

# *Marine Drilling and Blasting (D&B), and Social Licenses to Operate*

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# Marine Drilling and Blasting & Social License UN Sustainable Development Goals [SDG]

- The UN Sustainable Development Goals [SDG] that apply to this paper are:
  - #8. Decent Work and Economic Growth;
  - #14. Life below Water; and
  - #16. Peaceful and Inclusive Societies.



Marine Drilling and Blasting is sometime necessary to remove strong rock,



# Social License

- Failure to obtain Social License is an important reason for dredging companies winding up their Drilling and Blasting (D&B) arms, leading to a reduction in experienced contractors
- An SLO is not a formal licence, but an acceptance of a project by the wider public (community /stakeholders)
- A Legal Licence to Operate (LLO) is the attainment of required legal permits and approvals for a project to proceed



# Boutilier and Thomson (2011) – Stakeholder Communities

Stakeholders - anyone having a stake or an interest in a project.

- **Communities of Place:**
  - ◇ Local business; and
  - ◇ Community groups
- **Communities of Interest:**
  - ◇ National and international organisations; and
  - ◇ Political activists.
- **Communities of the disengaged.**



- *Reference: Boutilier R. and Thomson I. (2011), Modelling and measuring the Social Licence to Operate: Fruits of a dialogue between theory and practice, International Mine Management, Queensland, Australia*

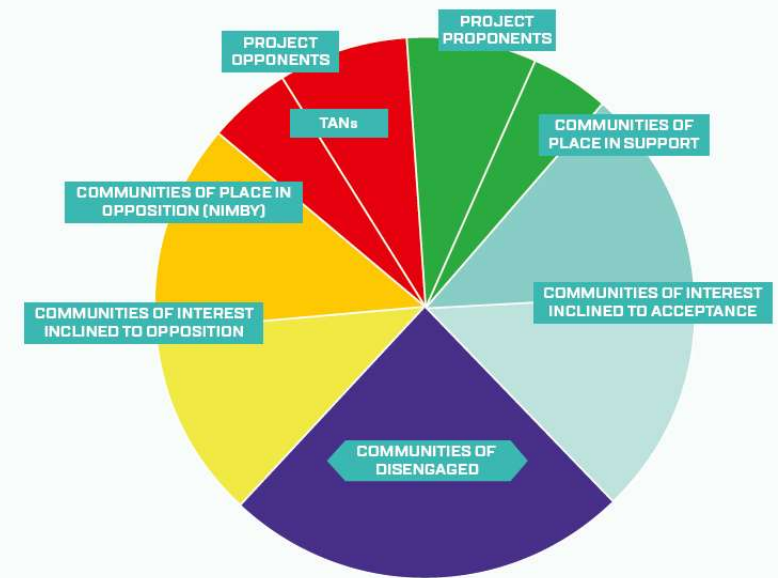


FIGURE 1  
Stakeholder community types.

Biernaux, Miller, Terra et Aqua 2021



# Boutilier and Thomson (2011) – Four Factor Model

- Bouthillier and Thomson (2011) developed their Four Factor Model of the SLO.
- Using the terms:
  - ◇ Project Legitimacy ; and
  - ◇ Project Trust.
- Project Legitimacy
  - ◇ Originally economic but extended to include Environmental Approvals and other Legal Licenses.
- Project Trust
  - ◇ Stakeholders need a higher level of trust in the project before they grant social licence. Normally only assured when Mutual Trust is achieved.



