# Appendix K

## Zone of Influence Maps by DNV Energy Systems Renewables Advisory (April 2021)

DNV

## FLAT ROCKS WIND FARM

# Zone of Visual Influence Maps

## Moonies Hill Energy Pty Ltd

**Document No.:** 10284364-AUME-T-01, Rev. B
**Date:** 13 April 2021

**IMPORTANT NOTICE AND DISCLAIMER**

1. This document is intended for the sole use of the Customer as detailed on the front page of this document to whom the document is addressed and who has entered into a written agreement with the DNV entity issuing this document ("DNV"). To the extent permitted by law, neither DNV nor any group company (the "Group") assumes any responsibility whether in contract, tort including without limitation negligence, or otherwise howsoever, to third parties (being persons other than the Customer), and no company in the Group other than DNV shall be liable for any loss or damage whatsoever suffered by virtue of any act, omission or default (whether arising by negligence or otherwise) by DNV, the Group or any of its or their servants, subcontractors or agents. This document must be read in its entirety and is subject to any assumptions and qualifications expressed therein as well as in any other relevant communications in connection with it. This document may contain detailed technical data which is intended for use only by persons possessing requisite expertise in its subject matter.

2. This document is protected by copyright and may only be reproduced and circulated in accordance with the Document Classification and associated conditions stipulated or referred to in this document and/or in DNV's written agreement with the Customer. No part of this document may be disclosed in any public offering memorandum, prospectus or stock exchange listing, circular or announcement without the express and prior written consent of DNV. A Document Classification permitting the Customer to redistribute this document shall not thereby imply that DNV has any liability to any recipient other than the Customer.

3. This document has been produced from information relating to dates and periods referred to in this document. This document does not imply that any information is not subject to change. Except and to the extent that checking or verification of information or data is expressly agreed within the written scope of its services, DNV shall not be responsible in any way in connection with erroneous information or data provided to it by the Customer or any third party, or for the effects of any such erroneous information or data whether or not contained or referred to in this document.

4. Any wind or energy forecasts estimates or predictions are subject to factors not all of which are within the scope of the probability and uncertainties contained or referred to in this document and nothing in this document guarantees any particular wind speed or energy output.

**KEY TO DOCUMENT CLASSIFICATION**

| | | |
|---|---|---|
| Strictly Confidential | : | For disclosure only to named individuals within the Customer's organisation. |
| Private and Confidential | : | For disclosure only to individuals directly concerned with the subject matter of the document within the Customer's organisation. |
| Commercial in Confidence | : | Not to be disclosed outside the Customer's organisation. |
| DNV only | : | Not to be disclosed to non-DNV staff |
| Customer's Discretion | : | Distribution for information only at the discretion of the Customer (subject to the above Important Notice and Disclaimer and the terms of DNV's written agreement with the Customer). |
| Published | : | Available for information only to the general public (subject to the above Important Notice and Disclaimer). |

| | | |
|---|---|---|
| Project name: | Flat Rocks Wind Farm | DNV – Energy Systems |
| Report title: | Zone of Visual Influence Maps | Renewables Advisory |
| Customer: | Moonies Hill Energy Pty Ltd | Level 12, 350 Queen Street |
| | PO Box 151 | Melbourne VIC 3000 |
| | Kojonup, WA 6395 | Australia |
| | Australia | Tel: +61 3 8615 1515 |
| Contact person: | Sarah Rankin | ABN 19 094 520 760 |
| Date of issue: | 13 April 2021 | |
| Project No.: | 10284364 | |
| Report No.: | 10284364-AUME-T-01, Rev. B | |

***Task and objective:***

*Maps of the Zone of Visual Influence for the proposed Flat Rocks Wind Farm, for (1) the total number of turbines with hubs visible, and (2) the total number of turbines with blade tips visible.*

| Prepared by: | Verified by: | Approved by: |
|---|---|---|
| D. Price<br>Senior Engineer | M. Purcell<br>Senior Engineer | T. Gilbert<br>Principal Engineer |

☐ Strictly Confidential
☐ Private and Confidential
☐ Commercial in Confidence
☐ DNV only
☒ Customer's Discretion
☐ Published

Keywords:
Flat Rocks Wind Farm, Zone of Visual Influence, ZVI



| Rev. No. | Date | Reason for Issue | Prepared by | Verified by | Approved by |
|---|---|---|---|---|---|
| A | 6 April 2021 | Initial release – DRAFT. Results checked but not approved. | D. Price | M. Purcell | - |
| B | 13 April 2019 | Approved release – DRAFT. | D. Price | M. Purcell | T. Gilbert |

# Table of contents



# Appendices

# 1 INTRODUCTION

Moonies Hill Energy Pty Ltd ("MHE" or "the Customer") have requested that DNV Australia Pty Ltd (DNV), conduct modelling in order to create Zone of Visual Influence (ZVI) maps of the area surrounding the proposed Flat Rocks Wind Farm (the "Project") located in Western Australia.

