



**MWH**

# **Achieving an Environmentally Sustainable Stream Diversion Design in an Opencast Mining Area**

Presented to: New Zealand Minerals Conference

Presented by: Craig Evans

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# Sustainable Management

**Managing the use, development and protection of natural and physical resources in a way, or at a rate, which enables people to provide for their social, economic and cultural well-being while...**

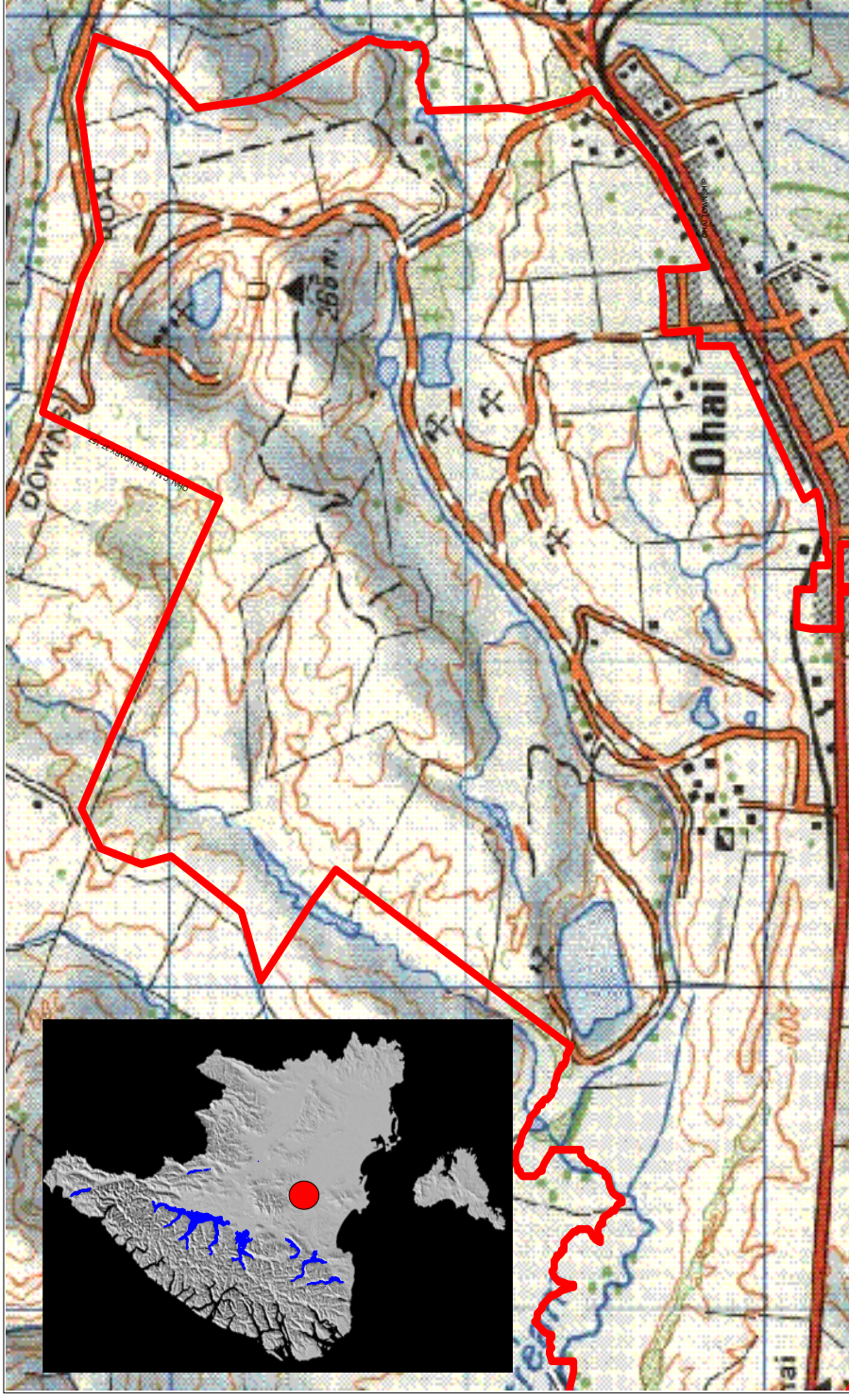


# Sustainable Management: Bottom Lines

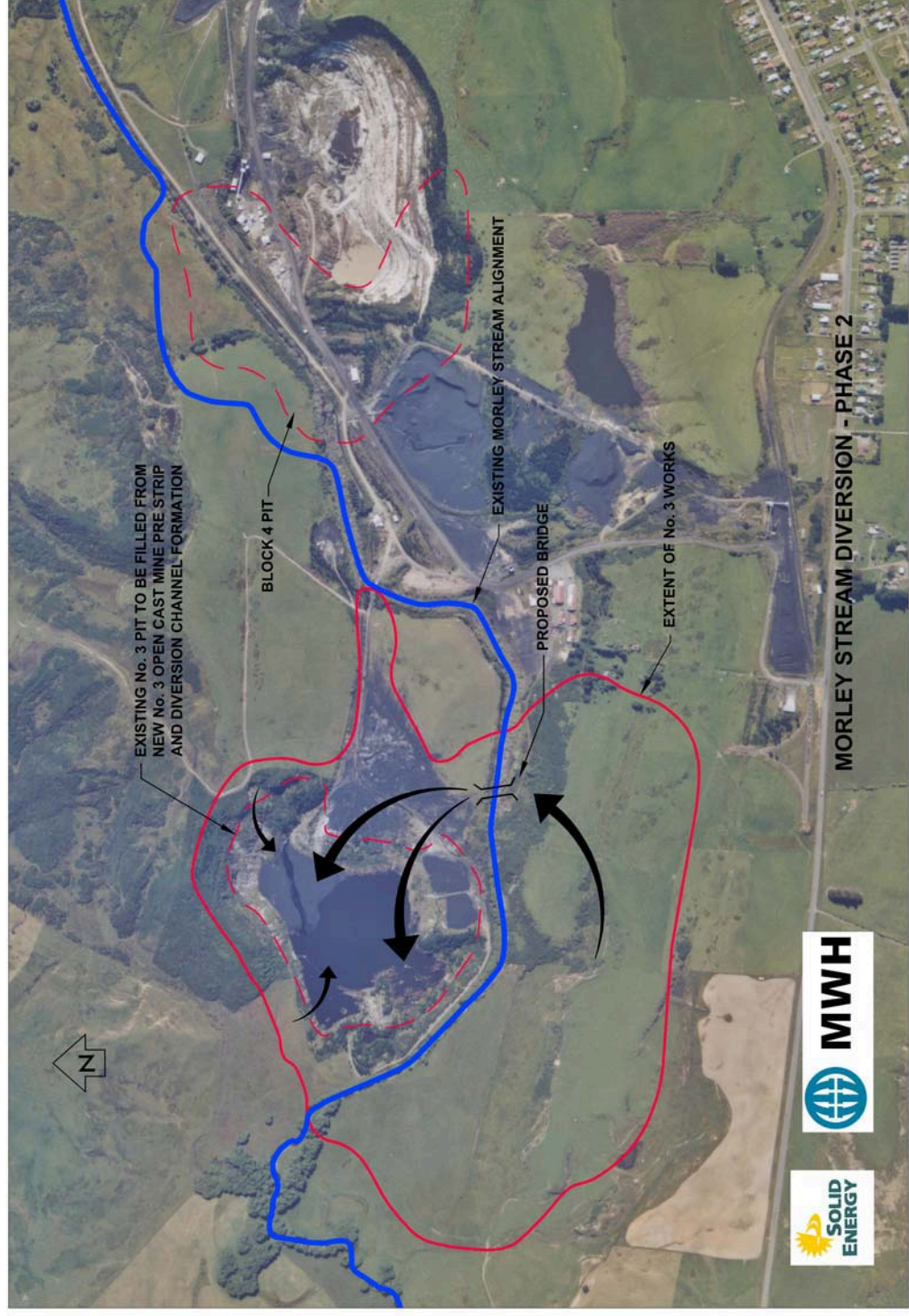
- **Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations;**
- **Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and**
- **Avoiding, remedying or mitigating any adverse effects of activities on the environment.**