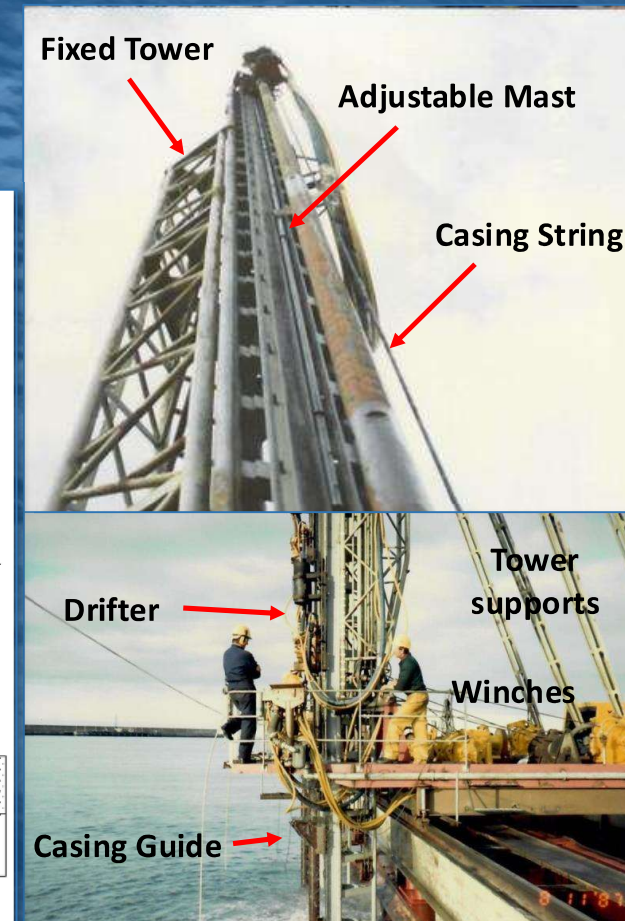
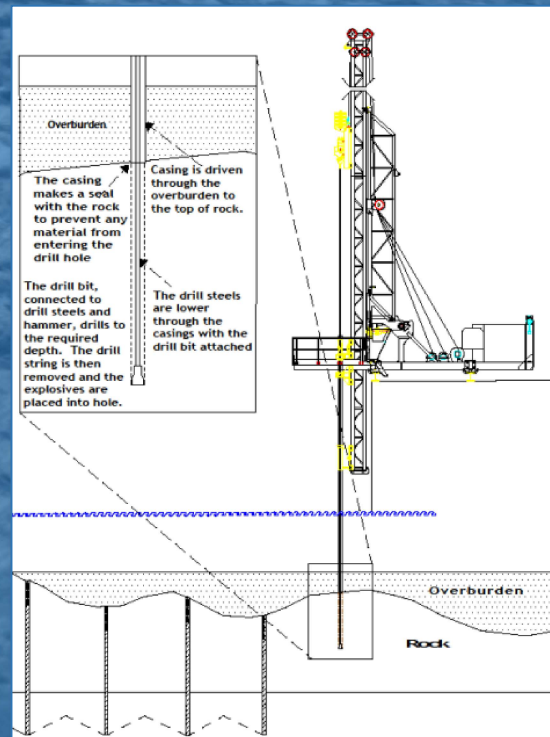
# Boutilier and Thomson (2011)

## – Four Factor Model

	Level	Description	Authors' Assessment	Legal License
4. Trust	Institutional Trust	Stakeholders have mutual trust	Positive identification with project is unlikely without this.	Compliance with approvals conditions are demonstrated.
3. Trust	Interactional Trust	Stakeholders are cooperating	Without this stakeholder approval is less likely.	The conditions mandated in environmental and other approvals has been clearly communicated.
2. Project Legitimacy	Socio-political Legitimacy	Proponents meet stakeholder expectations of honesty and fairness.	Without this stakeholder approval is unlikely.	Environmental and other approvals obtained.
1. Project Legitimacy	Economic Legitimacy	The project offers a clear economic benefit to the community	Without this stakeholders will withhold or withdraw any social license.	Environmental and other approvals processes are in progress.

