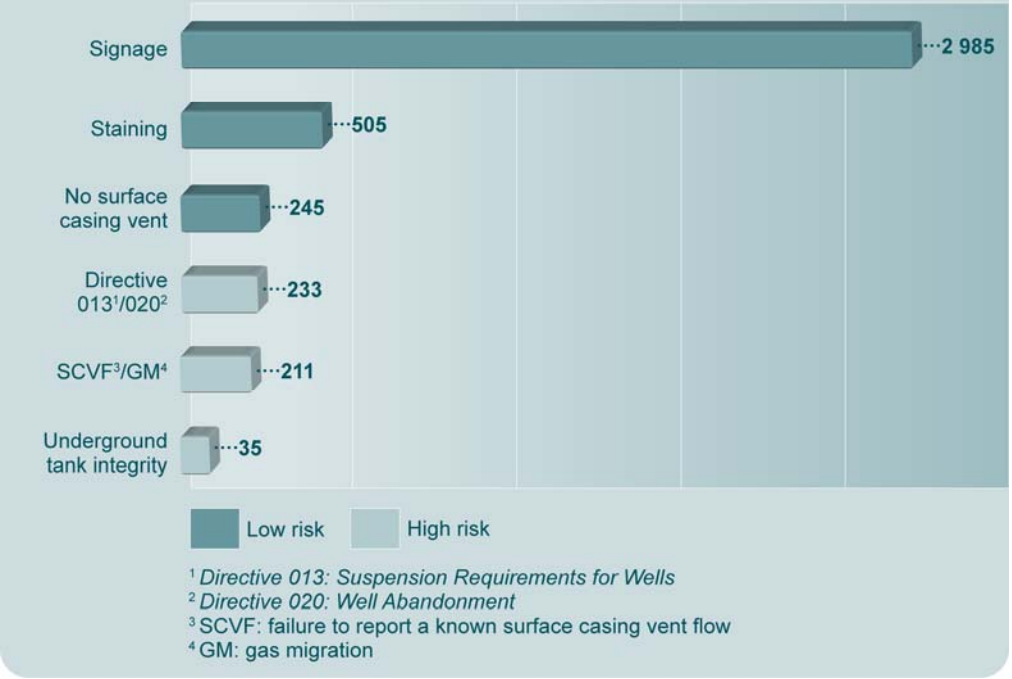
Table 11. Licensed wells, 2010

Licensed wells	Number
Oil well	52 513
Gas well	116 987
Coalbed methane gas well	14 579
Shale gas well	97
Coalbed methane and shale gas well	34
Service well	12 705
Suspended well	54 660
Drilling well	6
Abandoned well	151 407
"Other" well	2
Total	402 990

a) Voluntary Self-Disclosures

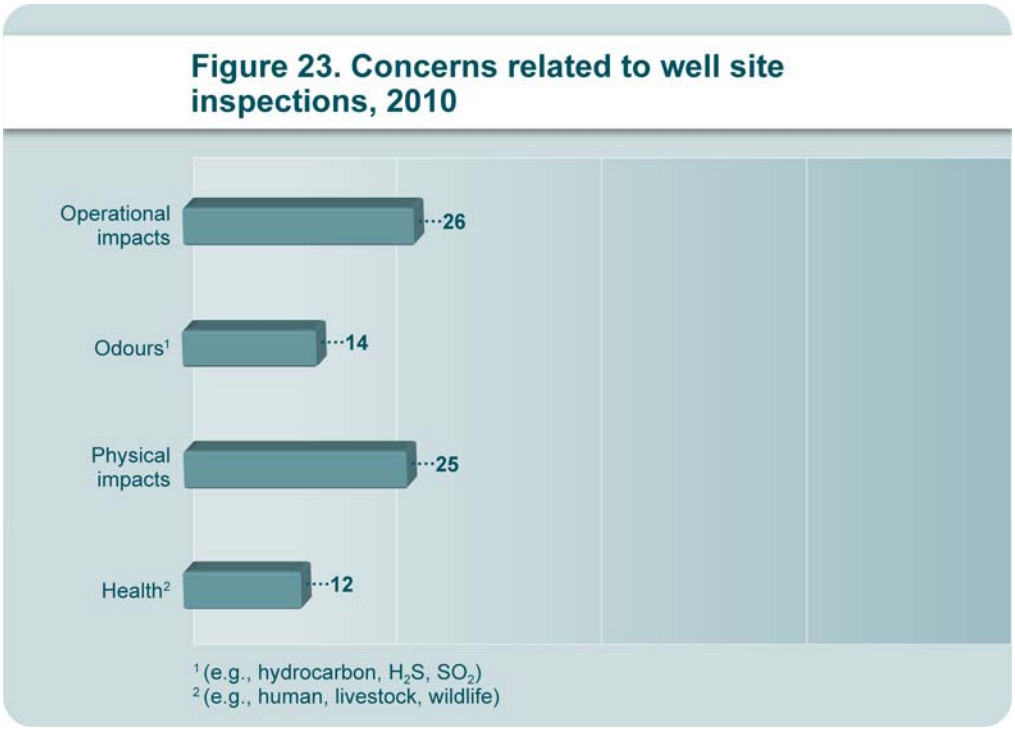
The Well Site Inspections compliance category received 4831 VSDs in 2010. There were 4254 low risk noncompliant VSDs and 577 high risk noncompliant VSDs. The most common low risk noncompliant and high risk noncompliant VSDs are indicated in Figure 22.

Figure 22. Well site inspections most common low and high risk noncompliant voluntary self-disclosures, 2010



b) Public Complaints

In 2010, 67 well site operations complaints were received by the ERCB, from which 77 concerns were identified—26 operational impacts, 14 odours, 25 physical impacts, and 12 health concerns (see Figure 23).



The most common concerns related to well sites were

- noise from pump jack engines,
- lease management-related hydrocarbon staining,
- inadequate fencing, and
- concerns about well test flaring.

