Petroleum, Geothermal and Major Hazard Facilities

ANNUAL REPORT 2022/23

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Te Kāwanatanga o Aotearoa
New Zealand Government

WORKSAFE
Mahi Haumaru Aotearoa

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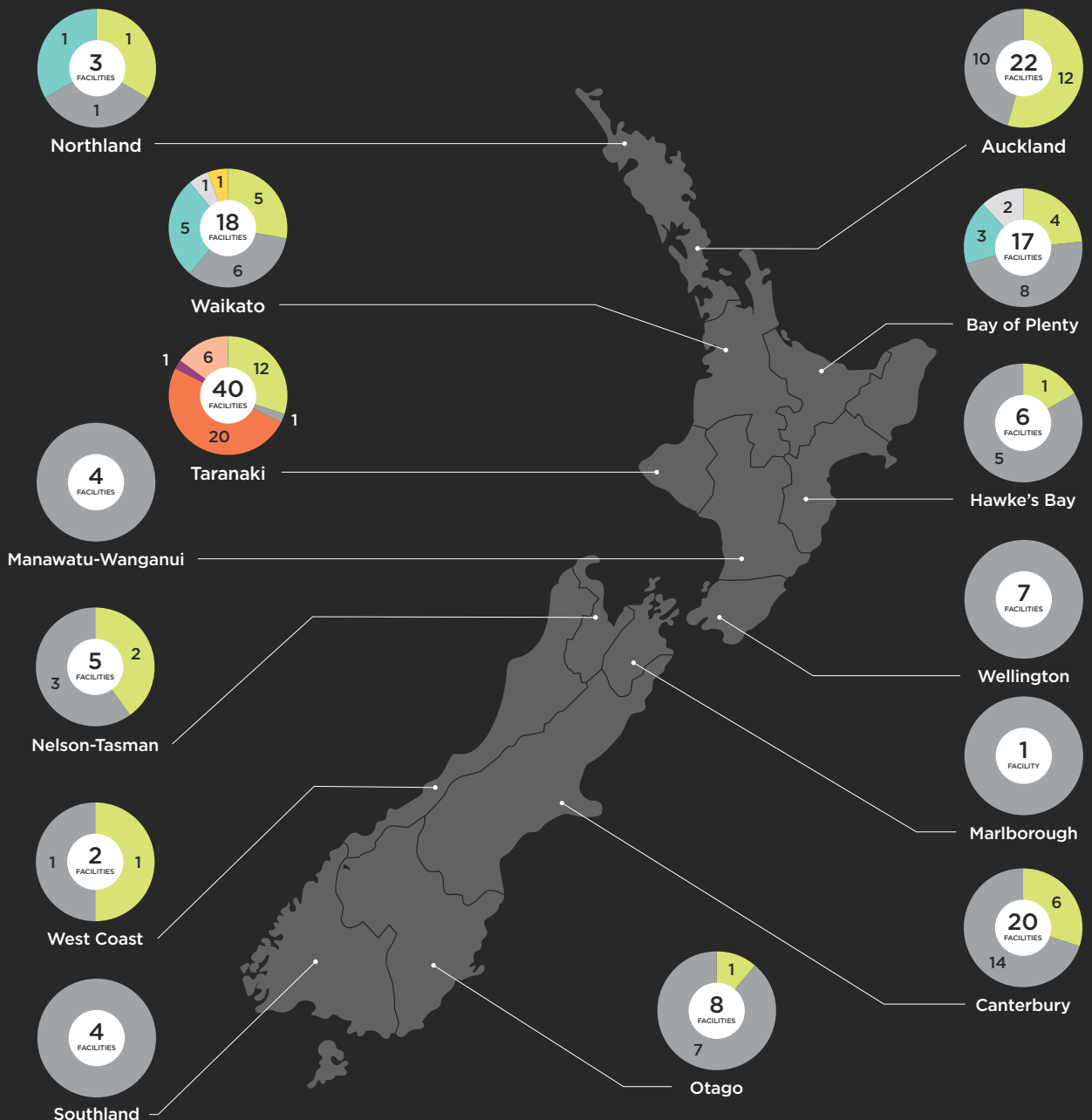

- Upper tier MHF
- Lower tier MHF
- MHF geothermal
- Non-MHF geothermal
- Onshore petroleum
- Offshore petroleum
- Offshore petroleum (decommissioning)
- Non-MHF geothermal and onshore petroleum

Our mission is to transform New Zealand's health and safety performance towards world-class.

Achieving this requires the commitment not just of WorkSafe, but of businesses, workers and a wide range of other players in the health and safety system.

Overview of this report

Tēnā koutou, greetings to all.

This annual report will look a bit different from previous versions and contains articles from the Deputy Chief Inspectors, commentary from the industry working groups and information from incidents that have lessons for all of us. Learning from incidents and actively working to prevent a similar situation at your facility is obvious, yet we don't always take the time to look around and learn from others.

WorkSafe has entered a period of business redesign and I am acting as Chief Inspector for the High Hazards team. My vision for the team is to:

- be clear about who we work with and why. Working with companies that have high inherent risk and operating below industry standards is a primary focus
- gain a detailed knowledge bank on the health and safety performance of each major hazard facility, petroleum installation and geothermal site. This information will include how successful each site is in applying systems to manage critical risks
- be adaptive to emerging technology. This includes being clear to industry about the standards and guidance we will recognize if they are not yet available in New Zealand
- understand the impact of our work on the companies we work with and evaluating the impact of our interactions on how a company manages hazards
- focus on following up on what we have directed companies to do and an escalation if the matter that gave rise to the direction is not rectified within an agreed time.

To realise this vision, the High Hazards team is taking a three-pronged strategic approach. We will **work with companies** that:

- have systems and controls designed to manage the risk but struggle to apply or maintain them
- have less than adequate systems and controls to manage the risk.

To support this approach, we will further develop our risk profile of the companies we work with.

The second component to our strategic approach will **look at risks to worker health**. We will be looking at whether:

- a company has sufficient information to determine worker exposure to health hazards
- the company has adequate controls to eliminate or reduce exposures
- that the health of the worker is monitored
- that the company understand psychosocial hazards for workers and manages those.

The third component to our strategic approach is to gather additional **knowledge of all high hazard operators**. This includes details about the communities where high hazard sites are located. We also seek to better understand the competency levels of the workforce.

We plan to be more transparent to industry about what your fees and levies contribute towards. Paying a levy does not necessarily mean your company will be inspected and there are a couple reasons for this:

- resources are used to target operators who pose a greater risk
- WorkSafe may have a degree of confidence that you are managing risk to an acceptable level.

Lastly, while this may be obvious, the application of high hazard regulation is a strategic priority. The nuance to this is that we will be strategic about our approach during a site inspection.

Good health and safety outcomes benefit your business and reputation, the industry, and the community. This is why it is critical for the industry and the regulator to work collaboratively on this shared objective.

I wish you a safe and productive year ahead and invite you to work collaboratively with WorkSafe's High Hazards team to achieve continual improvement.

Nāku noa, nā, yours sincerely

Dave Bellett
Acting Chief Inspector High Hazards

1.0 Review of the past year

IN THIS SECTION:

1.1 Safety cases

In the past year, the High Hazards team at WorkSafe reviewed one revised Petroleum safety case, two Major Hazard Facility (MHF) safety cases, and one MHF Geothermal safety case.

The numbers of safety cases accepted annually for Petroleum, MHF and Geothermal MHF sites since the beginning of the petroleum regime are shown in Figure 1.

