

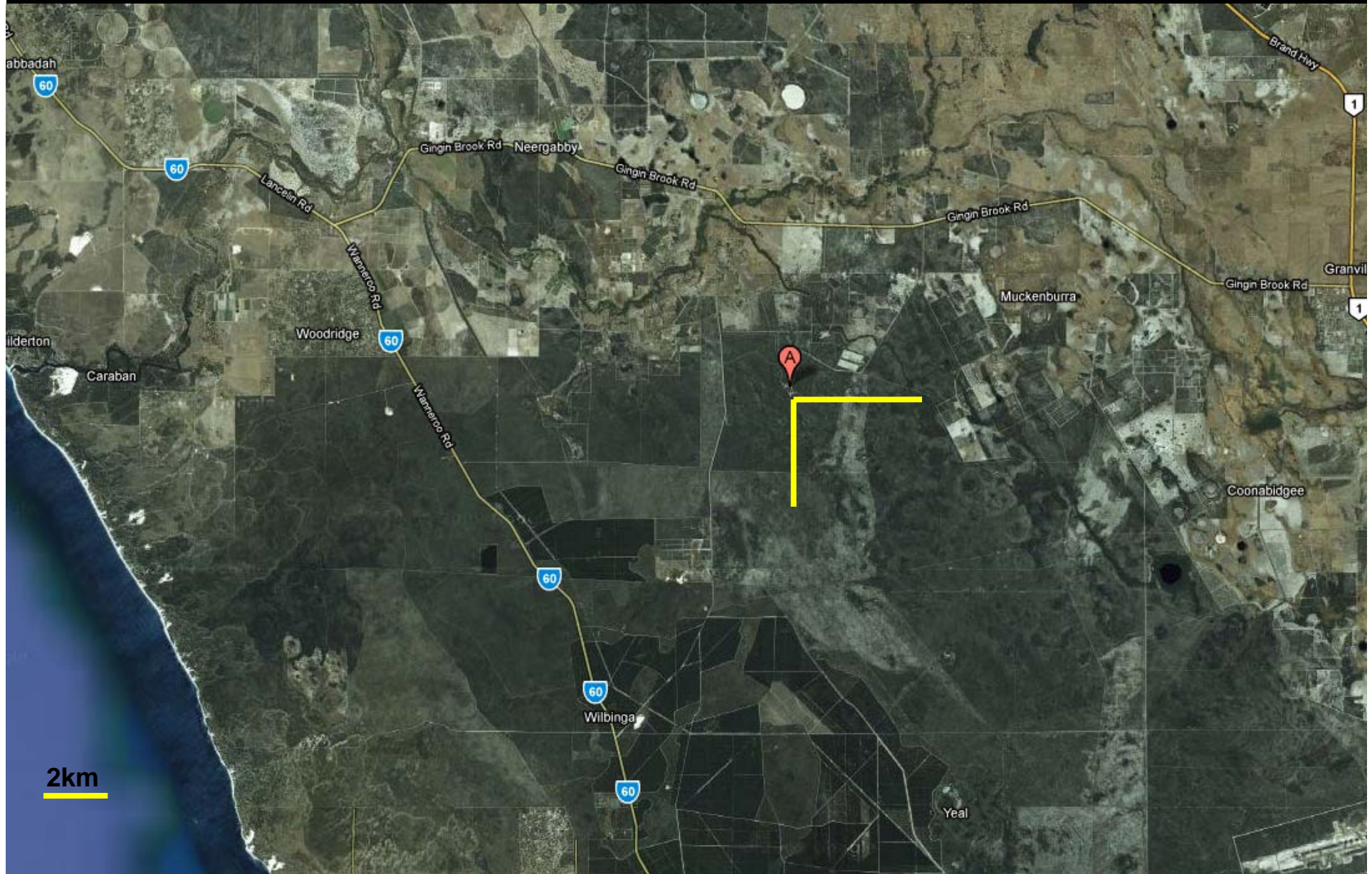
# Proposed AIGO Site, Infrastructure and Strategic Plan

David Blair on behalf of  
UWA AIGO team.