Methods taken by the licensee to address the above concerns included

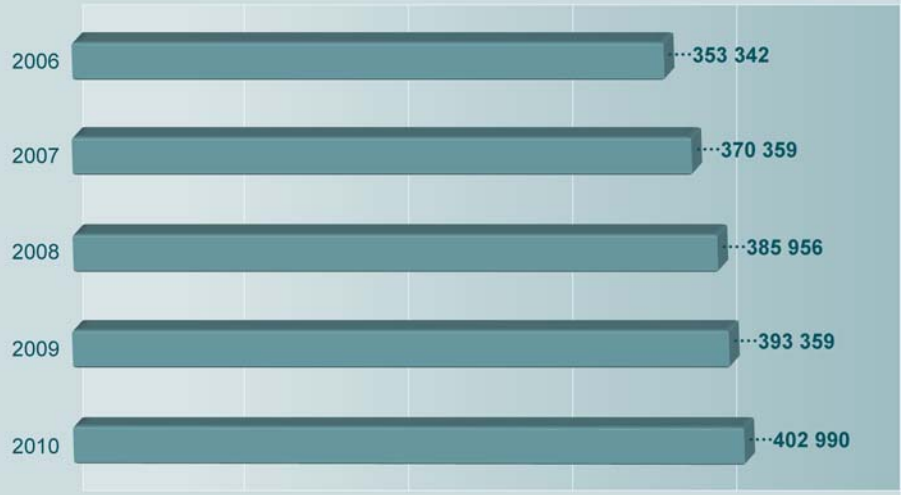
- equipment modifications to pump jack engines (e.g., changing mufflers),
- implementing operating procedures to repair leaking equipment,
- fence maintenance, and
- monitoring well test durations to ensure that the well test is stopped when well test information is adequate to complete the economic evaluation.

There were significantly fewer concerns in 2010 (77) than in 2009 (102).

c) Compliance Results

Figure 24 shows the total well site inventory from 2006 to 2010.

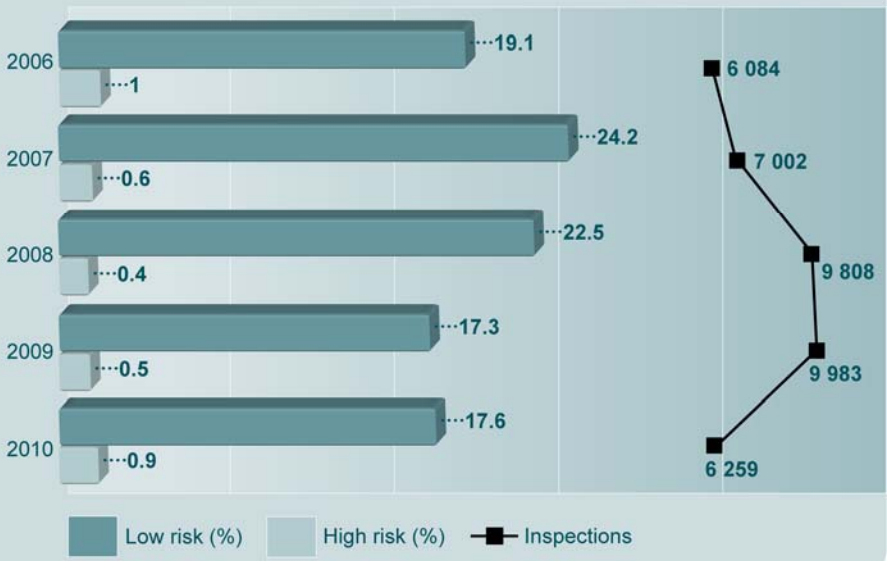
Figure 24. Well site inventory, 2006-2010



Of the 6259 well site inspections and investigations conducted in 2010, 360 were related to incidents.[19] Of the 6259, 5104 well sites (82 per cent) were found to be in compliance. Of the 1155 not in compliance, 1101 well sites (17.6 per cent) were low risk noncompliant and 54 well sites (0.9 per cent) were high risk noncompliant. There was a 99.1 per cent compliance rate with high risk requirements, compared with 99.5 per cent in 2009. None of the enforcement actions resulted in an enforcement appeal (see Figure 25).

[19]An incident is when a release, emergency, or complaint results in an inspection.

Figure 25. Total number of well site inspections and results, 2006-2010



The most common reasons for low risk noncompliance were

- housekeeping;
- lack of signs, or improper identification signs; and
- surface casing venting.

The most common high risk noncompliance was with "other ERCB requirements."

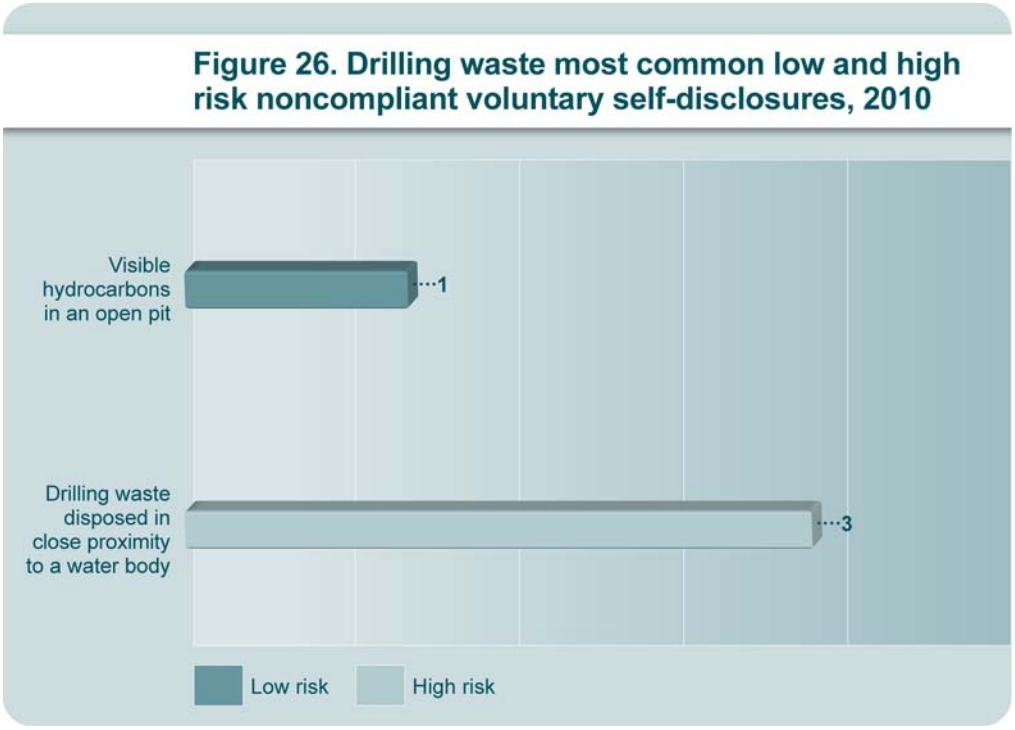
FSOB directed 10 well site operations to suspend activities in 2010, for a total shutdown duration of 1899 hours. The most common reasons for well sites to be suspended were

- an inadequate 24-hour emergency number on the lease sign (the number did not initiate an immediate response from the licensee or was not posted appropriately),
- inadequate fencing, and
- no dike within 100 m of a water body.

7) Drilling Waste

a) Voluntary Self-Disclosures

The Drilling Waste compliance category received seven VSDs in 2010, including one low risk noncompliant VSD and six high risk noncompliant VSDs. The most common low risk noncompliant and high risk noncompliant VSDs are indicated in Figure 26.[20]



b) Public Complaints

No public complaints were reported in the Drilling Waste compliance category in 2010.