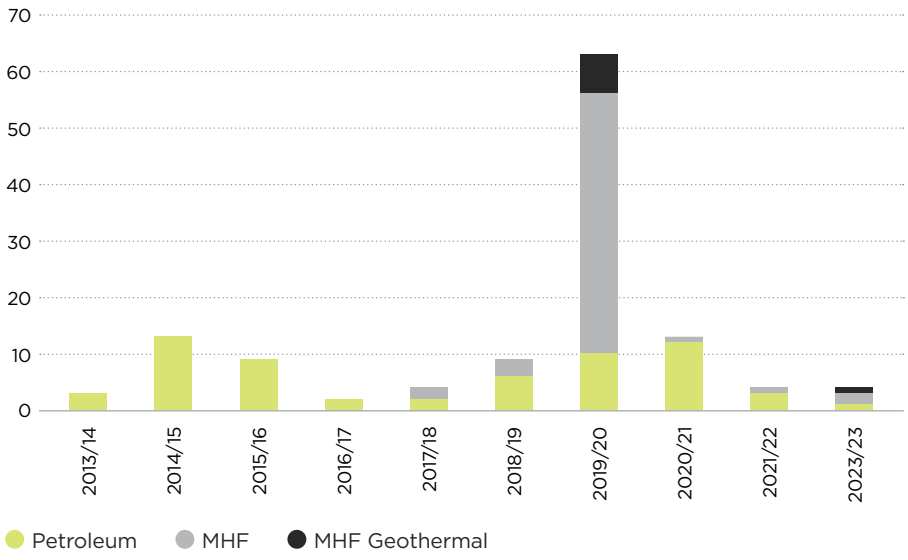

FIGURE 1: Safety cases accepted each year for Petroleum, MHF and Geothermal MHF sites

With all upper tier MHF sites now having an accepted safety case, the focus for inspectors this year remained with on-site verification to ensure that all elements of the safety case are in place on site and working effectively. We continued to follow up on future inspection topics identified in safety case assessments.

1.2 Site inspections

Sites are prioritised for inspection based on our assessment of the quality of the safety case, the number of future inspection topics, the time since the last inspection, and reported incidents or complaints. Last year, 133 high hazard site inspections were undertaken across a range of industries (Figure 2).

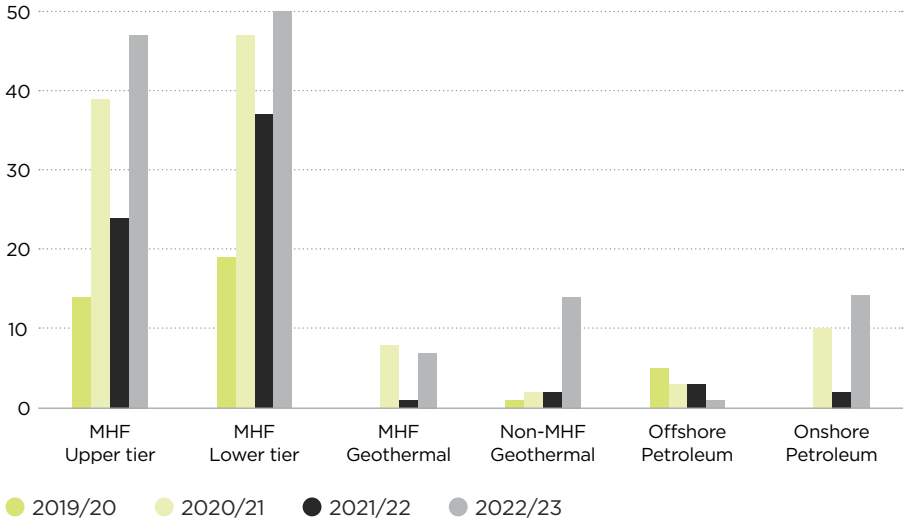

FIGURE 2: Site inspections completed by high hazard site type and financial year

Site inspections in 2022/23 by high hazard site type

47
MHF Upper tier

50
MHF Lower tier

7
MHF Geothermal

14
Non-MHF Geothermal

1
Offshore Petroleum

14
Onshore Petroleum

1.3 Enforcement measures

Where inspectors identify health and safety issues, a range of enforcement measures are available for use. Enforcement measures include prohibition, improvement and non-disturbance notices, sustained compliance notices and directive letters. Recommendations may also be made but these are not legally enforceable. Inspectors are guided as to the appropriate level of enforcement by our Enforcement Decision-making Model (EDM). Figure 3 shows enforcement measures taken and recommendations made by high hazard site type and financial year.

Last year, 514 enforcement measures were taken at high hazard sites across a range of industries (Figure 4). Most of the enforcement measures were taken at lower tier MHF (52%) and upper tier MHF (33%) sites. We will continue to focus on following up outstanding enforcement measures in 2023/24 to ensure they are complied with in a timely manner.

FIGURE 3: Enforcement measures taken and recommendations made by high hazard site type and financial year

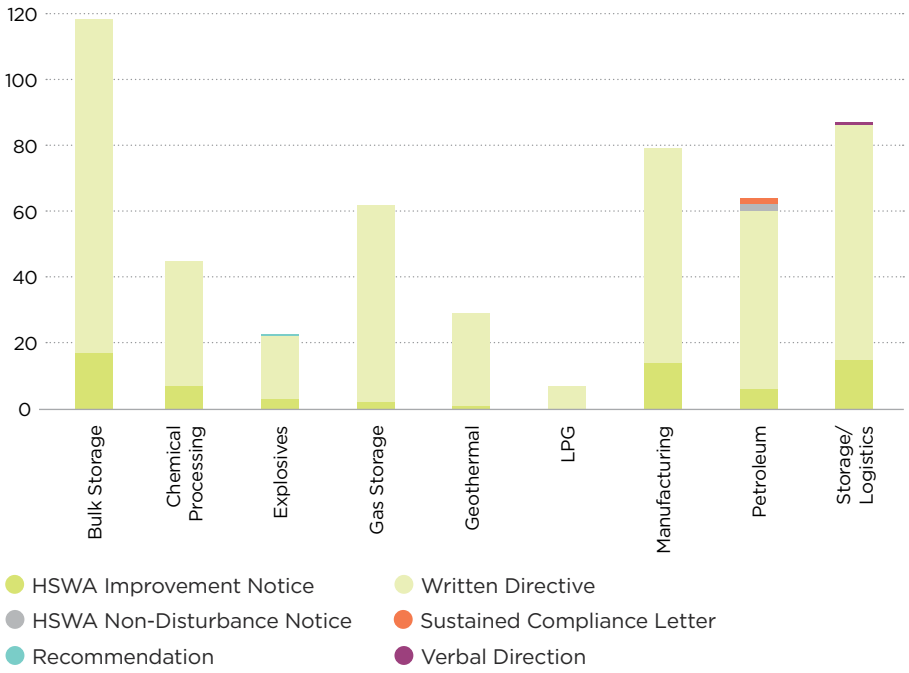

FIGURE 4: Enforcement measures taken in 2022/23 by industry sector

Case study

Step change reduction in safety risk makes business sense

The Major Hazard Facilities Regulations 2016 impose additional duties for managing risk including: identification of major incident scenarios, safety assessment, emergency plan, worker engagement, assessment of additional practicable control measures.

Since the introduction of the MHF Regulations the MHF inspectors have completed multiple focused inspections and engagements between Fonterra and WorkSafe leadership. As a result, Fonterra leadership committed to provide the necessary resources to address matters identified during the WorkSafe inspections.

After responding on numerous enforcements in 2019, Fonterra has continued to deliver on its bold commitment to elevate process safety performance across its entire manufacturing footprint to be on par with exceptional food safety, product quality, and environmental sustainability. Fonterra has seen the value of the principles of process safety at its MHF facilities and extended this thinking proportionally across a wider manufacturing footprint of 39 facilities in four countries.