- AIGO Site Maps and Buffer Zones
- AIGO Site Protection
- Site Studies, Seismic Noise, Local Interference and Wind Induced Seismic Noise
- AIGO Strategic Plan

22 February 2010

# Gingin Site in Context



# AIGO Site Protection

## Buffer Zone Requirements

Set seismic attenuation study led by David Coward  
5km buffer for “high disturbance” industry

## Summary of Events and Actions

### High voltage overhead power line proposed

Problem: Broadband RF noise from leakage arcs  
Solution: Power line re-routed to west side of site

### Proposed Rocla Sand Mine 2km NW from corner station

Problem: microseismic band Rayleigh waves from heavy vehicles moving on uneven surface.

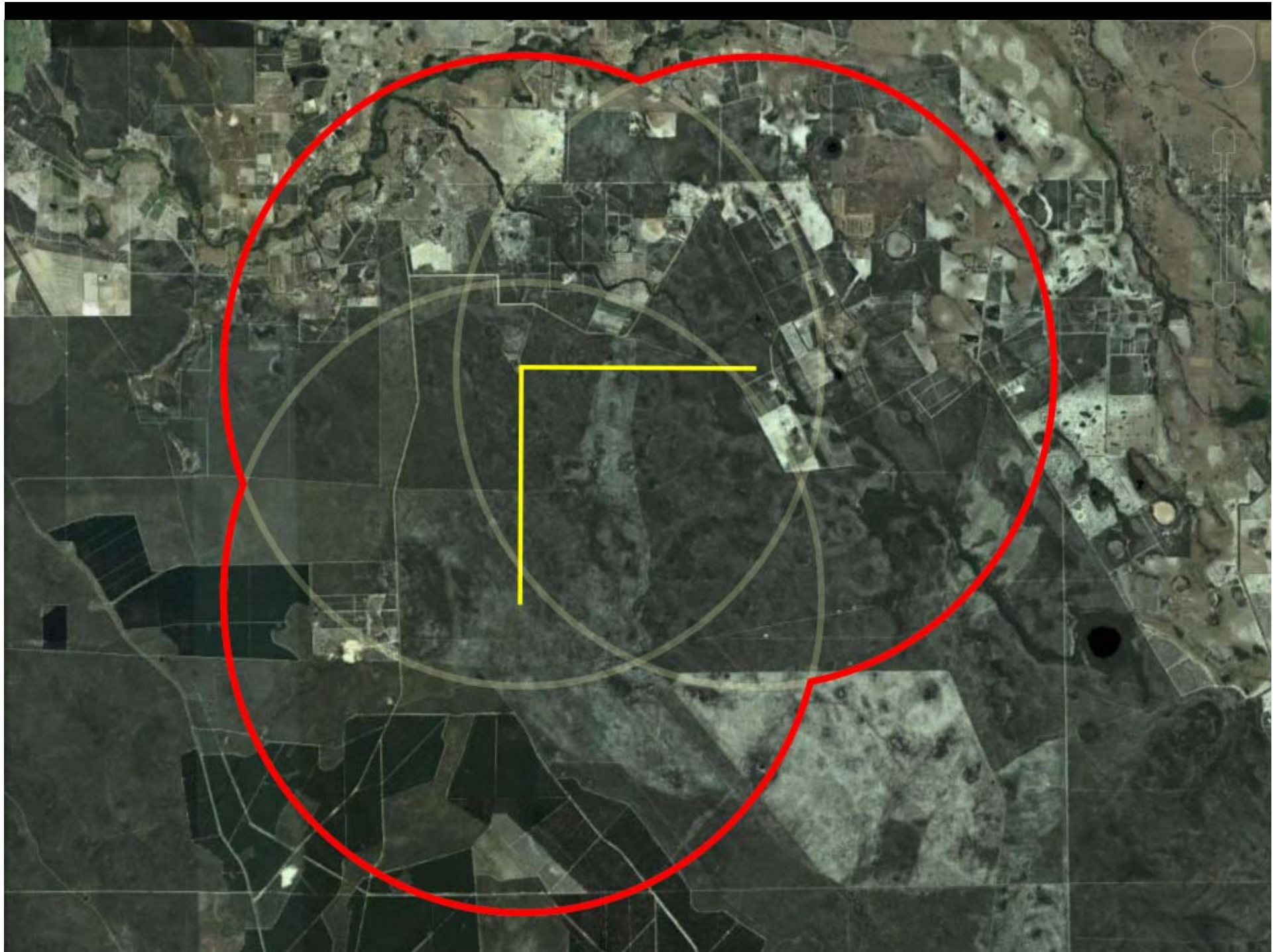
Action: University hired Legal Team. Council Hearings, Tribunal hearings,