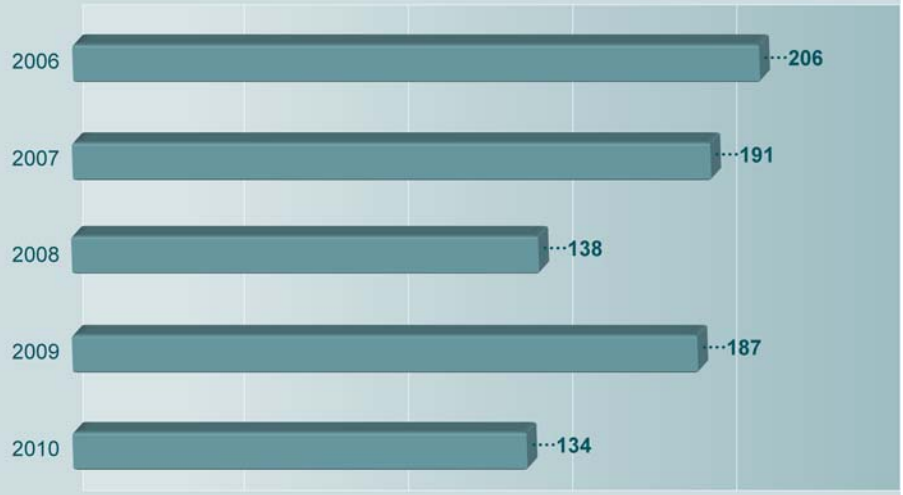
c) Compliance Results

In 2010, 134 drilling waste disposals inspections were conducted, of which 115 (85.8 per cent) were found to be in compliance with ERCB requirements. There was a 94 per cent compliance rate with high risk requirements, compared with 92 per cent in 2009. Of the 19 not in compliance, 11 (8.2 per cent) were low risk noncompliant and 8 (6 per cent) were high risk noncompliant. Figure 27 shows the total number of drilling waste disposals inspections from 2006 to 2010.

Twenty-five per cent fewer drilling waste disposals inspections were conducted in 2010; however, compliance rate results improved marginally compared with 2009.

[20]Note: VSDs depicted in the figures represent only the *most common* low risk noncompliant and high risk noncompliant VSDs. Other VSDs not accounted for in the figures are "one-offs."

Figure 27. Total number of drilling waste disposals inspections, 2006-2010



The most common reasons for low risk noncompliance were

- housekeeping/fencing for remote sumps,
- signage requirements, and
- notification requirements.

The most common reasons for high risk noncompliance were

- landspraying outside the planned spread area,
- landspraying closer than allowable limits to surface water, and
- sump closure not completed within 12 months of rig release.

In the five-year period from 2006 to 2010, the compliance rate for high risk noncompliance averaged 92 per cent. Even with a 30 per cent reduction in inspections over this period, high risk compliance remained constant. The most common high risk noncompliance identified through this five-year period was landspraying too close to a water body.[21]

[21]Landsprayed material did not enter water bodies.

8) Waste Facilities

In 2010, there were 106 waste facilities operating in Alberta.

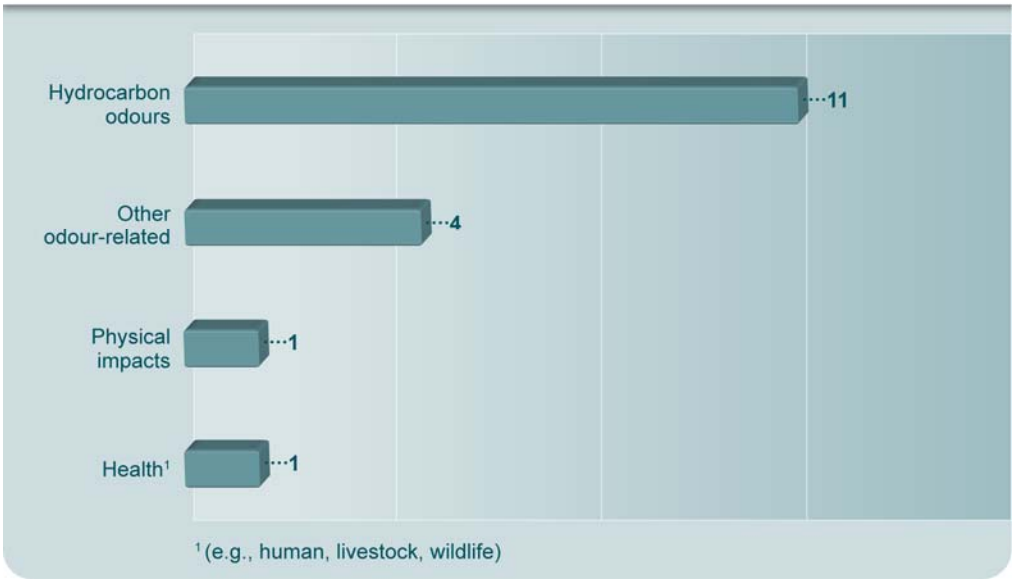
a) Voluntary Self-Disclosures

The Waste Facilities compliance category received 25 VSDs in 2010.

b) Public Complaints

In 2010, 17 waste facilities complaints were received by the ERCB, from which 1 concern was identified with each complaint—11 were associated with one facility and pertained to hydrocarbon odours, 4 were odour-related, 1 was a physical impact, and 1 was a health concern (see Figure 28).

Figure 28. Concerns related to waste facilities, 2010



The 11 odour concerns at one facility were attributed to

- venting from storage tanks and cement-lined storage areas in which hydrocarbons were being emitted directly to the atmosphere, and
- venting of hydrocarbons from processing equipment.

To address these concerns, vapor recovery from storage tanks, cement-lined storage areas, and process equipment was implemented, and the recovered vapours were either flared or directed through a scrubbing solution to remove the hydrocarbons.

The most common concerns related to waste facilities were

- hydrocarbon odours,
- fencing, and
- collected surface water pumped off-lease.