In a recent conversation with Mr. Norris – Fonterra's Global General Manager for Critical Risk and Process Safety, commonly known as Chuck – he emphasised, "As the dairy industry has scaled in complexity over more than a century, its technologies can pose risks, but they are also indispensable in delivering the goodness of dairy to the world. However, our ongoing commitment to process safety has never just been about MHF compliance, rather the continued evolving of Fonterra into an even safer, more sustainable, and productive cooperative.

"I would encourage any primary manufacturing business to proportionally place principles of process safety within their safety strategy."

Fonterra has made substantial progress over the past three and a half years in rolling out its 14-element process safety management system. The company has maintained a close relationship with WorkSafe's High Hazards Unit during this period, leveraging insights to extend engagement, education, and enforcements to change process safety management across its manufacturing operations in New Zealand, Australia, Malaysia, and Sri Lanka. Fonterra's comprehensive safety assessments and consequence modelling have generated over 10,000 recommendations and more than 1,200 Safety Critical Elements (SCEs). Responding to these findings has significantly bolstered Fonterra's resilience

against rare but critical safety risks. As of the close of this financial year in July 2023, Fonterra has addressed over 7,000 recommendations since starting in 2019 and had made step change improvements in its SCE design verification. It has also rolled out 589 asset assurance strategies, implementing 391 dedicated SCE maintenance tasks, and invested millions to materially reduce hazardous substances and install, enhance, or remediate safety controls all in pursuit of its aspiration for zero serious harm.

These data points are just part of the story. Over the past year, Fonterra has invested around $60 million to dramatically reduce its anhydrous ammonia capacity from 28 tonnes to just 5 at its Whareroa site. This was accomplished through the use of modern technology, not available when the existing assets were designed and commissioned last century. The new plant rooms use three fully isolated and scrubbed chilled water systems, which now reticulate chilled water across the main pipe bridge in place of ammonia. A strategic decision was required to take this path and was influenced by stepping back from early recommendations of discrete MHF safety assessments seeking to make safe the status quo. Through identifying now available modern refrigeration technologies a more sustainable and energy efficient approach was viable. Mr Norris points out, “Fonterra has successfully eliminated numerous major incident scenarios at their MHF and significantly reduced the long-term costs associated with not having to maintain integrity of ageing, highly hazardous ammonia plant and systems. This is a win on many fronts, especially safety”.

In further discussion with Mr Norris, Fonterra is also in the last steps of commissioning three separate instantaneous chlorination systems at its Clandeboye (two off) and Te Rapa (one off) sites to remove liquified chlorine gas. An additional trial is also underway to test the business continuity resilience to a reduced chlorine holding at their MHF.

Lastly, Fonterra has been working with Waka Kotahi under the co-regulatory Rail Safety Act to modernise their Rail Safety Case for 13 industrial sidings. “While Rail is partially removed from achieving dairy processing, we must also get this right”. We applied similar MHF thinking to our simplified rail safety assessment, and this helped harmonise our safety case with like risks from scheduled hazardous substances. “It became clear, we could also help share rail insights with other industrial siding operators who may also not see rail at their core”.

Figure 5 shows the number of enforcement measures issued in 2022/23 by category and provides an indication of the key areas of concern to our inspectors. Last year, most enforcement measures were issued for health and safety issues relating to operational controls (27%), safety assessments (16%), and emergency response plans (9%).

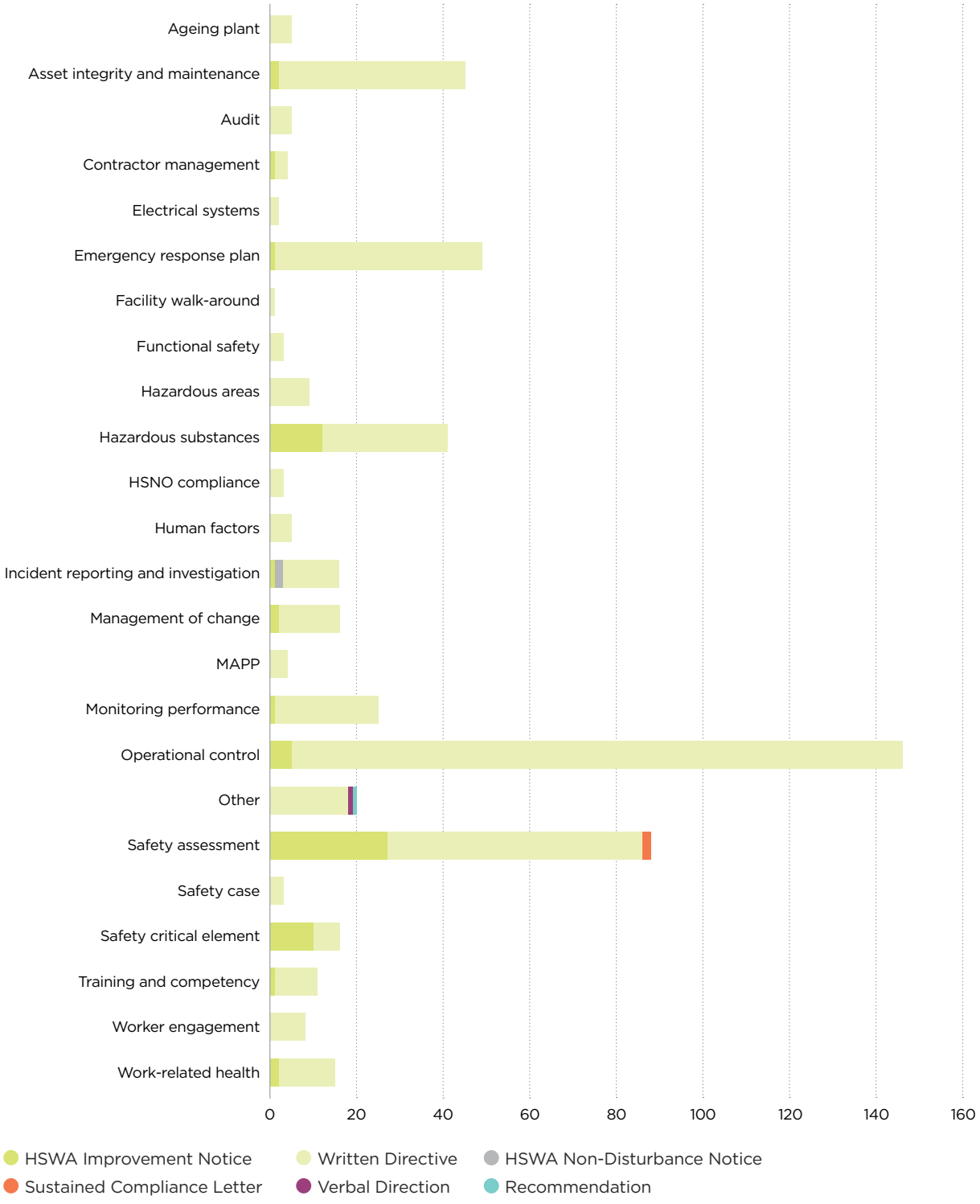

FIGURE 5: Enforcement measures taken in 2022/23 by category

1.4 Regulatory insight

Ageing assets

Ageing of plant (or the accumulation of damage) can present a risk to the health and safety of workers. Operators have a duty to manage this risk, so far as reasonably practical.

Through analysis of the data extracted from notifiable incidents, WorkSafe's High Hazards team has observed a general increase in loss of containment events when compared to previous years. There may be valid reasons for this, including a rise in operators notifying incidents in general. However, it is reasonably foreseeable that ageing assets are a significant contributary factor to this rise.