Solution: Land swap with degraded pine forest now being pursued

### Proposed EW rail route 3km south of buffer

Solution: proposed rail route relocated beyond buffer zone

22 February 2010





232 m  
Pointer 31°21'28.53" S 115°42'56.75" E

Image © 2010 DigitalGlobe  
© 2010 MapData Sciences PtyLtd, PSMA  
Streaming ||||| 100%

©2007 Google™

Eye alt 803 m



1499 m  
Pointer 31°22'30.08" S 115°44'26.18" E

Image © 2010 DigitalGlobe

© 2010 MapData Sciences PtyLtd, PSMA

Streaming ||||| 100%

©2007 Google™

Eye alt 5.19 km

# Seismic Studies

REVIEW OF SCIENTIFIC INSTRUMENTS

VOLUME 74, NUMBER 11

NOVEMBER 2003

## Vehicle-induced seismic effects at a gravitational wave observatory

D. Coward,<sup>a)</sup> D. Blair, and R. Burman

*School of Physics, University of Western Australia, Nedlands WA 6009, Australia*

C. Zhao

*School of Computer and Information Science, Edith Cowan University, Mount Lawley WA 6050, Australia*

(Received 14 November 2002; accepted 29 May 2003)

The seismic signature of a vehicle traveling on the site of the Australian International Gravitational Observatory has been studied using a two-axis seismometer. The main laboratory strongly attenuated the vehicle-induced seismic noise across all frequencies. We find that the magnitude of the vehicle-induced seismic signal followed a  $d^{-\gamma}$  power law, with  $d$  the source–detector distance and  $\gamma \approx 1.7 \pm 0.4$ . The results are indicative of strong attenuation of seismic disturbances and are consistent with other measurements of low-amplitude Rayleigh wave attenuation in similar sandy soil types, a highly desirable property for the site of a gravitational wave observatory. This analysis provides a tool for estimating the magnitude of vehicle-induced seismic noise at the laboratory buildings from more distant sources on and around the site. © 2003 American Institute of Physics. [DOI: 10.1063/1.1614411]