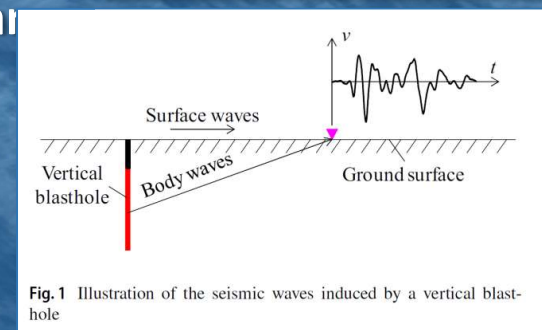
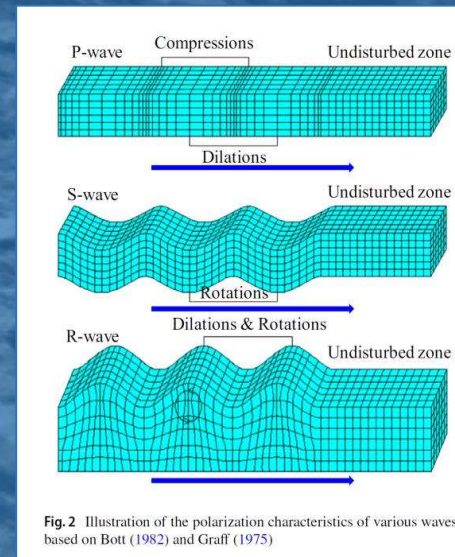
# Project Legitimacy - the Marine D&B Method Statement

- **Equipment**
  - ◇ Travelling Gantry
  - ◇ Tower assembly
  - ◇ Drilling spread
- Casing driven through overburden to competent rock, which will not collapse hole
- Drilling the hole into rock continues with a drilling bit
- Drill strings are extracted and hole is immediately charged
- Casing is extracted and the signal cord tied off
- Rig moves to next hole
- Blast group of holes on daily or shift basis



# Project Legitimacy – Environmental Impact of Blasting

- Minimum Velocity on Detonation (VOD) = 3,400 m/s
- Waves produced, attenuate exponentially with time and distance, but cause damage to buildings, structures and marine animals.
- Consist of Body waves (P–compression, S-shear) and Surface waves [P-waves arrive first]
- Seismic waves propagate through the seafloor, adjacent land and interfaces – ground and water / ground and atmosphere. (PPV mm/s)
- Shock waves caused mainly by gas expansion, move faster than speed of sound, range is short. (kPa)
- Sound waves have greater range and are dangerous to marine mammals' auditory functions. [dB re 1  $\mu$ Pa)



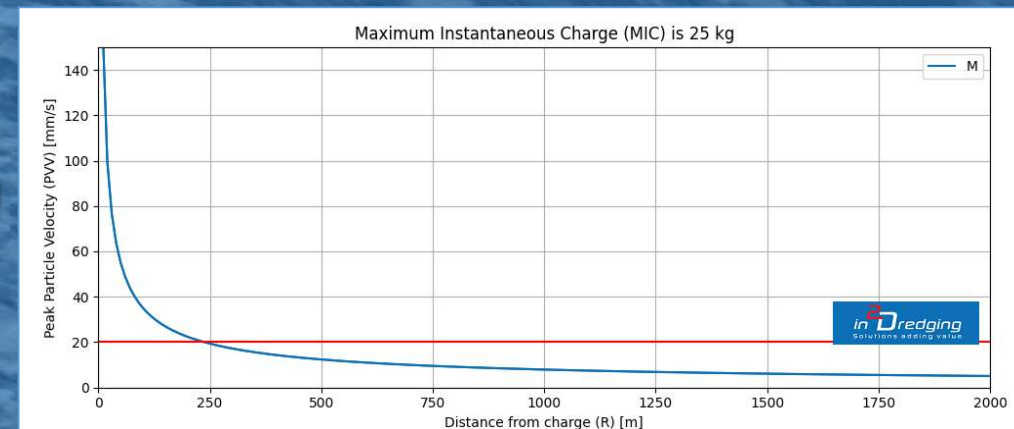


# Project Legitimacy – E. Approvals - Ground Vibration Control

- Determination of the Maximum Instantaneous Charge (MIC) that will not damage structures
- Measured as Peak Particle Velocity (PPV)
- Work with standard PPV limits

$$V = Kg \left( \frac{R}{\sqrt{Q}} \right)^{-B}$$

$$Q = \left( \frac{R}{\frac{V}{Kg}^{1/-B}} \right)^2$$



## British and German Standards

<b>AS 2187.2 2006</b>
V [mm/s] vector Peak Particle Velocity (PPV)
R [m] distance between charge and point of measurement
Q [kg] Maximum Instantaneous Charge (MIC)
B Attenuation empirical parameter
Kg Geological empirical parameter