# Ohai Mine: Solid Energy NZ Ltd

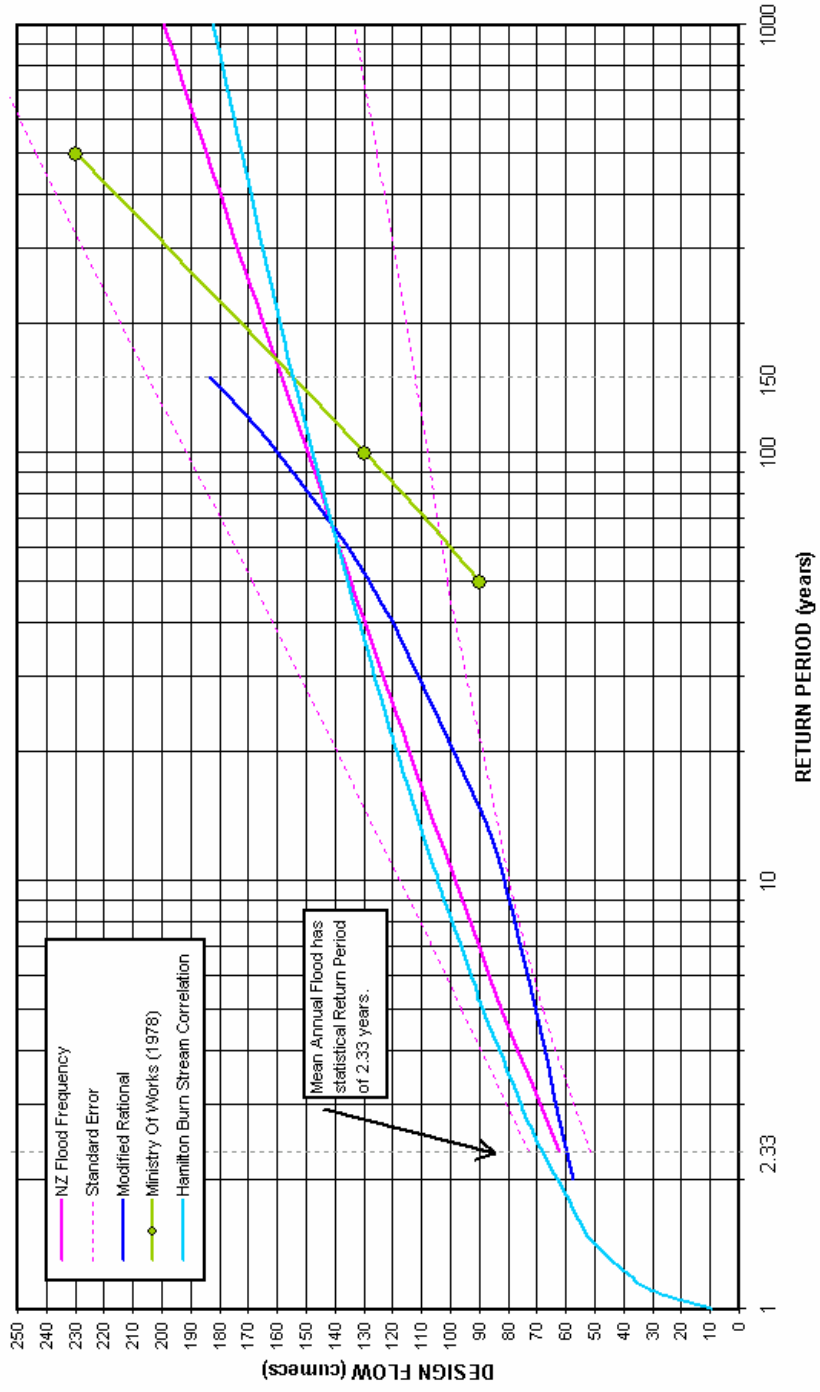


# Morley Stream Diversion

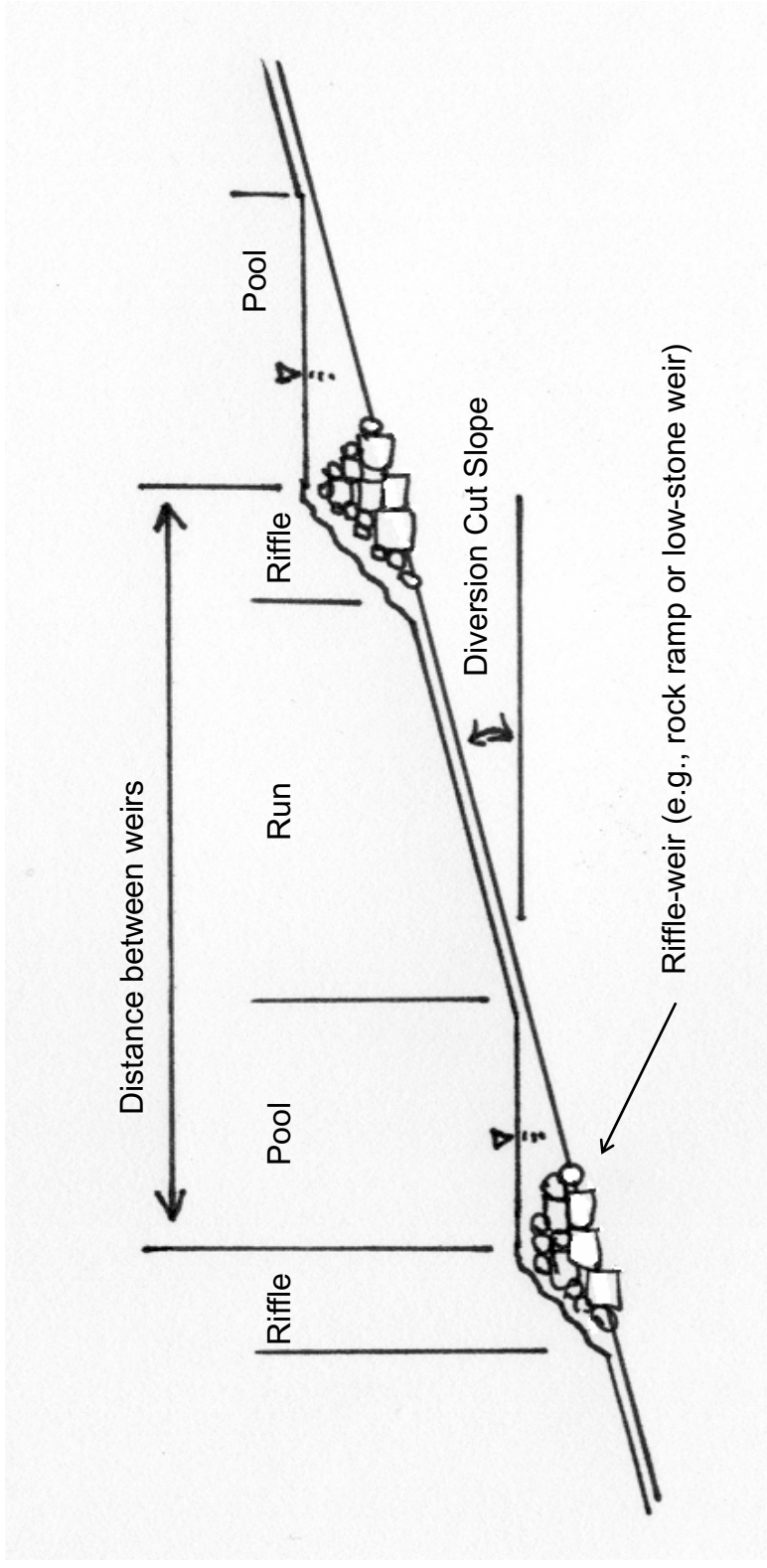


# Hydrology

DESIGN FLOOD ESTIMATES: Morley Stream - Ohai

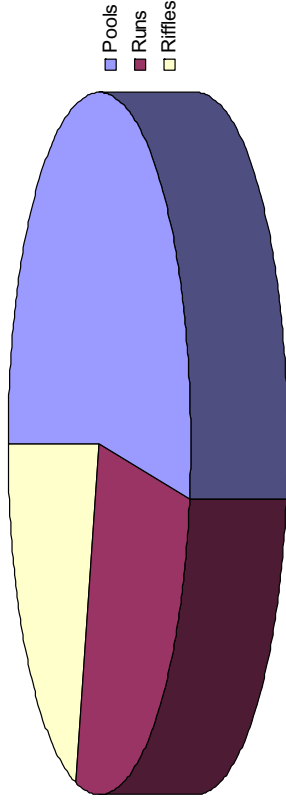


# River Morphology

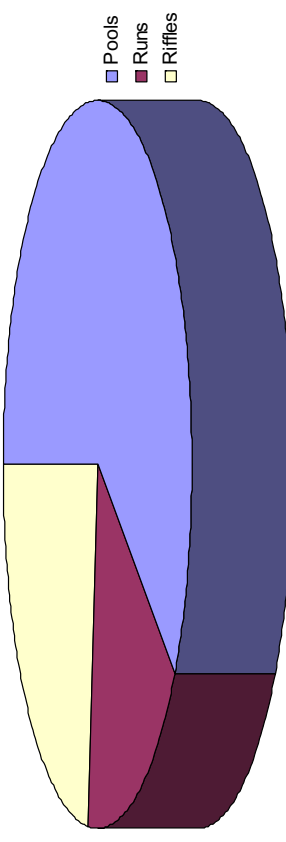


# River Morphology

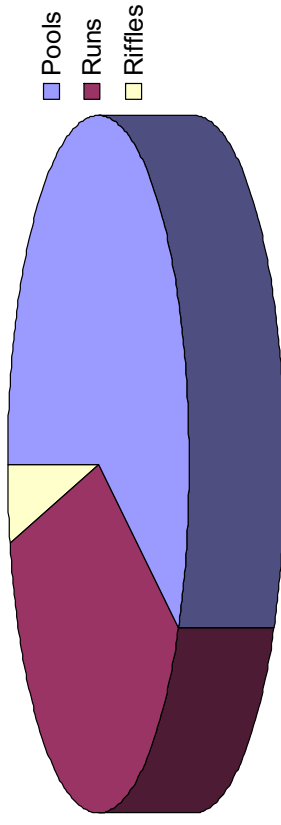
Natural



1978 Diversion



Design



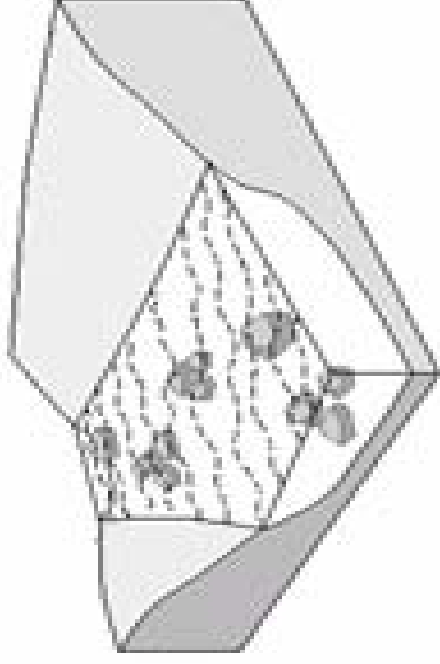


# Ecological Features

Rock Ramps

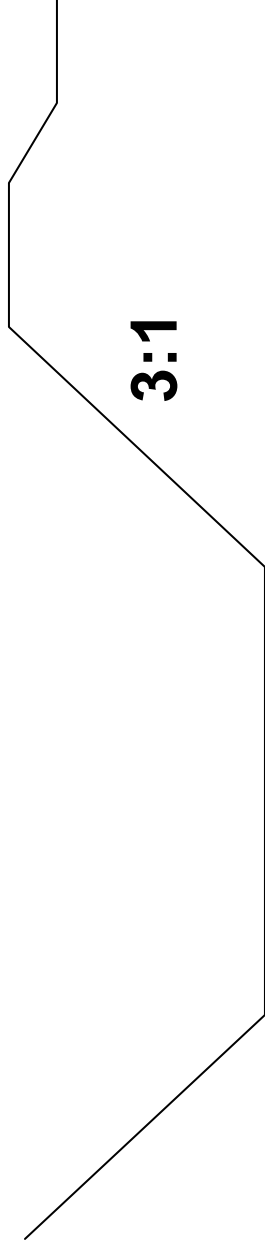