$$a \sim d^{-\gamma}$$

Silt, high clay fine sand:  $\gamma \sim 0.8 - 1$

Course quartz sand  $\gamma \sim 1.5 - 1.7$

We measured  $\gamma \sim 1.7$

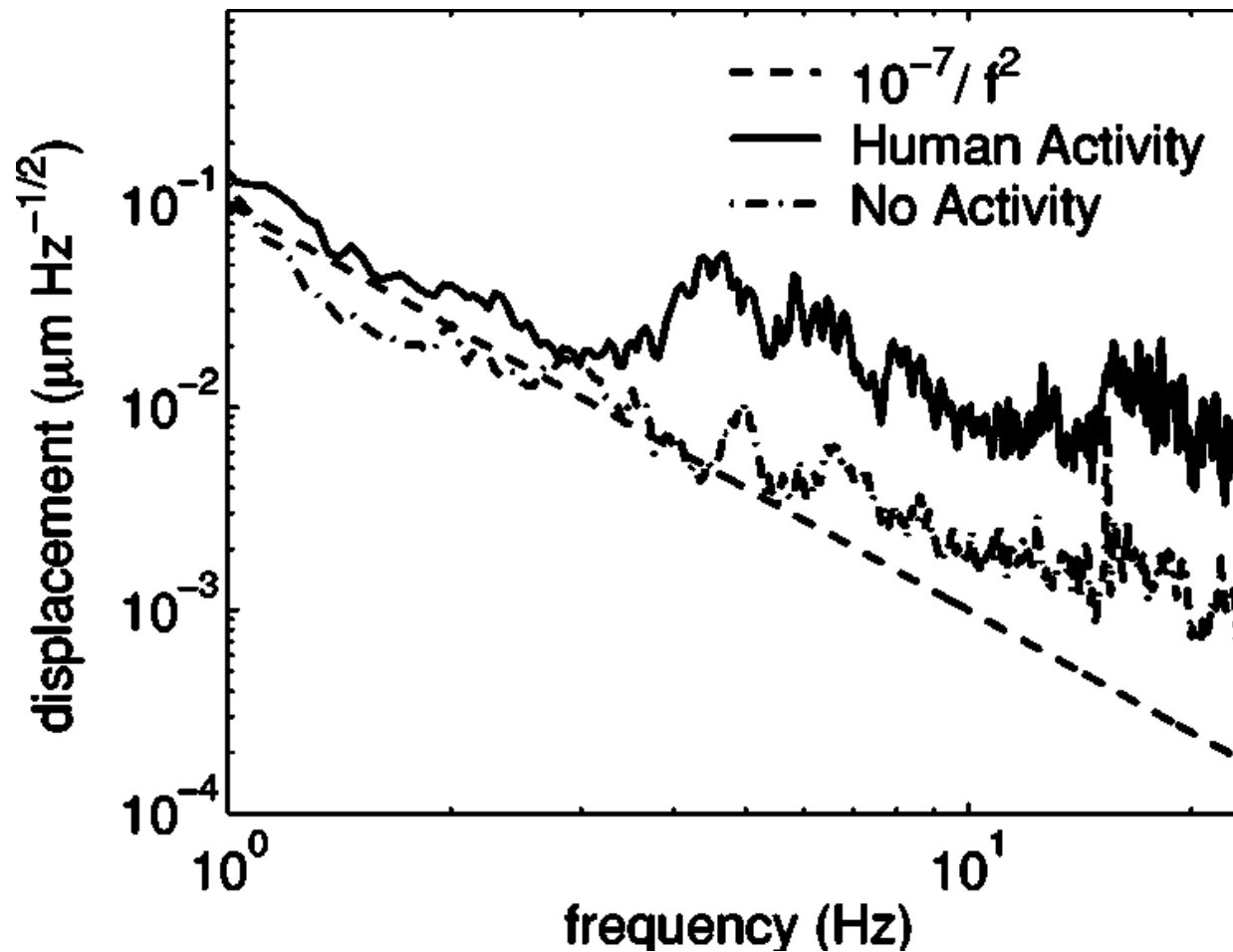
22 February 2010

# Wind and Local seismic Noise

- Seismic signature from wind undetectable for  $v < 40\text{km/hr}$
- Air filter fans main source of noise in south arm. Current efforts to seismically isolate fan ducts.
- Seismic noise from vehicles excite building resonances  
~15Hz
- High finesse optical cavity locking with Advanced isolators indicate worst local source of noise is human activity in corner station.
- Fan noise not critical with advanced isolation systems



# Seismic Noise Degradation by Human Activity near Corner Station



# Strategic Plan for Gingin Gravity Precinct

- AIGO Research Centre
- Gravity Discovery Centre: Education and Public Outreach
- Geosciences Australia Magnetic Observatory

Strategic plan required for Planning Permission for Detector Arms and New Buildings

*Completed Dec 2009 after 1 year of meetings.*

*Approved by DEC Jan 2010*

Plan shows indicative ground plans and “placeholders” for future facilities.