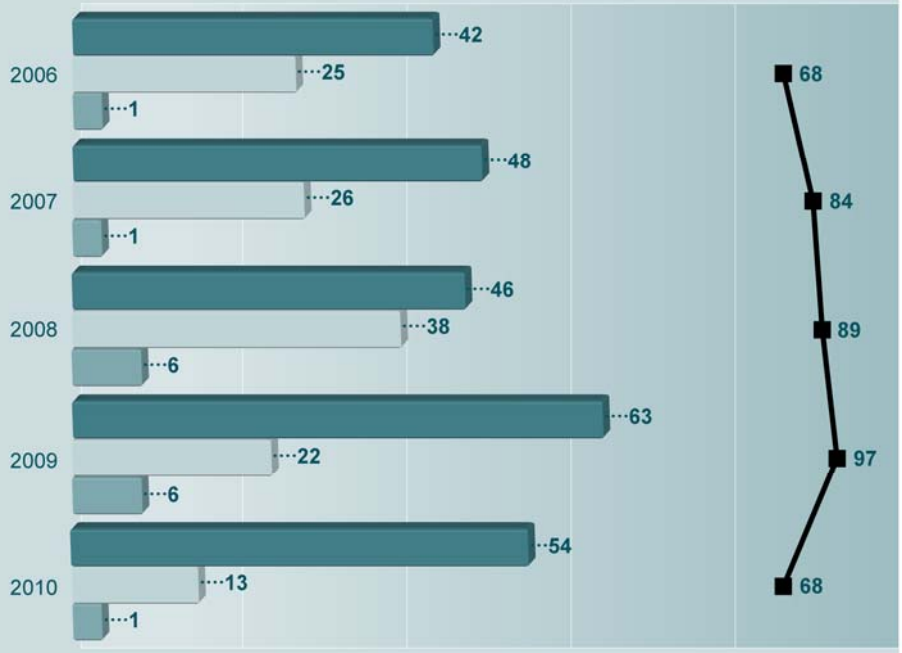
These concerns were addressed to the ERCB's satisfaction.

Hydrocarbon odour emissions have been the main source of complaints, and these emissions have been addressed by implementing emission controls to collect and flare hydrocarbon vapours.

c) Compliance Results

Sixty-eight waste facilities inspections were conducted, of which 54 (79.4 per cent) were in compliance. Of the 14 facilities not in compliance, 13 (19.1 per cent) were low risk noncompliant and 1 (1.5 per cent) was high risk noncompliant. There was a 98.5 per cent compliance rate with high risk requirements, compared with 93 per cent in 2009. Figure 29 shows the total number of waste facilities inspections and results from 2006 to 2010.

Figure 29. Total number of waste facilities inspections and results, 2006-2010

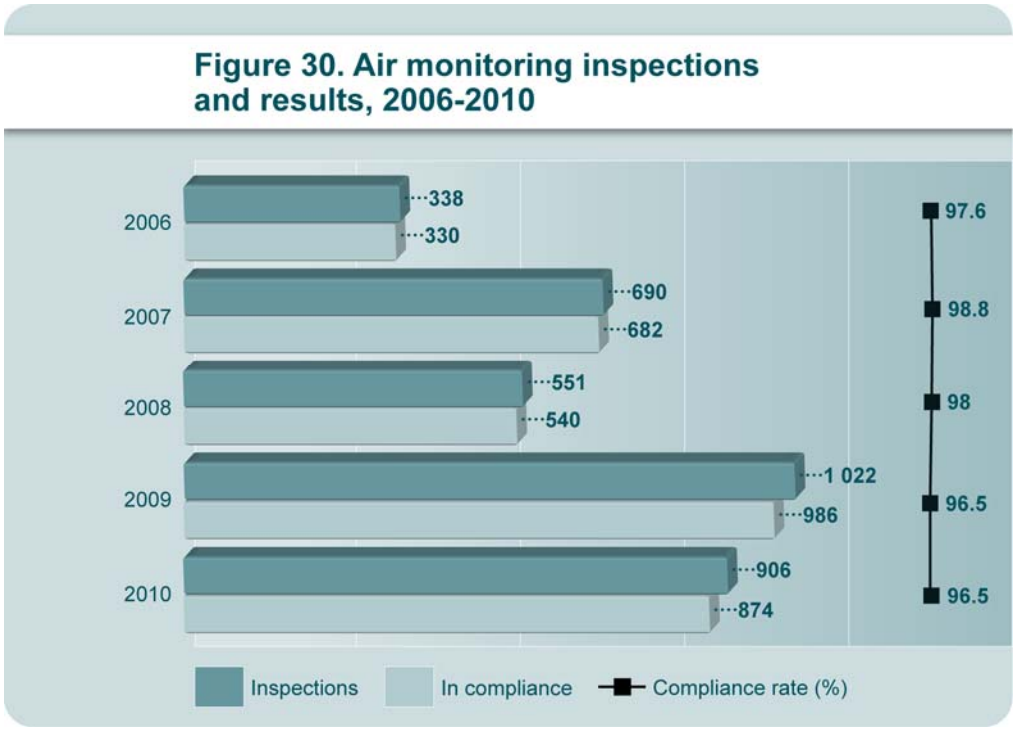


3.2 Related Matters

3.2.1 Air Monitoring Compliance Results

In 2010, 906 air monitoring inspections were conducted, of which 874 (96.5 per cent) were in compliance. Of the 32 (3.5 per cent) air monitoring inspections found in noncompliance, 30 (3.3 per cent) were low risk noncompliant and 2 (0.2 per cent) were high risk noncompliant. The compliance rate for high risk requirements was 99.8 per cent, compared with a 99.6 per cent compliance rate in 2009.

Figure 30 shows the total number of air monitoring inspections from 2006 to 2010.



In 2010, the team participated in 14 open houses. It demonstrated a mobile air monitoring unit and FLIR (forward-looking infrared) camera capabilities at these events. The FLIR camera is used to detect hydrocarbon leaks, which involves testing air quality for compliance with H_2S and sulphur dioxide (SO_2)[22] emissions.

[22] Sulphur dioxide is defined in the glossary.

3.2.2 Liquid Releases

In 2010, 1174 liquid releases were reported, of which 71 were classified as Priority 1, 212 as Priority 2, and 891 as Priority 3.[23] All reported liquid releases were prioritized[24] to allow for an appropriate, timely, and effective response by FSOB inspectors.

The 2010 figure represents a decline from 1191 in 2009. The most common causes of liquid releases were

- equipment failure,
- operator error,
- pump jack stuffing box failure, and
- internal pipeline corrosion failure.

3.3 Emergency Management Group Compliance Categories

The Emergency Management Group includes Emergency Planning and Assessment (EPA). EPA conducts compliance assurance audits on submitted Emergency Response Plans (ERPs) within two compliance categories: General ERP Requirements and Technical ERP Requirements.

The overall goal of the emergency preparedness and response program is to protect public safety and environmental impact by implementing pre-defined emergency response measures contained in an ERP.

Table 12 summarizes ERP approval activity for 2010.

Table 12. Emergency Response Plan approval activity, 2010

Plan Type	Received	Approved	Closed	Withdrawn	Pending
Drilling/ Completions	83	56	2	10	19
Production/ Facility	63	53	2	1	5
Supplements (which can be either Pipeline Supplements, Well Supplements, or Production Area Supplements)	56	51	0	0	3
High Vapour Pressure[1]	11	10	0	1	0
Total ERP Activity	213	170	4	12	27

[1]High vapour pressure is defined in the glossary.