The purpose of the wind farm modelling is to generate a ZVI map for the following cases:

- Total number of turbines visible at the hub height of 125 m (i.e. number of turbines with hubs visible), and
- Total number of turbines visible at the maximum blade tip height of 200 m (i.e. number of turbines with blade tips visible).

This technical note presents the assumptions and results of the modelling.

This technical note has been prepared pursuant to DNV proposal L2C-212386-AUME-P-01-A, dated 15th February 2021, and is subject to the terms and conditions contained therein.

# 2 DESCRIPTION OF THE SITE

The site is located to the east of the Albany Highway, approximately 260 km southeast of Perth and 30 km southwest of the township of Katanning in southwest Western Australia. The Palgarup State Forest lies approximately 66 km to the southwest of the site and the mountains of the Stirling Range are located approximately 60 km to the southeast.

The proposed wind farm is sited on undulating terrain, with turbine base elevations varying from approximately 340 m to 380 m above sea level (ASL). The site and surrounding area consists mainly of farmland containing scattered trees, however there are also some large patches of dense forestry. The general terrain at the site and the immediate surrounding areas can be described as gradually undulating.

# 3 MODELLING METHODOLOGY

## 3.1 Model inputs

The turbine layout considered by the Customer /1/ /2/ consists of 42 turbine locations, split into two stages. Both stages are included in the ZVI maps presented in this report and, in both stages, the turbines are Vestas V150 turbines with a hub height of 125 m above ground level (AGL) and rotor diameter of 150 m, giving a maximum tip height of 200 m AGL. The turbine coordinates used for the wind farm model, along with coordinates of nearby dwellings /3/, are listed in Appendix A.

The digital elevation model (DEM) used in the assessment is based on a combination of 2 m interval elevation contours previously provided by the Customer and data obtained during the Shuttle Radar Topography Mission (SRTM) /4/, which has been used to extend the map up to approximately 20 km from proposed turbine locations.

All coordinates listed in this report are based on the UTM WGS84 Zone 50 South coordinate system.

## 3.2 ZVI calculations

The ZVI calculation is based on the following parameters and assumptions:

- visibility line of sight calculations were made for an observer height of 1.6 m AGL
- there is an unobstructed line of sight from each turbine to the observer, with the exception of terrain blockage effects, with no reductions in visibility due to:
    - vegetation,
    - buildings or other structures
    - weather induced visibility reducers such as fog or haze, and
    - physical limitations of the human eye or the visual cognition response of the observer
- the effect of curvature of the earth is included
- an atmospheric Refraction Coefficient of 0.13
- the ZVI map has been calculated to a distance of 20 km from any wind farm turbine, without any reduction in turbine visibility within this area except as calculated with the assumptions listed above

## 3.3 Results

The results of the ZVI modelling of the proposed Flat Rocks Wind Farm are presented in Appendix A in the form of ZVI maps overlaid on topographic maps of the site and surrounding areas. The maps are also provided as high-resolution PNG images along with this report.

# 4 REFERENCES


/1/ Stage 1 and Stage 2 turbine coordinates. Provided in an email attachment by Sarah Rankin of MHE to Trenton Gilbert of DNV on 18th February 2021.

/2/ Stage 1 turbine coordinates. Provided in an email attachment by Sarah Rankin of MHE to Michael Quan of DNV on 18th March 2021.

/3/ "Houses.kmz". Dwelling coordinates. Provided as an email attachment by Sarah Rankin of MHE to Michael Quan of DNV on 25th February 2021.

/4/ "Shuttle Radar Topography Mission (SRTM)", NASA JPL, viewed 17th October 2016, http://www2.jpl.nasa.gov/srtm/.