As the industry seeks to increase the economic life of assets, many will remain in operation longer than anticipated. Some oil and gas assets have been in service for more than four decades. Ageing assets are a significant concern globally in the oil and gas industry due to the potential risks they pose. For example, corrosion can weaken pipelines and increase the likelihood of leaks or spills, leading to environmental damage and safety hazards. Similarly, ageing offshore platforms may become less structurally stable over time, increasing the risk of accidents or failures.

Life extension of an asset means it can continue fulfilling its intended function without compromising its design, technical or operational integrity. As these assets age, they may require increased maintenance and repairs to ensure their continued efficiency, safety, and compliance with regulations.

There are three main categories of ageing: material degradation, obsolescence, and organisational issues. As well as platform structures, pipework, and pressure vessels, ageing can involve control and instrumentation systems, software, staff demographics, skills, training, and competencies.

Emphasis needs to be given to proactive risk management to mitigate the potential impacts of ageing assets. This involves, firstly, identifying damage risks applicable to the facility, then conducting regular inspections, evaluating asset performance and condition, estimating remaining useful life, and developing strategies for ongoing inspection frequencies, maintenance, repair, or where necessary, re-rating or replacement to identify and address potential risks before they escalate. This may require investment in new technologies and materials to improve the durability, continued reliability and performance of their infrastructure and ultimately the safety of the plant and equipment, thereby minimising the negative effects of ageing assets.

A comprehensive ageing asset management plan would typically include (but not be limited to) the following elements:

- **Inventory and assessment**: Identifying all ageing assets and assessing their current condition, performance, and remaining useful life or obsolescence.
- **Identification (analysis) of ageing plant risk**: Evaluating the risks associated with ageing assets, including safety, reliability, and financial risks. Prioritising assets based on criticality and potential impact.
- **Definition and implementation of control measures (inspection and maintenance strategies)**: Determining the appropriate maintenance strategies to be implemented, such as preventive maintenance, condition-based maintenance, or reliability-centred maintenance.
- **Cost estimation**: Assessing the costs associated with maintaining, repairing, or replacing ageing assets. This includes considering factors like labour, materials, downtime, and lifecycle costs.

- **Capital planning**: Developing a long-term capital plan that outlines the timing and funding requirements for asset replacements or major repairs.
- **Monitoring and performance measurement**: Implementing a system to track asset performance, maintenance activities, and costs. Regularly reviewing and analysing the data to identify areas for improvement.

It is expected that operators can clearly demonstrate that they have established ageing asset management strategies in place.

Thanks

Nick Dawtry
Deputy Chief Inspector, Petroleum and Geothermal

Process safety leadership and management

It is a requirement under New Zealand's Health and Safety at Work Act 2015 that officers undertake due diligence – that is, that they understand the risks and hazards of the business, keep themselves informed, and ensure that the business has the resources and systems to effectively manage all health and safety hazards. Leaders of a high hazard business are no different, however the potential to cause serious harm to multiple people off site is often significantly higher. Potential low frequency, high consequence events must be understood and demonstrably managed by our operators.

We will engage with leaders when there are signs that an operator does not fully understand process safety. These signs may be seen during our inspections or as the result of notifiable incidents, and include issues with resourcing, competency, and inadequate safety management systems.

These officer-level meetings are an effective means of communicating high hazard regulatory requirements to those with the most influence on the business' approach to process safety. We may need to focus on educating leaders about process safety, and the need for process safety competency and resources in the business. Personal safety and process safety incidents or events have different precursors and business leaders must understand that process safety requires different controls.

Knowledgeable process safety leadership is critical for managing major incident/accident hazards. A focus on process safety at senior leadership level is essential – there have been too many catastrophic events where lack of process safety understanding within the business leadership is determined to be a root cause. Well-known examples include the 2005 BP Texas City refinery disaster and the 2020 Anglo American Grosvenor coal mine explosion in Australia.

High hazard industry leaders need to be assured that the business' safety management system is implemented and operating correctly. Activities could include management reviews, management audits and, management site visits with an emphasis on process safety requirements. An understanding of 'weak signals' is also vital since precursor events for process safety incidents are generally more subtle compared with those for personal safety incidents.

At future inspections we will be looking for evidence of process safety leadership, including, but not limited to, management audits and reviews.

For further information read Corporate governance for process safety: Guidance for senior leaders in high hazard industries – OECD or relevant publications by Andrew Hopkins.

Our high hazard operators must ensure they have the knowledge, the resources, and systems to ensure the business understands and manages the major incident/accident hazards at their facilities and installations – and this has to be led and understood by leaders in these businesses.

Kate Studd
Acting Deputy Chief Inspector,
Major Hazard Facilities

1.5 Notifiable incidents

Notifiable incidents, known to high hazard industries as 'near-misses' or 'precursor events' must be reported to WorkSafe under section 24(1) of the Act, regulation 70 of the Petroleum Exploration and Extraction (PEE) regulations, regulation 33 of the MHF regulations, and regulation 35A of the Geothermal Energy regulations.

Figure 6 shows the number of notifiable incidents at high hazard sites between July 2017 and June 2023. Overall, the number of notifiable incidents reported has increased over time as expected, due to improved understanding by operators to notify as per their legislative requirements. Increased notifications from operators indicates better awareness of their health and safety responsibilities under the Act and regulations.

In the past 12 months (July 2022 – July 2023), 353 notifiable incidents were reported, more than the 270 reported in the previous year.

Inspectors will review reporting arrangements as part of our inspection approach. It is essential that operators monitor their processes for notifiable incidents as these are important indicators of failures in risk management. Having identified and reported incidents, operators should also investigate the causes of the incident, and take action to rectify failures and prevent their reoccurrence.

We will increase our emphasis on the investigation and insights from notified incidents in 2023/24 as we are finding the regulator is often reviewing these with the duty holder to ensure correct root causes are identified.