[23]Priority rating 1, 2, and 3 are defined in the glossary.

[24]The priority of a liquid release is determined by the following: if a liquid release is on-lease or off-lease; area sensitivity; if a liquid release is sweet or contains H_2S; size of the area affected; and if the environment, wildlife/livestock, and the public are affected.

1) General ERP Requirements

a) Voluntary Self-Disclosures

In 2010, EPA received eight VSDs in the General ERP Requirements compliance category. Four pertained to late submission of an annual plan update within the time frame outlined under *Directive 071: Emergency Preparedness and Response Requirements for the Petroleum Industry*, three were related to delay in conducting an ERP exercise, and one was related to using incorrect data when calculating an EPZ.

b) Public Complaints

No public complaints were reported in the General ERP Requirements compliance category in 2010.

c) Compliance Results

EPA conducted 57 audits under the General ERP Requirements compliance category in 2010, of which 2 received notices of low risk noncompliance. For high risk requirements in this compliance category, all 57 audits were in compliance.

2) Technical ERP Requirements

a) Voluntary Self-Disclosures

In 2010, EPA received four VSDs in the Technical ERP Requirements compliance category. Three pertained to missing lines in the technical data list of production ERPs,[25] and one was related to failure to complete required public consultation.

b) Public Complaints

No public complaints were reported in the Technical ERP Requirements compliance category in 2010.

c) Compliance Results

EPA conducted 15 audits under the Technical ERP Requirements compliance category in 2010. There was a 93.3 per cent compliance rate with high risk requirements, of which 6.7 per cent resulted in high risk noncompliance. One high risk enforcement action was issued as a result of a licensee commencing drilling operations on its sour well before receiving ERCB ERP approval. This enforcement action did not result in an enforcement appeal.

3.4 Liability Management Group Compliance Categories

The Liability Management Group includes the Liability Management Operations (LMO) Section. This section conducts compliance assurance in two compliance categories: Noncompliance with Liability Management Program Requirements and the Orphan Fund Levy.[26] VSDs and public complaints are not applicable to these two compliance categories.

[25] A company failed to include one or more pipelines, wells, or facilities in its asset list.
[26] Orphan Fund Levy is defined in the glossary.

Table 13 summarizes 2010 Liability Management Rating (LMR) Program assessment results. There has been a slight decrease in deemed assets and an increase in deemed liabilities. The number of licensees with an LMR above 5.00 decreased from 192 to 165 (14 per cent decrease), meaning either the deemed assets decreased or the deemed liabilities increased for this category.

Table 13. Liability Management Rating Program assessment results, 2010

Parameter	January-March	April-June	July-September	October-December
Industry average LMR	4.73	4.64	4.60	4.59
Deemed assets (millions [$M]) (Cdn.)	$76 951	$76 163	$75 986	$76 422
Deemed liabilities ($M) (Cdn.)	$16 134	$16 411	$16 507	$16 650
Licensees: LLR of 0.00	224	231	236	233
Licensee liability rating (LLR) between 0.00 and 0.99	91	87	83	89
LLR between 1.00 and 1.99	180	175	179	182
LLR between 2.00 and 4.99	225	228	225	229
LLR above 5.00	192	175	169	165

1) Noncompliance with Liability Management Program Requirements

Compliance Results

The number of compliant licensees increased from 2009 to 2010 (see Table 14).

Table 14. Liability Management Rating Program assessment results, 2006-2010[1]

	2006	2007	2008	2009	2010
Initial assessments (invoices issued)	256	286	274	302	357
Low risk enforcement with a Board Order issued	8	12	66	59	32
Compliance rate with low risk requirements[2]	75%	74%	63%	80%	91%
Amount of security deposits held at Dec. 31, 2010 ($M) (Cdn.)	$27.8M	$35.2M	$43.5M	$41.9M	$124M
Numbers of licensees providing deposits at Dec. 31, 2010	348	361	386	391	436

[1] Reflects enforcement in LLR, Large Facility Liability Management, and Oilfield Waste Liability (OWL) programs.
[2] Low risk requirements are used to calculate compliance rate, as there are no high risk requirements in this compliance category.

The amount of security deposits held by the ERCB increased significantly in 2010 because of implementation of the OWL program and transfer of security held under the former OWL program.[27]

[27] Under the former program, licensees were required to provide full security to cover their deemed liabilities, whereas the current OWL program is based on an asset-to-liability ratio.

2) Orphan Fund Levy

Compliance Results

The Orphan Fund Levy is based on revenue requirements identified in the Orphan Well Association (OWA) budget. The ERCB allocates the cost of the Orphan Fund Levy among the licensees subject to the Licensee Liability Rating (LLR) and OWL programs. Table 15 presents the Orphan Fund Levy compliance results for the last five years. In 2010, 872 Orphan Fund Levy invoices were issued to licensees, of which 700 (80.3 per cent) were in compliance by paying by the due date. The remaining 172 (19.7 per cent) licensees and approval holders were noncompliant and assessed an administrative penalty.[28]

Table 15. Orphan Fund Levy compliance results, 2006-2010

	2006	2007	2008	2009	2010
Number of invoices	963	908	914	877	872
Administrative penalty	156	164	124	99	172
Compliance rate with low risk requirements[1]	84%	82%	86%	89%	80%

[1]Low risk requirements are used to calculate the compliance rate, as there are no high risk requirements in this compliance category.

Enforcement Results

The following Board Orders and administrative designations were issued to enforce industry compliance with ERCB liability management programs and Orphan Fund Levy requirements (see Table 16). Table 13 shows an upward trend in the use of enforcement orders to gain compliance.

Table 16. Liability Management Program and Orphan Fund Levy enforcement results, 2006-2010

Enforcement	2006	2007	2008	2009	2010
Miscellaneous Order	6	17	36	55	69
Closure Order	15	25	47	82	58
Abandonment Order	20	8	22	61	87
Abandonment Cost Order	0	0	3	3	5
Named Individual Designation	3	2	0	0	0

3.5 Technical Operations Group Compliance Categories

The Technical Operations Group includes the Production Operations and Well Operations Sections. These sections conduct compliance assurance audits in six compliance categories: Production Measurement and Reporting; Enhanced Production Audit Program (EPAP); Flaring, Incinerating, and Venting Audits; Glycol Dehydrator Benzene Emissions; and Sulphur Recovery Guidelines; Well Abandonment Audits.

[28]A 20 per cent administrative penalty is issued for failure to submit the Orphan Fund Levy when required.