Boulder Clusters



Groups of boulders placed in the base flow channel to provide cover, create scour holes, or areas of reduced velocity.

# An “Engineered” Solution



- **No provision for habitat types**
- **No provision for low to median flows**
- **Uniform channel at hydraulically optimal slope**

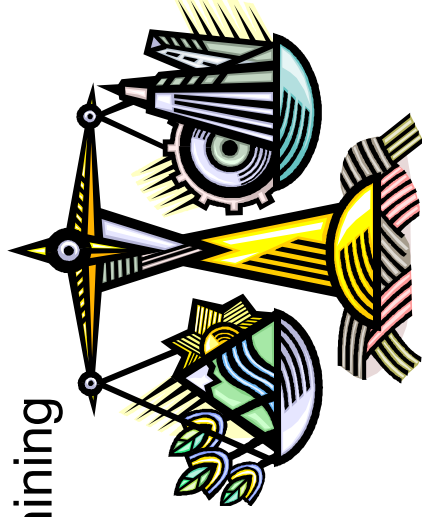


# A “Sustainable Solution”

## Mining and Engineering

- Convey flood flows
- Minimise erosion
- Minimum footprint
- No maintenance
- Allows mining

- Convey flood flows
- Minimise erosion
- Optimum low and median flows
- Provide in-stream habitat
- Riparian margins
- Sinuosity
- “Natural”



# Obtaining the Sustainable Solution

- **Multi-disciplinary approach to design:**
  - geotechnical, river hydraulic, environmental, aquatic biology and structural
- **Stakeholder consultation workshops**



# Outcome



- Stakeholders feel involved in design
- Transparent address of ecological issues
- Preparedness to provide written approval of resource consents.