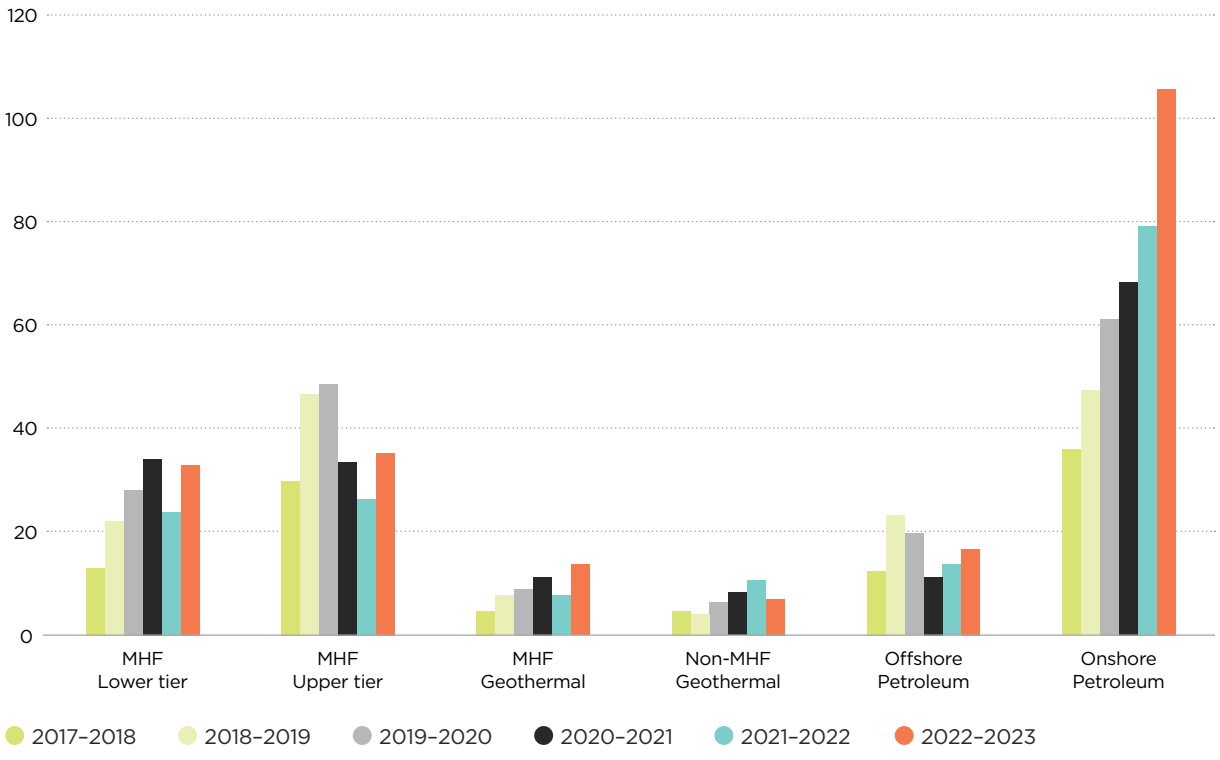

FIGURE 6: Notifiable incidents reported by high hazard site type between July 2017 and June 2023

Figures 7 and 8 show the legislative categories for notifiable incidents reported to WorkSafe for the four years between July 2017 and June 2023. The data shows that in the 2022/23 year, 76% of notifiable incidents involved damage to, or failure of, a safety-critical element that required intervention to ensure it will operate as designed, a slight decrease from 77% in 2021/22.

A total of 36 unplanned incidents (other than false alarms) requiring emergency plans to be implemented occurred and 14 incidents that did not cause but had the potential to cause a major incident occurred.

There were ten incidents involving an uncontrolled release of hydrocarbon vapour (exceeding 1kg). In different circumstances these incidents could have given rise to a major incident.

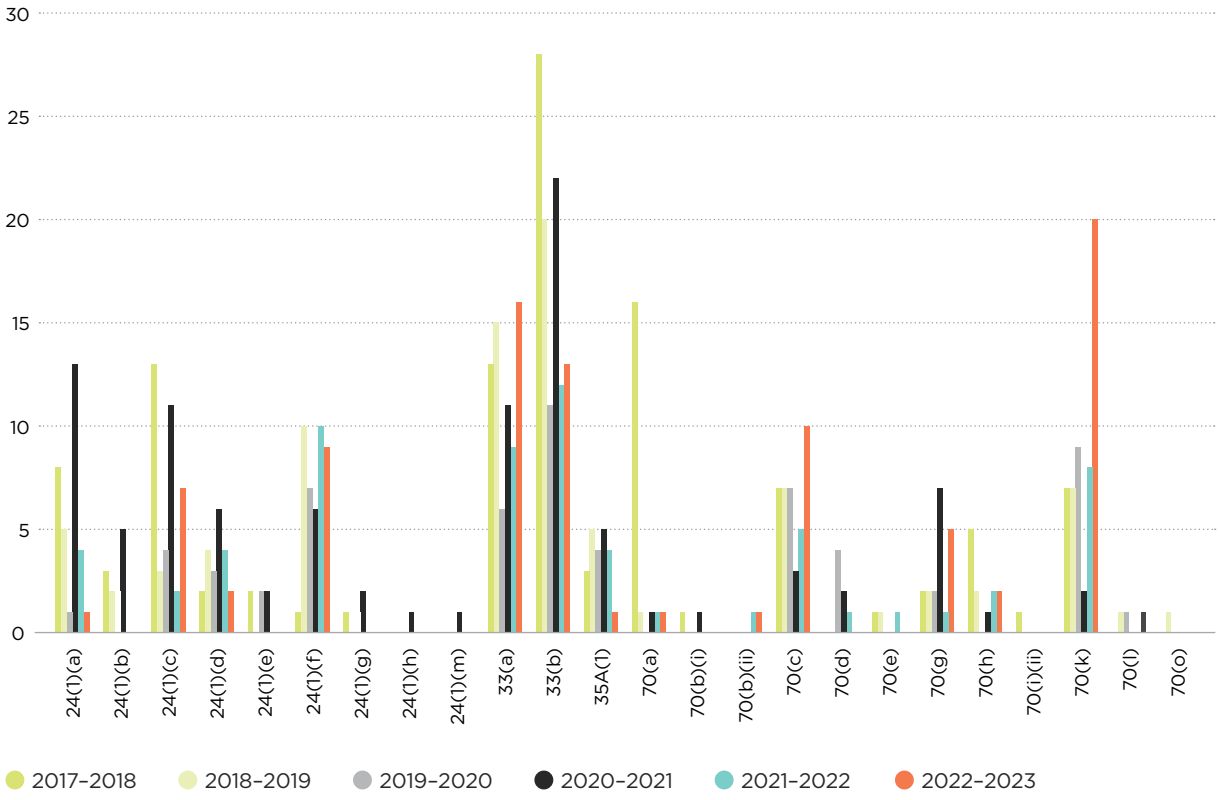

FIGURE 7: Legislative categories for notifiable incidents reported by high hazard sites between July 2017 and June 2023 (excludes damage to, or failure of, a safety-critical element that requires intervention)

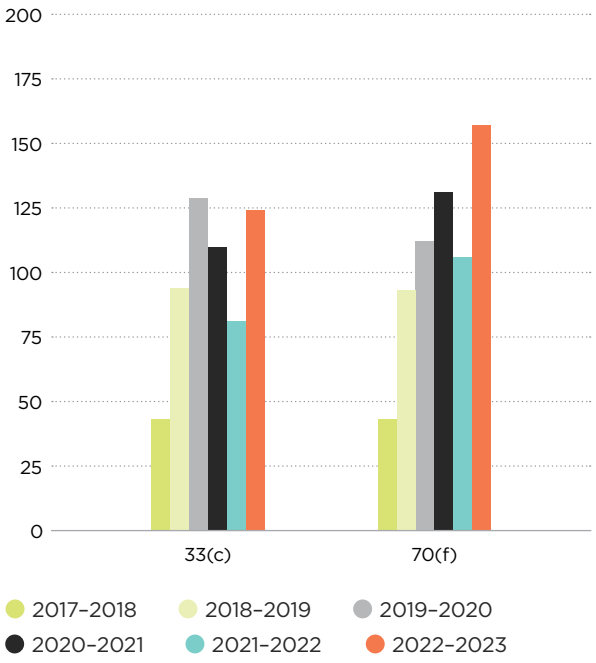

FIGURE 8:
Legislative category for notifiable incidents, reported by high hazard sites between July 2017 and June 2023 of damage to, or failure of, a safety-critical element that requires intervention to ensure it will operate as designed

1.6 Petroleum and geothermal regulatory notifications

Operators have regulatory requirements to notify WorkSafe prior to conducting certain operational petroleum and geothermal activities.

The PEE regulations require that notifications are submitted within specified timeframes before starting the notifiable operations. The notifications are received by WorkSafe and reviewed by petroleum and geothermal inspectors. Inspectors may follow up with operators as required.

The Geothermal regulations require that notifications of operational activity and bore manager applications are made to WorkSafe.

Figure 9 shows the legislative notification categories made to WorkSafe for the five years between July 2017 and June 2023. The data shows that most notifications received are well operation and well workover/interventions in the petroleum sector, and geothermal bore consents within the geothermal sector.

From the period July 2019 to June 2023 a steady increase in well operation can be observed because of several drilling/workover campaigns being conducted.