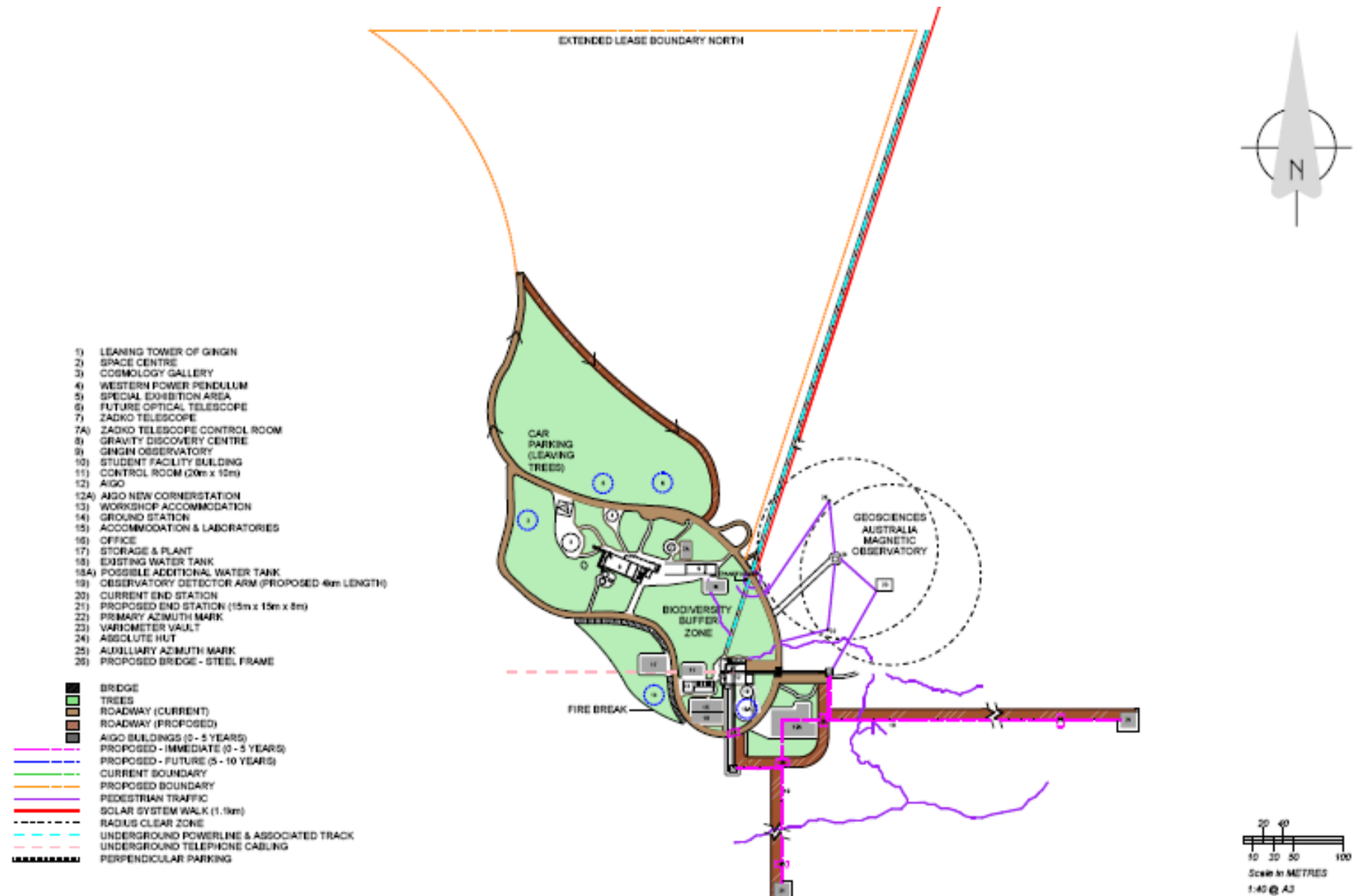
Plan emphasises environmental management for preservation of the high biodiversity banksia bushland.