1) Production Measurement and Reporting

a) Voluntary Self-Disclosures

In 2010, the Production Measurement and Reporting compliance category received 11 VSDs.[29]

b) Public Complaints

No public complaints were reported in the Production Measurement and Reporting compliance category in 2010.

c) Compliance Results

In 2010, the Production Audit Team (PAT) conducted five audits, one of which was low risk noncompliant and four of which were high risk noncompliant. None of the enforcement actions were appealed, compared with one enforcement appeal in 2009. Table 17 shows the total number of production measurement and reporting audits and the compliance results from 2006 to 2010.

Table 17. Production measurement and reporting audits and compliance results, 2006-2010

	2006	2007	2008	2009	2010
Number of audits	16	16	33	43	5
Noncompliance with low risk requirements	0	3	8	13	1
Noncompliance with high risk requirements	16	13	17	20	4

Effective March 2010, PAT no longer conducted substantive audits in order to work on design completion, development, and implementation of EPAP. This resulted in a significant reduction in audits from 2009 to 2010.

2) Enhanced Production Audit Program

a) Voluntary Self-Disclosures

The Enhanced Production Audit Program compliance category received no VSDs in 2010.

b) Public Complaints

No public complaints were reported in the Enhanced Production Audit Program compliance category in 2010.

c) Compliance Results

In 2010, PAT, due to the implementation of EPAP, did not enforce *Directive 076: Operator Declaration Regarding Measurement and Reporting Requirements.*

[29]These VSDs are being addressed and have yet to be finalized.

3) Flaring, Incinerating, and Venting Audits

This compliance category evaluates industry compliance with requirements derived from the *Oil and Gas Conservation Act*, *Oil and Gas Conservation Regulations*, and *Directive 060: Upstream Petroleum Industry Flaring, Incinerating, and Venting*. This compliance category has three main focus areas:

(1) Economic evaluation of gas conservation audits:

In 2010, 53 economic evaluation audits were conducted with 8 being high risk noncompliant. The number of audits conducted in 2010 was slightly less than, but comparable to, previous years. Table 18 shows the number of *Directive 060* economic evaluation audits and the compliance results from 2006 to 2010.

Table 18. Total compliance results from economic evaluation of gas conservation audits, 2006-2010

	2006	2007	2008	2009	2010
Number of audits	17	20	59	56	53
Noncompliance with low risk requirements	n/a[1]	n/a	n/a	n/a	n/a
Noncompliance with high risk requirements	0	2	5	5	8
Compliance rate with high risk requirements	100%	90%	92%	91%	84.9%

[1]n/a= not applicable

(2) Conservation at existing oil and bitumen batteries—gas to oil ratio (GOR) greater than 3000 m^3/m^3 audits:

In 2010, 160 GOR greater than 3000 m^3/m^3 audits were conducted in accordance with *Directive 060*, 154 of which were in compliance. Table 19 shows the number of audits and results from 2006 to 2010. Of the 160 audits, 6 were high risk noncompliant. There are instances in which data has been reported in error, thereby inflating the number of wells being reported with a GOR of greater than 3000 m^3/m^3.

Table 19. GOR greater than 3000 m^3/m^3 audits, total compliance results, 2006-2010

	2006	2007	2008	2009	2010
Number of audits	17	120	150	119	160
Noncompliance with low risk requirements	n/a[1]	n/a	n/a	n/a	n/a
Noncompliance with high risk requirements	17	120	8	4	6
Compliance rate with high risk requirements	0%	0%	95%	97%	96%

[1]n/a= not applicable

(3) Well test flaring approval audits:

Temporary flaring or incinerating approvals are issued for well testing in accordance with Section 3.3 of *Directive 060*. In 2010, 110 temporary flaring or incinerating approvals were issued, of which 89 were audited for compliance to *Directive 060*. Of the 89 audits, 1 was high risk noncompliant.

Table 20 depicts compliance assurance for used temporary flaring/incinerating approvals from 2006 to 2010.

Table 20. Total compliance results from well test flaring/incinerating approval audits, 2006-2010

	2006	2007	2008	2009	2010
Number of approvals Issued	451	349	200	124	110
Number of audits	254	323	210	150	89
Noncompliance with low risk requirements	n/a[1]	0	0	0	0
Noncompliance with high risk requirements	n/a[1]	2	1	2	1
Compliance rate with high risk requirements	n/a[1]	100%	100%	100%	100%

[1]n/a= not applicable. Audits were conducted in 2006; however, no enforcement action was taken.

4) Glycol Dehydrator Benzene Emissions

In 2010, 2258 operating glycol dehydrators were reported across Alberta for facilities such as gas plants, batteries, compressor stations, and well sites. Of the 2258 operating glycol dehydrators, 5 were high risk noncompliant due to exceeding the annual benzene emission limit, 33 were low risk noncompliant due to failure to submit the required annual Dehydrator Benzene Inventory List, and 4 were low risk noncompliant due to failure to notify residents within 750 m of a dehydrator. The compliance rate with high risk requirements for benzene emissions in 2010 was 99.8 per cent, compared with 99.7 per cent in 2009.

A focused audit was conducted in 2010 for dehydrators with controls reported as tanks, condenser units, or not specified where the emissions before controls exceeded the site emission limit. Of the 17 audits conducted,[30] 10 were low risk noncompliant due to failure to complete the Dehydrator Engineering and Operations Sheet and/or inventory data correctly, 5 operations were compliant, and 3 files remain open pending final data collection and review.

5) Sulphur Recovery Guidelines

Sulphur recovery efficiency was monitored at 40 sulphur recovery gas processing plants and 44 acid gas injection[31] gas processing plants. This was done to ensure that sulphur emissions requirements were not exceeded on a calendar quarter-year basis.

In 2010, 332 compliance audits were conducted. Table 21 details the results. Refer to the *ST101: Sulphur Recovery and Sulphur Emissions at Alberta Sour Gas Plant* annual report for a more detailed review of sulphur recovery performance at Alberta sour gas plants.