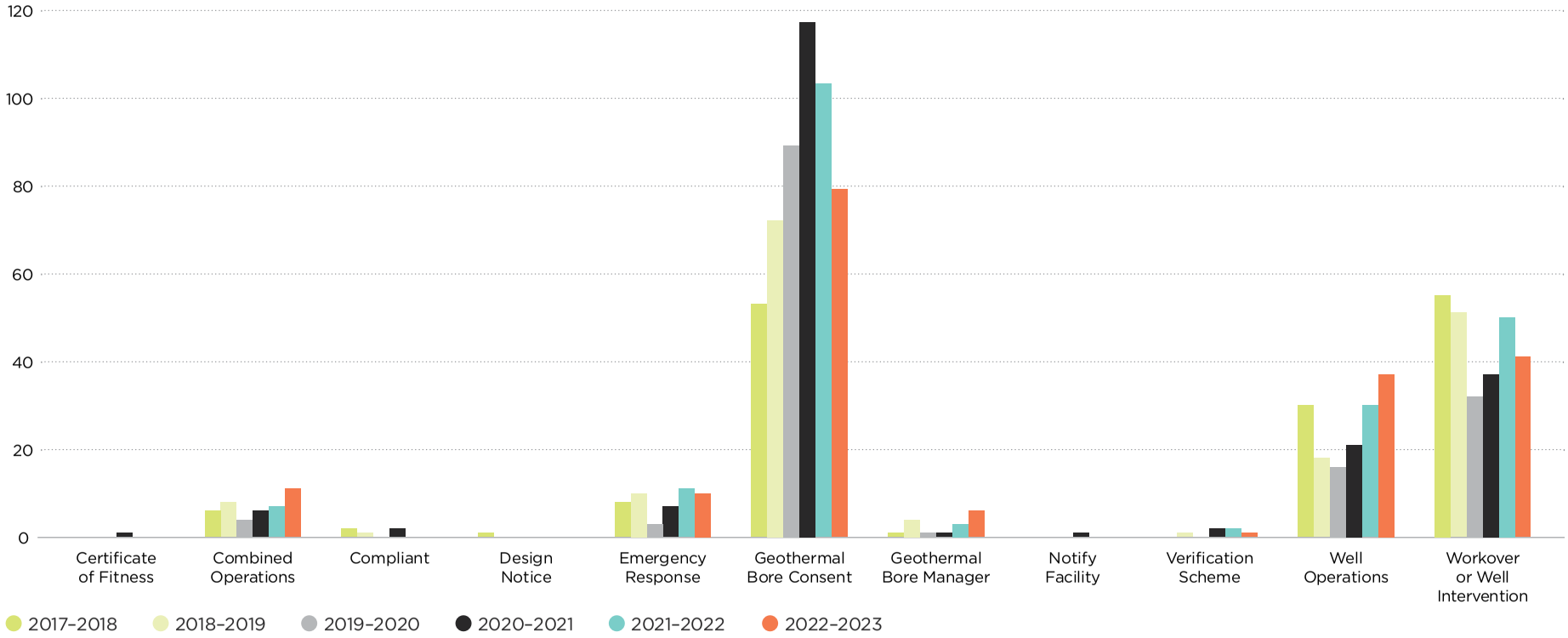

FIGURE 9: Petroleum and geothermal regulatory notifications between July 2017 and June 2023

1.7 High potential incidents

The High Hazards team has adopted the following definition of a high potential incident (HPI):

'An event, or a series of events, that causes or has the potential to cause a significant adverse effect on the safety or health of a person.'

High potential incidents (HPI) – what are they?

The incident must have occurred at a major hazard facility, petroleum, or geothermal installation to be counted in this measure.

The High Hazards team has a four-step process to assess HPIs:

1. Incoming notifiable incidents are compared against a list of incident examples and definitions in a prescriptive assessment.
2. If the notifiable incidents relate to one or more of the prescriptive events in step 1, and could meet the definition of HPI, these are then evaluated on the risk of harm by considering the potential consequences and likelihood based on the potential outcomes of a credible escalation scenario.
3. The outcome of the HPI assessment is then recorded in the database.
4. HPI assessments are reviewed by management with the outcome recorded in the database.

HPIs are a metric included in the WorkSafe *Statement of Intent* and are reported accordingly.

Incident analysis

A selection of notifiable incident cases received by WorkSafe over the past year is included in this report. Below is a summary of these incidents along with considerations for operators to take into account where relevant to their organisation.

INCIDENT DATE	INDUSTRY	ACTIVITY	SUMMARY	CONSIDERATIONS
July 2022	Petroleum and Geothermal	Well workover	A well control incident occurred following running tubing and about to run in hole to land out the tubing hanger. Water returns were observed at the bell nipple and a check of all pumps confirmed they were off and surface manifolds were closed to the wellbore. Returns flow increased so the annular preventer was closed on the tubing. Water then flowed out the flowline port via the tubing hanger, along with noise and structure vibration, and as a result the blow out preventer (BOP) blind/shear rams were closed. The surface pressure observed below the BOP upon closure was 100psi (6.9barg). Rig, casing, and service crews all mustered. Approximately 16m^3 of treated sea water used as well kill fluid was lost during the event. As the gas detection was not activated during the incident, it was initially thought that there were no hydrocarbons released. However, when the distributed control system (DCS) was examined post incident it was evident that there was a small volume of gas in the returns at surface.	– This incident demonstrates the value of functioning and tested well control equipment, diligent observation and checking by the crew, and practical well control procedures. – Have you considered the possibility of gas remaining in the reservoir section of the wellbore after killing the well? – What do you do to ensure that your fluid column (that is, primary barrier) is effectively maintained during periods when hole filling is stopped, for example, landing a string? – Have you practiced your emergency response procedures recently and applied learning to address any negative findings?
Aug 2022	Major Hazard Facilities	Normal operations	During static bulk storage tank operations, a communications failure alarm was sounded from the tank master PC screen. Upon intervention the terminal operator identified that a tank radar was in fault. To rectify the fault the radar head was replaced with a site spare, yet since replacement the radar continued to go into communications fault on an infrequent basis. The operator cleared the fault via the tank master PC screen thereby returning the radar to its normal operating state.	– This operator conducted electrical insulation and continuity testing and identified low insulation resistance readings at a terminal junction box (JB). All terminals in the JB were properly cleaned and retesting indicated a significant improvement in insultation resistance. – Data isolator switches also had faults and were replaced as were aging power, communication, and signal processing cards within the control system. – Are you regularly checking the condition of your tank radars, the effectiveness of cabling and electrical terminations, and the age and apparent reliability of control system cards, or do you operate a run to failure strategy for key monitoring equipment that assist significantly in the prevention of major incidents?
Aug 2022	Petroleum and Geothermal	Maintenance – mechanical	In a geothermal power station, gas was observed passing from plant that had been dismantled in preparation for overhaul. A gas meter identified high levels of hydrogen sulphide (H2S). The gas appeared to be coming from another operating unit via a common manifold. Low lying areas of the building where there was a risk of H2S accumulating were cordoned off. Nightshift workers were required to carry gas monitors and were limited to working in areas higher up in the building.	– Would you consider shutting down to remove the hazard whilst targeted plant and equipment are overhauled? – What controls are needed to tolerate escaping H2S? – Single valve isolations are fine in certain circumstances however in sour service double block and bleed isolations, or spading and blinding for a positive isolation are far more effective.