22 February 2010

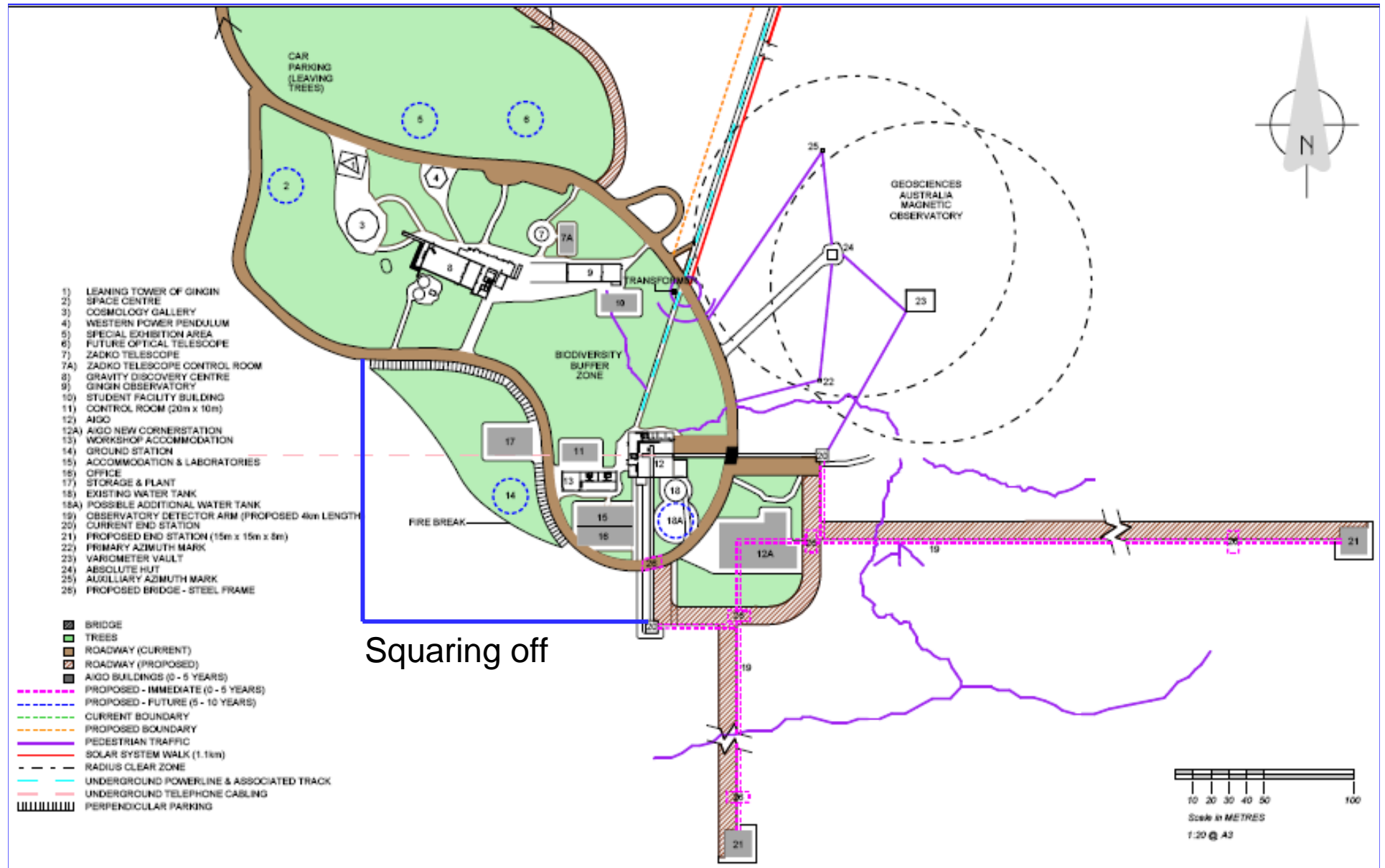
# Stakeholders

- UWA (Facilities management, Legal office and AIGRC)
- Gravity Discovery Centre Foundation
- Dept of Environment and Conservation (DEC)
  - DEC Wanneroo Office (landscaping, site design, fire protection)
  - DEC Head Office : Leasing Department
- Gingin Shire,
- Wheatbelt Development Commission.

# Site map showing proposed lease extension and entry-exit loop



# Precinct map



# Conclusion

- AIGO Site Protection ok.
- Seismic studies and experience operating high finesse cavities make site seem suitable
- Self generated seismic noise is the worst issue
- We now know the weak points of our building designs and how to do better for AIGO.
- Strategic plan sign-off beneficial: design changes still possible.