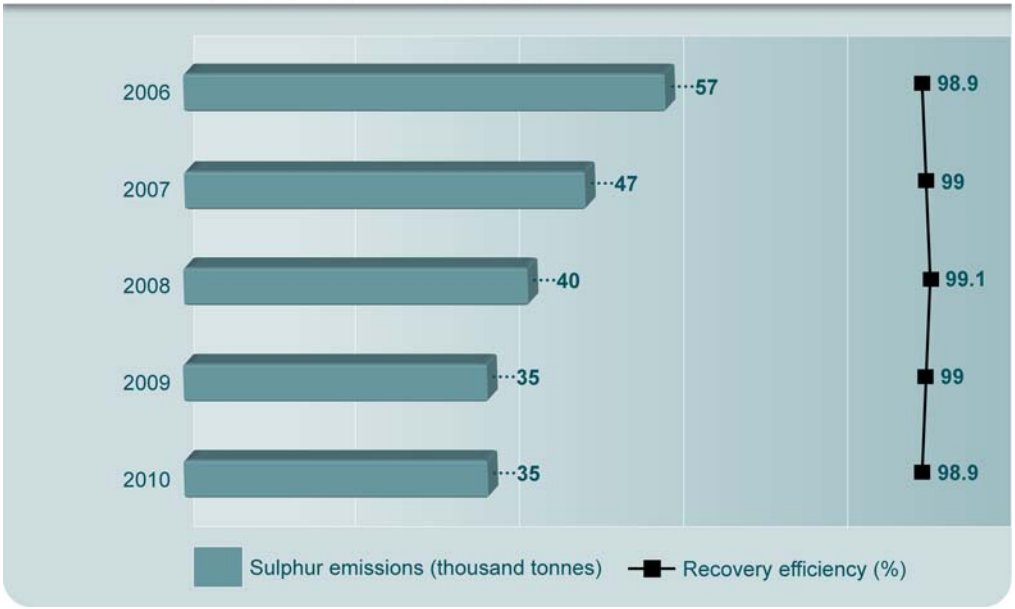
[30]Because each audit included more than one dehydrator unit, enforcement numbers may not match audit numbers.
[31]Acid gas that has been injected is treated as sulphur recovered.

Table 21. Sulphur recovery and compliance results, 2006-2010

	2006	2007	2008	2009	2010
Number of audits	332	332	332	332	332
Noncompliance with low risk requirements	2	1	1	2	0
Noncompliance with high risk requirements	7	10	13	7	8
Compliance rate with high risk requirements	98%	97%	95%	98%	97.6%

The efficiency at gas plants recovering sulphur was 98.9 per cent in 2010. Overall, sulphur emissions have decreased by 61 per cent since 2006, from 57 000 to 35 000 tonnes (see Figure 31).

Figure 31. Efficiency versus emissions of sulphur recovery plants



6) Well Abandonment Audits

In 2010, the Field Operations Group, on behalf of the Well Operations Section, conducted 48 cased- and open-hole well abandonment[32] inspections to ensure industry compliance with *Directive 020: Well Abandonment.* Of these 48 inspections, all were in compliance with ERCB regulations.

[32]Cased- and open-hole well abandonment are defined in the glossary.

3.6 Enforcement Action Appeals

In accordance with Section 5 of *Directive 019*, a licensee who disagrees with an enforcement action issued by any group in the ERCB can appeal to the ERCB's enforcement advisor. Table 22 shows the number of enforcement appeals from 2006 to 2010.

Table 22. Enforcement appeals by year, 2006-2010

2006	2007	2008	2009	2010
8 total 2 rescinded[1] 3 granted[3] 3 denied[4]	11 total 5 granted[3] 6 denied[4]	2 total 1 granted[3] 1 denied[4]	11 total 1 rescinded[1] 5 granted[3] 5 denied[4]	2 total 1 dismissed[2] 1 granted[3]

[1]Rescinded—An ERCB group decided to rescind its response prior to the enforcement advisor rendering a decision.
[2]Dismissed—The ERCB enforcement advisor dismissed the appeal based on the grounds that they did not have jurisdiction to consider the appeal.
[3]Granted—The ERCB enforcement advisor overturned an ERCB group's response.
[4]Denied—The ERCB enforcement advisor upheld an ERCB group's response.

3.7 Summary

Operational suspensions in 2010 in the noted compliance categories are shown in Table 23.

Table 23. Facilities and operations shut down by FSOB request, 2010

Compliance Category	Number of suspensions	Duration of inactivity	Most common reasons for suspensions
Drilling Operations (Rigs)	12	69 hours (2.9 days)	• Noncompliance issues related to bleed-off systems • Well control crew training and tripping • Pressure testing
Well Servicing (Rigs)	4	28 hours (1.2 days)	• Noncompliance with "other ERCB requirements" • Noncompliant BOP systems
Gas Facilities	3	2 108 hours (87.8 days)	• Inappropriate spacing • Lack of equipment protection in a hazardous area • Lapse in conducting an integrity test of an underground storage tank
Oil Facilities	3	2 173 hours (90 days)	• Lack of adherence to *Directive 055: Storage Requirements*
Pipelines	30	22 080 hours (920 days)	• Ground disturbance requirements were not followed and contact damage has occurred • Corrosion integrity work was required following a failure to prove or establish integrity before resuming pipeline operations
Well Site Inspections	10	1 899 hours (79 days)	• Inadequate 24-hour emergency number on the lease sign • Inadequate fencing • No dike within 100 m of a water body
Total	62	28 357 hours (1 181 days)	

Compliance assurance in 2010 is summarized in Table 24.

Table 24. FSOB compliance summary, 2010

	Compliance category	Field Inspections/ Audits	Compliance	Low risk noncompliance	High risk noncompliance	Compliance rate (in compliance with high risk requirements)
Field Operations Group	Drilling Operations	326	288	20	18	94.5%
	Drilling Waste	134	115	11	8	94%
	Well Servicing	236	219	13	4	98%
	Well Site Inspections	6 259	5 104	1 101	54	99.1%
	Gas Facilities	2 325	1 818	484	23	99%
	Oil Facilities	3 354	2 596	729	29	99.1%
	Waste Facilities	68	54	13	1	98.5%
	Pipelines	1 627	1 398	136	93	94.3%
Emergency Management Group	General ERP Requirements	57	55	2	0	100%
	Technical ERP Requirements	15	14	0	1	93.3%
Liability Management Group	Noncompliance with Liability Management Rating Requirements	357	325	32[1]	n/a[2]	91%[1]
	Orphan Fund Levy	872	700	172[1]	n/a[2]	80.3%[1]
Technical Operations Group	Flaring, Incinerating, and Venting Audits[3]	302	287	0	15	95%
	Production Measurement and Reporting	5	0	1	4	n/a[4]
	Sulphur Recovery Guidelines	332	324	0	8	97.6%
	Glycol Dehydrator Benzene Emissions	2 258	2 206	47[5]	5	99.8%
	Well Abandonment Audits[6]	48	48	0	0	100%
Total		18 575	15 551	2 761	263	98.6[7]

[1]This noncompliance category has only low risk noncompliance; therefore, it was used to calculate the overall compliance rate.
[2]n/a= not applicable
[3]The Flaring, Incinerating, and Venting Audits have three focus areas. Refer to Section 3.5 for this compliance category.
[4]n/a= not applicable. The compliance rate for this compliance category is not significantly relevant to the overall industry compliance rate, as this ERCB group stopped conducting substantive audits in March 2010.
[5]This statistic represents the addition of low risk noncompliance. Refer to Section 3.5, 4) Glycol Dehydrator Benzene Emissions.
[6]These audits were conducted by Field Operations Group personnel.
[7]In situ oil sands noncompliance is recorded in one or more of the compliance categories listed above and is not distinguished separately in this report.