Type of structure for the project	Guideline criteria in vibration velocity (PPV), mm/s	Reference
Berthing/mooring dolphins, access bridge, loading platform with concrete/steel marine pile structure	80	DIN 4150
Utilities (water, electrical, communication and sewer), ammonia export and re-circulation pipelines and diesel fuel lines, along the berth access and platform	50	BS 7385
Landside industrial buildings, including office, storage shed	20	DIN 4150
Landside industrial facilities, including above ground fuel tanks and vertical tanks	50	BS 7385
Landside utilities (water, electrical, communication and sewer), ammonia export and re-circulation pipelines and diesel fuel lines, above ground	50	BS 7385
Landside utilities (water, electrical, communication and sewer), ammonia export and re-circulation pipelines and diesel fuel lines, below ground	50	DIN 4150

# Project Legitimacy – E. Approvals - Sound Waves Propagation

- **Foundation Paper - *Aquatic Mammals Noise Exposure Criteria (Southall et al. 2007).***
- **Injury from shock waves is only possible close to the blast.**
- **Sound waves have the least attenuation, therefore are felt at greatest range.**
- **Marine mammal species have major differences in auditory capabilities.**
- **For Whales and Dolphins [cetaceans], sound is critical for locating and communicating with others, navigating, and finding food.**
- **Cetaceans, especially baleen whales with heightened auditory and sonar ability are most sensitive to auditory damage.**
- **Therefore, they are the most sensitive to blasting.**

*Aquatic Mammals Noise Exposure Criteria (Southall et al. 2007).*

*Acoustic Effects Marine Mammals [NOPSEMA 2019]*



Dolphin Discovery Centre Bunbury

# Project Legitimacy – Sound Waves Propagation - Functional Hearing Frequency

## Effects in severity

- **TTS – Temporary Threshold Shift**
  - What is the behavioural marker?
- **PTS – Permanent threshold Shift**
  - What is the behavioural marker?
- **Translating Behavioural markers to injury**

Functional Hearing group	Est. auditory band width	Animal
Low-frequency cetaceans	7 Hz -22Hz	Balleen Whales Humpback whale Southern Right whale Blue whale
Mid-frequency cetaceans	150Hz – 160Hz	Toothed Whales Bluenose dolphin Short beaked dolphin Humpbacked dolphin Orca
Pinnipeds in water Eared seals	75Hz – 75kHz	Australian Fur Seal New Zealand Fur Seal Australian Sea Lion
		True seals
Sirenia	1kHz – 18kHz	Dugong
<i>Southall et.al.</i>		