INCIDENT DATE	INDUSTRY	ACTIVITY	SUMMARY	CONSIDERATIONS
Aug 2022	Petroleum and Geothermal	Production operations – hydrocarbon	A drain valve from a flare knockout drum to the closed process drains was left open. Operators responded to rising pressure in the process drains and identified that a drain valve must be open. While locating the open drain valve, gas from process drains pipework vented via a condensate tank vent at tank roof level. This triggered line of sight gas detection. A subsequent compressor trip resulted in some minor flaring, along with increasing pressure further in the process drains. Because of this, operators were able to identify the link between flaring and process drains pressure. Line of sight gas detection alarmed again but did not activate emergency shut down (ESD). The control room operator (CRO) worked on reducing flaring rates while operators located the open drain valve on the flare knockout drum. Once this valve was closed all venting stopped, and process drains system pressure was reduced to normal condition.	– The operator forgot to close the valve after being distracted by a radio call. This simple omission ultimately led to a significant volume of gas being released. Do you mandate that plant operators stand by at the specific location when manually draining (or filling) tanks and vessels and to focus on the specific task until it is completed? – There were inconsistent methods for the manual draining task. Three valves could be operated to drain the knockout drum, and different operators used different valves. Furthermore, one operator understood that the vessel was to be drained at each operator round, regardless of the level in the vessel, increasing the frequency of the potential for gas blow by. Consistency and increased safety would result from a concise documented procedure for performing this task. – Previous hazard studies had looked at individual parts of the process drains system but an all of system hazard review had not been completed. How sure are you that you have covered all hazards associated with your plant and equipment? – Automation of draining would improve reliability of the task, which would decrease operator exposure and frequency of human interaction with the system. Furthermore, instrumentation would provide diagnostic data in the control room in the event of a failure.
Sep 2022	Major Hazard Facilities	Plant start-up	Following a maintenance turnaround, various plant was being brought online as per reinstatement procedures. Hydrocarbon gas was being progressively reintroduced to one section of plant when an unusual noise was heard likened to escaping gas. On investigation it was found that a ¾" plug had blown off a valve fitting attached to a heat exchanger. A large volume of hydrocarbon gas escaped until operators were able to divert to nitrogen to fully purge the system. The emergency plan was activated, and all personnel evacuated to the muster areas.	– During the turnaround, this plug had been lightly screwed into the corresponding valve, with an intention by the fitter to return at a later time to tighten. Operational checks before reintroducing gas failed to notice the plug was not tightly screwed. Documenting the maintenance work packs, the desired valve position and plug installation would have been beneficial. Do you implement formal and documented operational tightness checks post-turnaround? How thorough is your programme? – A significant volume of gas was released during this incident in an area where electrical equipment was in service. The integrity of equipment to prevent potential ignition sources is critical to overall plant safety.

INCIDENT DATE	INDUSTRY	ACTIVITY	SUMMARY	CONSIDERATIONS
Sep 2022	Major Hazard Facilities	Forklift use	A 200L drum of Lactanol liquid was pierced by a forkhoist tine and split, causing the contents to spill to the ground.	– Staging areas utilised for mechanical handling of drums on pallets by forklifts and forkhoists need to be as flat and level as possible to prevent awkward approach angles for forklift tines. – The frequency of forklift movements around unprotected equipment containing hazardous substances increases the risk of damage and spills. – Competence assurance of personnel using forklifts for specific activities is as necessary as experience, training, and supervision. – Certified forklift tine attachments for dedicated loads may reduce the general lack of means for the forklift operator to accurately determine tine tip position. – What response plans do you have in place and are they tested to manage a spill such as this?
Nov 2022	Major Hazard Facilities	Production operations – geothermal	At a geothermal power station, the rostered night shift plant operator called in sick. The management team was unsuccessful in their attempts to engage another operator at short notice. A proposal was agreed and enacted to put someone in the control room to purely watch the screens, with no authority to make any operational decisions or actions. If an alarm or concern was raised, they would immediately call the operations manager who would come to site. It was noted that all plants have emergency shut down/fail safe programmes that would automatically implement if needed. A contractor employee, believed to have knowledge of the plant, was sourced to stand in. This person was relieved by a company operator engaged some hours later.	– A reduction in the number of operators was a result from a company restructuring; some of the operators were released earlier than originally planned. This meant management temporarily filled some operator roles. Sickness of the one remaining operator exacerbated the situation, ultimately leading to a flawed decision to utilise a contractor to watch plant screens overnight. The contractor was not a trained and competent operator. The situation contravened the requirements of the facility safety case.
Dec 2022	Petroleum and Geothermal	Well drilling	During offshore drilling operations, the knuckle boom contacted a drill pipe on the pipe feeder as the pipe handling crane slewed, causing the pipe to dislodge from the feeder and coming to a rest against the pipe handling crane boom and bay. All personnel on the deck were focused on preparing for a complex lift and did not notice the crane was about to impact the pipe.	– This incident illustrates that duty holders must consider all hazards related to each possible configuration of their equipment, and then put effective controls in place for each arrangement. – The possibility of being able to dislodge pipe from the pipe feeder table with the rig in the configuration it was at the time of the incident had not previously been identified and understood. – Being preoccupied with the next significant task reduces the situational awareness of those involved. – How confident are you that your competence assurance programme is sufficiently robust to ensure trainees transit smoothly and safely towards competence?

INCIDENT DATE	INDUSTRY	ACTIVITY	SUMMARY	CONSIDERATIONS
Jun 2023	Major Hazard Facilities	Tank or vessel draining	During a vessel reinstatement the vessel was being drained of water using LPG vapour as the motive force. A flexible hose was connected to allow the water to be directed into a culvert. As the water phase ended, vapour phase mixed with water caused the hose to whip while releasing water/vapour into the air in sufficient volume to activate gas detectors on a neighbouring site.	– In planning work, the hazards associated with each work step need to be identified along with the measures to control each hazard. Also, operators must consider identifying other measures to control a situation if things go wrong. – Operators must pay full attention to the task of draining or filling vessels during maintenance activity. – During work planning and preparation, operators need to consider and plan their responses to potential emergency events.
Jun 2023	Major Hazard Facilities	Product load-out	Following an LPG load-out, a valve at the end of the transfer hose remained slightly open allowing LPG vapour to leak from the hose until it was detected by a nearby gas detector. On detection the plant shut down and staff were alerted by an automated SMS service.	– How do you ensure operator diligence to close the valve and check? – Is maintenance effective to ensure positive valve shut off? – Would a dual valve arrangement option assist against leakage? – The value of local gas detection and shut down executive action is proven.

TABLE 1: - A summary of incidents along with considerations for operators to take into account where relevant to their organisation.

1.8 Industry working groups

Liquefied Petroleum Gas (LPG)

The LPG working group was established in June 2021 to share knowledge between High Hazard inspectors, coordinate across LPG operators, and define our strategy for facilities holding LPG.

All High Hazard inspectors with responsibility for operators and facilities holding LPG are members of the group, alongside the Chief Inspector, Deputy Chief Inspectors and representatives from WorkSafe's Hazardous Industries Teams.

A key focus for the group has been to identify the process safety maturity of operators and intervene as required. Work continues on benchmarking of control measures (including safety-critical elements), comparing consequence models and safety assessments. Compliance with the *AS/NZS 1596:2014 The Storage and Handling of LP Gas* has also been a topic for the group.

This year we met with the GasNZ technical committee to share observations from the previous year and discuss where we will be focusing our efforts in the coming years. Engagement with other regulators and GasNZ will continue.

The group will continue to work together on setting expectations for operators of high hazard facilities with LPG. This will include ageing plant management, overlapping with that working group.

Asset integrity

The focus of the asset integrity working group (formerly known as the ageing plant working group), has been to provide internal guidance to assist WorkSafe inspectors in preparing for and undertaking inspections related to asset integrity.

Being a broad subject covering many aspects, WorkSafe has chosen to take a phased approach to asset integrity-related inspections, with initial discussions largely aimed at understanding the organisational support structures and risk management systems of operators.