Abbreviations

BOP	blowout preventer
CAR	Community and Aboriginal Relations
EPA	Emergency Planning and Assessment
EPAP	Enhanced Production Audit Program
EPZ	emergency planning zone
ERCB	Energy Resources Conservation Board ("the Board")
ERP	Emergency Response Plan
FIS	Field Surveillance Inspection System
FLIR	forward-looking infrared
FSOB	Field Surveillance and Operations Branch
GM	gas migration
GOR	gas to oil ratio
H_2S	hydrogen sulphide
LLR	Licensee Liability Rating
LMO	Liability Management Operations
LMR	Liability Management Rating
n/a	not applicable
OWA	Orphan Well Association
OWL	Oilfield Waste Liability
PAT	Production Audit Team
SCVF	surface casing vent flow
SO_2	sulphur dioxide
VSD	voluntary self-disclosure

Units of Measurement

$M	millions of dollars
%	per cent
km	kilometre
m	metre
m^3	cubic metres

Glossary

Blowout—An unintended flowing of wellbore fluids (e.g., oil, gas, water, or other substance) at surface that cannot be controlled by existing wellhead and/or blowout prevention equipment, or a well that has fluids flowing from one formation to another formation that cannot be controlled by increasing the fluid density. Control can only be regained by installing additional and/or replacing existing wellhead and/or blowout prevention equipment to allow shut-in or permit the circulation of control fluids, or by drilling a relief well.

Blowout preventer—Equipment installed or that might be installed at the wellhead to control pressures and fluids during drilling, completion, and certain workover operations.

Cased-hole well abandonment—The downhole abandonment of a completed or cased well.

Casing failure—Any loss of casing integrity, including casing damage that results in suspension of operations or in abandonment of the well.

Compliance category (previously known as audit/inspection category)—Describes an activity or operation (e.g., drilling operations, gas facilities, pipelines). Each compliance category contains a group of noncompliant events related to a specific activity or operation. The ERCB uses compliance categories to identify persistent noncompliance related to that activity or operation. For the list of compliance categories, go to the ERCB Web site www.ercb.ca under Industry Zone : Compliance and Enforcement : Compliance Categories and Contacts.

Facility—Any building, structure, installation, or equipment over which the ERCB has jurisdiction and that is connected to or associated with the recovery, development, production, handling, processing, treatment, or disposal of hydrocarbon-based resources or any associated substances or wastes. This does not include wells or pipelines.

High risk noncompliant—An event that represents an unacceptable level of risk not in accordance with an ERCB act, regulation, directive, or Board direction. In this instance, immediate mitigative measures must be taken. If risk assessment results, as they pertain to health and safety, environmental impact, resources conservation, and stakeholder confidence in the regulatory process are more significant, the noncompliance is considered high risk. Examples of high risk noncompliance are H_2S release causing odours off-lease at an oil battery and required blowout preventer drills not conducted.

High vapour pressure—A pipeline system conveying hydrocarbons or hydrocarbon mixtures in the liquid or quasi-liquid state with a vapour pressure greater than 110 kilopascals absolute at 38°C, as determined using the Reid method.

Hit—Striking a buried pipeline during a ground disturbance activity resulting in the pipeline or pipeline coating being damaged; a release of product does not necessarily result.

Hydrogen sulphide—A naturally occurring gas found in a variety of geological formations and also formed by the natural decomposition of organic matter in the absence of oxygen. H_2S is colourless, heavier than air, and extremely toxic. In small concentrations it has a rotten egg smell and causes eye and throat irritation.

Kick—Any unexpected entry of water, gas, oil, or other formation fluid into a wellbore that is under control and can be circulated out during drilling operations.

Leak—An opening, crack, or hole in a pipeline causing some product to be released, but not immediately impairing the operation of the pipeline.

Licensee—The responsible duty holder (e.g., licensee, operator, company, applicant, approval holder, or permit holder) as specified in legislation.

Low risk noncompliant—An event that represents an acceptable level of risk not in accordance with an ERCB act, regulation, directive, or Board direction. If risk assessment results, as they pertain to health and safety, environmental impact, resources conservation, and stakeholder confidence in the regulatory process are minimal, noncompliance is considered low risk. Examples of low risk noncompliance are missing facility signage, and garbage and debris not stored in a reasonable manner at an oil or gas facility.

Open-hole well abandonment—The downhole abandonment of an open-hole well after drilling is complete but before the rig is released.

Operational impacts—Concerns associated with installation operations (e.g., explosion, fire, flare, smoke, spill, uncontrolled flow, nuisance, noise).

Orphan Fund Levy—A levy based on revenue requirements identified in the Orphan Well Association budget. The Liability Management Operations Section collects financial security annually from licensees subject to the Licensee Liability Rating and Oilfield Waste Liability programs. This levy pays the costs to suspend, abandon, remediate, and reclaim orphan wells, pipelines, and facilities.

Physical impacts—Concerns raised due to possible impacts on public safety, land, water wells, or other property (e.g., lease management, public hazard, property damage, water well).

Pipeline incident—Includes pipeline failures and pipeline hits (a hit with release of fluid, without release of fluid, or a failure itself).

Priority rating (liquid and gas releases):

Priority 1—Releases that pose the most serious potential environmental and public impact. Inspectors make every attempt to respond immediately to the location and conduct an inspection as soon as possible or, when/where this is not possible, request another regulatory agency to conduct the initial assessment.

Priority 2—Releases in which a significant volume has been released or the impact on the environment is a concern. These sites are generally inspected within seven working days.

Priority 3—Releases are low-volume and contained on-site. Approximately 25 per cent of Priority 3 releases are inspected to ensure that they are satisfactorily addressed.

Release—Any unintended discharge of upstream product (to the environment) that is released from its normal containment or transportation device, such as a well that can be controlled by existing wellhead and/or blowout prevention equipment, storage tank, pipeline, tank truck, etc. A release would also include any discharge (to the environment) of a refined product that has been injected into a well or pipeline. It would not be considered a release if at a well, the flow of fluids (e.g., oil, gas, water, or other substance) into the wellbore can be circulated out or bled off through the existing surface equipment.

Rupture—The instantaneous tearing or fracturing of the pipeline material, immediately impairing the operation of the pipeline.

Sulphur dioxide—A colourless, water-soluble, suffocating gas formed by burning sulphur in air; also used in the manufacture of sulphuric acid. SO_2 has a pungent smell similar to a burning match. SO_2 is extremely toxic at higher concentrations. The molecular weight of SO_2 is heavier than air; however, typical releases are related to combustion, which makes the gaseous mixture lighter than air (buoyant).

Voluntary self-disclosure—Proactive identification, reporting, and correcting of noncompliance by licensees without prompting from the ERCB.