# Behaviour Severity Scale – Southall et al. 2007

*Kara Capaldo Getty Images – Treehugger 2021*

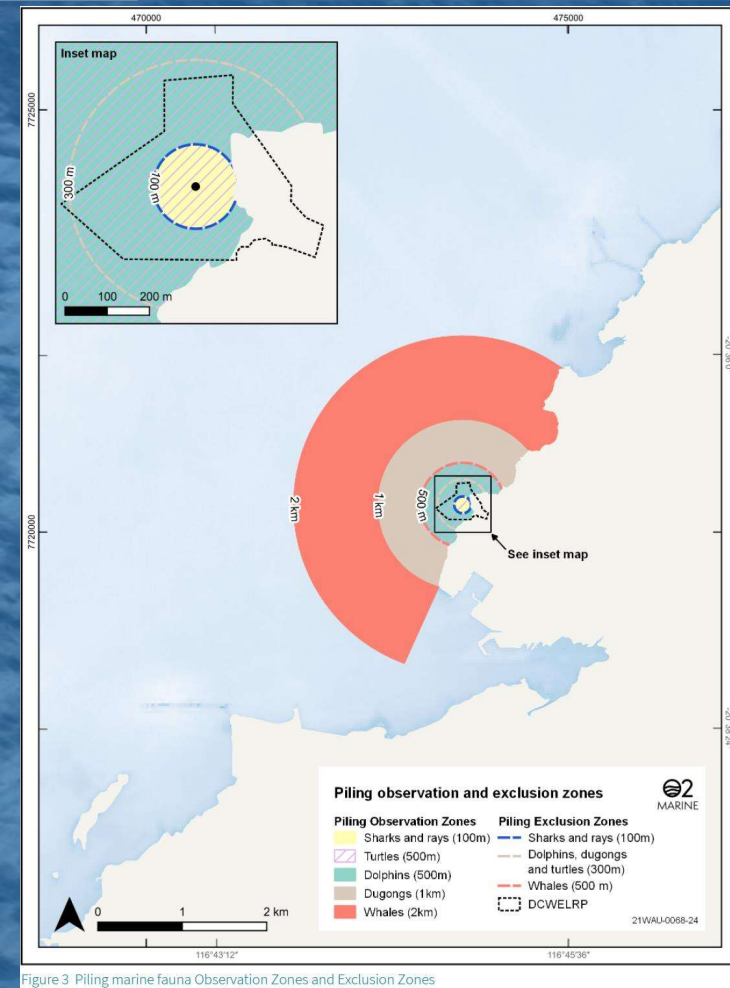
- 0. - No observable.
- 1. – Brief orientation response.
- 2. – Brief change in vocal and respiration.
- 3. – Further vocal / respiration changes, minor movement changes – no avoidance.
- 4. - Moderate movement and vocal change. Minor changes to group distribution - no avoidance.
- 5. – Extensive or prolonged movement and vocal change – moderate changes in group distribution - no avoidance.
- 6. – Brief mother/calf separation. Aggressive anti-predator behaviour - moderate avoidance.
- 7. – Moderate mother/calf separation. Extensive aggressive anti-predator behaviour - sustained avoidance.
- 8. – Significant mother/calf separation from observable communication disruption - extreme avoidance.
- 9. - Panic and flight.

# Project Legitimacy - Environmental Approval

## Example: Marine Mammal Management Plan Appendix A – Underwater Noise Management Procedures

- **Create Management Zones;**
  - ◇ Exclusion Zone
  - ◇ Observation Zone
- **Appoint Marine Fauna Observers (MFO)**
- **Blasting restrictions**
  - ◇ In daylight hours for monitoring animals
  - ◇ Restrictions around poor visibility
  - ◇ When water level is mid-tide or below
  - ◇ Piling and blasting not to occur sequentially within 24 hrs
- **If animal sighted**
  - ◇ Blast only after MFO gives all clear
  - ◇ 2 minute – 30 minute after sighting rule

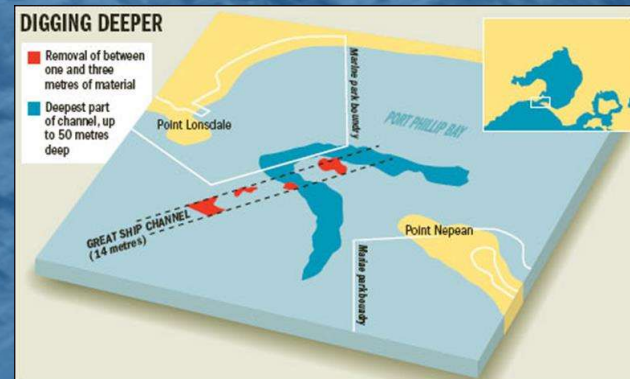
Pilbara Port  
Authority



# Project Trust - Communication

- Gaining Stakeholder Trust introduces a political element that requires further efforts beyond the Environmental Approval.

- ◇ Being seen to comply with, all permit conditions.
- ◇ Transparent and simple Communication
- ◇ Maintain open relationships with local businesses
- ◇ Establish a shared set of facts with the larger body of Stakeholders
- ◇ Counter disinformation, extreme framing and emotional trigger words, like:
  - ‘Blasting’
  - ‘Behavioural change’
  - ‘Kill’



# Project Trust – Proponent Proactivity

- Avoidance of unexpected events by extensive pre-project preparation
- To win Trust, Proponents cannot afford any well-publicised incident.
- Where necessary, Proponents go beyond Regulator base-line requirements.
- Should become fully conversant with site habitats and animal behaviours.
- Know more about your site than project opponents.
- Invest early in up-to-date technology.
- Project surveillance and monitoring to be better than project opponents.
- Build up-front Social License cost into the project budget



# Project Trust

Questions?

*FREVIEW News*





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