WorkSafe has a specific interest on systems and resources used by operators to identify applicable damage mechanisms. Follow-up discussions therefore look to obtain a better understanding of the nature of asset integrity risks that have been identified by the operator and the control measures established to manage the risks identified.

The working group includes representatives from across WorkSafe's High Hazards, Mining and Extractives, and Technical Programmes and Support teams.

Since the establishment of the working group, engagements with 15 operators have been held regarding their systems of asset integrity risk management.

To date, more than 30 written directives and three improvement notices have been issued. The most common theme identified has been the need for operators to assess their system of asset integrity risk management against the responsibilities outlined in in-service inspection standards.

Going forward, WorkSafe plans to develop general guidance for operators in relation to asset integrity risk management systems.

Storage/logistics

The storage and logistics working group (originally called the warehouse industry group) was established at the end of 2021.

The working group consists of Major Hazard Facilities (MHF) inspectors for storage and logistics facilities and includes other inspectors from MHF and Petroleum and Geothermal (P&G) that have large storage elements to their sites.

Recently, representatives from hazardous substances and hazardous industries have also attended to provide their perspective to the group.

The aim of the group is to improve knowledge and consistency across inspectors and identify common issues and good practice across the industry.

The group meets periodically to share learnings and experiences from inspections and discuss areas of concern or that require more clarity or consistency. A key component of this is sharing information on standards used and controls measures in place.

Recently there has been a focus on racking standards, separation distance requirements, fire suppression and gas detection.

Bulk storage

The bulk storage working group was established in March 2022.

This group continues and expands on the scope of a previous working group focused on the Buncefield recommendations for in-scope operators. The group currently covers all bulk hydrocarbon storage operators (total of 47 sites) but will expand to include bulk tank storage of other chemicals in due course.

The working group consists of inspectors/representatives from Major Hazard Facilities, Petroleum and Geothermal, Technical Services, and Hazardous Industries and Certification teams.

The group meets periodically to discuss topics and share learnings from recent inspections and incidents.

The aim of the group is to improve consistency amongst the inspectors and to collaborate on identifying areas to focus on at future inspections.

Safety critical elements will continue to be a focus area for this working group. Our inspectors have started to build a database of what safety critical elements each facility has. This will be part of enabling the working group to assess where there has been positive uptake of controls and where further improvement may be warranted.

Inspectors have started analyzing data from reported incidents and issued enforcements specific for this group to understand any trends that will be focused on during inspections. Along with asset integrity management these topics will be a focus for our inspectors in the coming years.

The group will also be considering additional means of engagement with the industry outside of inspections and the potential for sharing targeted learnings in the future.

2.0 Our focus for the year ahead

IN THIS SECTION:

2.1 High Hazards strategy

For the 2023/24 year, the High Hazards team will prioritise inspections based on the highest inherent risk to workers and communities coupled with visiting operators who are still developing their health and safety systems or are slow to adopt good industry practices.

The strategy can be broken down into the following elements.

Ensuring operators meet core regulatory requirements

Target highest risk areas (including risk to the community)

Targeting low maturity operators and size of risk

Safe work, healthy work

Develop comprehensive data sets of operators performance and the impacts of their business on communities

Spending our levy funding to lift industry standards

2.2 Unannounced inspections

High Hazards inspectors have traditionally provided companies notice of inspections. The benefit of doing this allows the company time to prepare and have the right people at the site to facilitate the inspection. For the year ahead, on occasions, inspectors will undertake unannounced inspections. The reason for this is to align with good regulatory practice and findings from the Pike River Mine Royal Commission of Inquiry recommendation:

> "The field inspection programme should define the types of activities to be carried out, by whom, how often and how they will be reported. The frequency of activities will depend on the potential consequences of non-compliance, the operating environment of the industry, technological complexity, and the compliance profile of the particular workplace. Visits by inspectors to a workplace should be a mixture of announced and unannounced visits".
>
> Royal Commission's final report, Volume 2, Chapter 25, para 9

In other areas of New Zealand industry, unannounced inspections are welcomed and sometimes asked for by companies with mature health and safety management practices. They view this type of inspection as a snapshot of their own workers applying their own systems on a particular day.

When conducting unannounced inspections, Inspectors will only spend a few hours on site and generally focus on one particular area of the operation. They will ask to speak with the most senior person at the operation when they arrive on site.

2.3 Investigation and analysis of notifiable incidents

In the 2023/24 year, we will continue to ensure complex process safety incidents and other precursor events are followed up, considered for investigation, investigated as required to identify root causes, and reported on in a timely manner. Concurrent assessment of High Potential Incidents remains a significant focus area and we will seek to establish, with the assistance of the reporting duty holder, the credible escalation scenario for each incident to reliably improve such assessments of incident potential. In some cases, the outcomes of this investigative work will support decisions as to whether enforcement or other measures will be taken or not. Continuous improvement of our processes and procedures to ensure investigation thoroughness and consistency is also an important part of our work scope throughout the year.

We will also continue to gather incident data from notifiable incidents reported to WorkSafe and analyse these for themes, trends, and common learning. Each reported incident will be added to the database and collectively analysed to identify and develop trend information. Conclusions drawn from the analyses will be used to assist the determination of strategies for ongoing site inspections. Learning from incidents is an important part of analysing the data to which we aim to present back to industry via a range of methods for ongoing consideration and continuous improvement.

2.4 International regulatory engagement

International Offshore Regulators Forum

WorkSafe is an active contributing member of the IRF for global offshore safety. This group of international regulators is made up of representatives from New Zealand, Australia, UK, USA, Mexico, Canada, Brazil, Norway and Denmark. The forum meets twice annually, and we encourage you to check out the IRF website irfoffshoresafety.com to view the range of information relevant to high hazard industries.

The IRF and industry identified three opportunity statements to be addressed collaboratively with the internationally recognised industry associations of International Association of Drilling Contractors (IADC) and International Association of Oil and Gas Producers (IOGP). More information on these opportunity statements can be found on the IRF website, with regular updates published.
You are welcome to contact us to discuss these further.

In addition, the IRF publishes monthly articles which you are welcome to view on the IRF website: irfoffshoresafety.com

Australia, currently the IRF Chair through to December 2024, hosted the IRF Safety Conference and AGM in Perth, Australia on 2–6 October 2023. The conference was an opportunity for the global industry and its regulators to discuss matters with a view to encouraging further safety risk reduction.

WorkSafe also attended one OECD regulator meeting in October 2023 (via Zoom). The meeting, held in Paris, was about sharing what has been learnt from chemical accidents around the world.

WorkSafe Victoria

In the last year WorkSafe inspectors met with their counterparts in WorkSafe Victoria to share information and discuss approaches to MHF in the different jurisdictions. WorkSafe Victoria introduced MHF legislation in 2000, following the Longford incident, and the Australian work health and safety model regulations are based on the Victorian regulations. WorkSafe Victoria has a lot more experience in implementing MHF legislation than in New Zealand. There is much our inspectors can learn from the approach Victorian inspectors take with operators and how this has evolved over time. Topics that have been discussed include ageing plant, common operators, publicly available information, approach to inspections and reporting to operators.

We are also involved in the Australian regulators' community of practice for MHF regulators, that includes government inspectors from all Australian jurisdictions. This forum discusses common issues including inspection approaches, interpretation of legislation, common operators, specific industries and hazardous substances.

2.5 Feedback

We are keen to know what you think and how we can provide better or more useful data next time. Please send any feedback to: hhu.mhf@worksafe.govt.nz

Disclaimer

WorkSafe New Zealand has made every effort to ensure the information contained in this publication is reliable, but makes no guarantee of its completeness.

It should not be used as a substitute for legislation or legal advice. WorkSafe is not responsible for the results of any action taken on the basis of information in this document, or for any errors or omissions.

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