# APPENDIX A SITE INFORMATION AND ZVI MAPS

**Table A-1 Flat Rocks Wind Farm turbine coordinates – Stage 1.**

| Turbine ID | Easting[1] [m] | Northing[1] [m] | Turbine ID | Easting[1] [m] | Northing[1] [m] |
|---|---|---|---|---|---|
| T001 | 531840 | 6241787 | T010 | 533285 | 6238735 |
| T002 | 532100 | 6241227 | T011 | 533253 | 6238266 |
| T003 | 530604 | 6240976 | T012 | 530660 | 6237354 |
| T004 | 532458 | 6240750 | T013 | 531682 | 6237572 |
| T005 | 530327 | 6240492 | T014 | 531130 | 6246118 |
| T006 | 532848 | 6240247 | T015 | 531663 | 6245378 |
| T007 | 530034 | 6239959 | T016 | 531924 | 6244916 |
| T008 | 533060 | 6239815 | T017 | 531927 | 6244440 |
| T009 | 533224 | 6239233 | T018 | 533574 | 6244165 |

***Notes:***

1. Coordinate system is UTM WGS84 Zone 50S.

**Table A-2 Flat Rocks Wind Farm turbine coordinates – Stage 2.**

| Turbine ID | Easting[1] [m] | Northing[1] [m] | Turbine ID | Easting[1] [m] | Northing[1] [m] |
|---|---|---|---|---|---|
| T001 | 533353 | 6251758 | T015 | 536201 | 6247429 |
| T003 | 532675 | 6251443 | T016 | 534497 | 6246947 |
| T004 | 533626 | 6251119 | T017 | 530818 | 6247319 |
| T005 | 532328 | 6250880 | T018 | 536269 | 6246950 |
| T006 | 533248 | 6250736 | T019 | 534021 | 6246789 |
| T007 | 533756 | 6250500 | T020 | 535002 | 6246668 |
| T008 | 531575 | 6250252 | T021 | 531467 | 6246454 |
| T009 | 532922 | 6250191 | T023 | 535002 | 6245864 |
| T010 | 532333 | 6250139 | T024 | 535977 | 6246267 |
| T011 | 533464 | 6250113 | T026 | 534675 | 6246351 |
| T012 | 533791 | 6249619 | T027 | 535305 | 6246210 |
| T013 | 533260 | 6249574 | T029 | 534457 | 6245858 |

***Notes:***

1. Coordinate system is UTM WGS84 Zone 50S.

**Table A-3 Dwellings located in proximity to the proposed Flat Rocks Wind Farm.**

| Dwelling ID[2] | Easting[1] [m] | Northing[1] [m] | Dwelling ID[2] | Easting[1] [m] | Northing[1] [m] | Dwelling ID[2] | Easting[1] [m] | Northing[1] [m] |
|---|---|---|---|---|---|---|---|---|
| NSH 01 | 529798 | 6252398 | NSH 12 | 529822 | 6247171 | NSH 23 | 527880 | 6245016 |
| NSH 02 | 534034 | 6254130 | NSH 13 | 530084 | 6245361 | NSH 24 | 529664 | 6247150 |
| NSH 03 | 534715 | 6252104 | NSH 14 | 531650 | 6243477 | NSH 25 | 539639 | 6249790 |
| NSH 04 | 533708 | 6248507 | NSH 15 | 532980 | 6242569 | NSH 26 | 537651 | 6239341 |
| NSH 05 | 538397 | 6245086 | NSH 16 | 527583 | 6245239 | SH 27 | 534087 | 6239798 |
| NSH 06 | 536092 | 6244487 | NSH 17 | 525525 | 6244591 | SH 28 | 531662 | 6251703 |
| NSH 07 | 536187 | 6243019 | NSH 18 | 525552 | 6238707 | SH 29 | 533630 | 6245188 |
| NSH 08 | 533602 | 6237033 | NSH 19 | 528558 | 6237293 | SH 30 | 528911 | 6240554 |
| NSH 09 | 533299 | 6237262 | NSH 20 | 531581 | 6233170 | SH 31 | 529077 | 6237156 |
| NSH 10 | 527067 | 6249862 | NSH 21 | 526817 | 6247723 | SH 32 | 528718 | 6236883 |
| NSH 11 | 527858 | 6248864 | NSH 22 | 529707 | 6247138 | NSH 33 | 537747 | 6239374 |

***Notes:***

1. Coordinate system is UTM WGS84 Zone 50S.
2. Dwellings labelled as "NSH ##" are non-stakeholders in the project and those labelled as "SH ##" are stakeholders in the project.

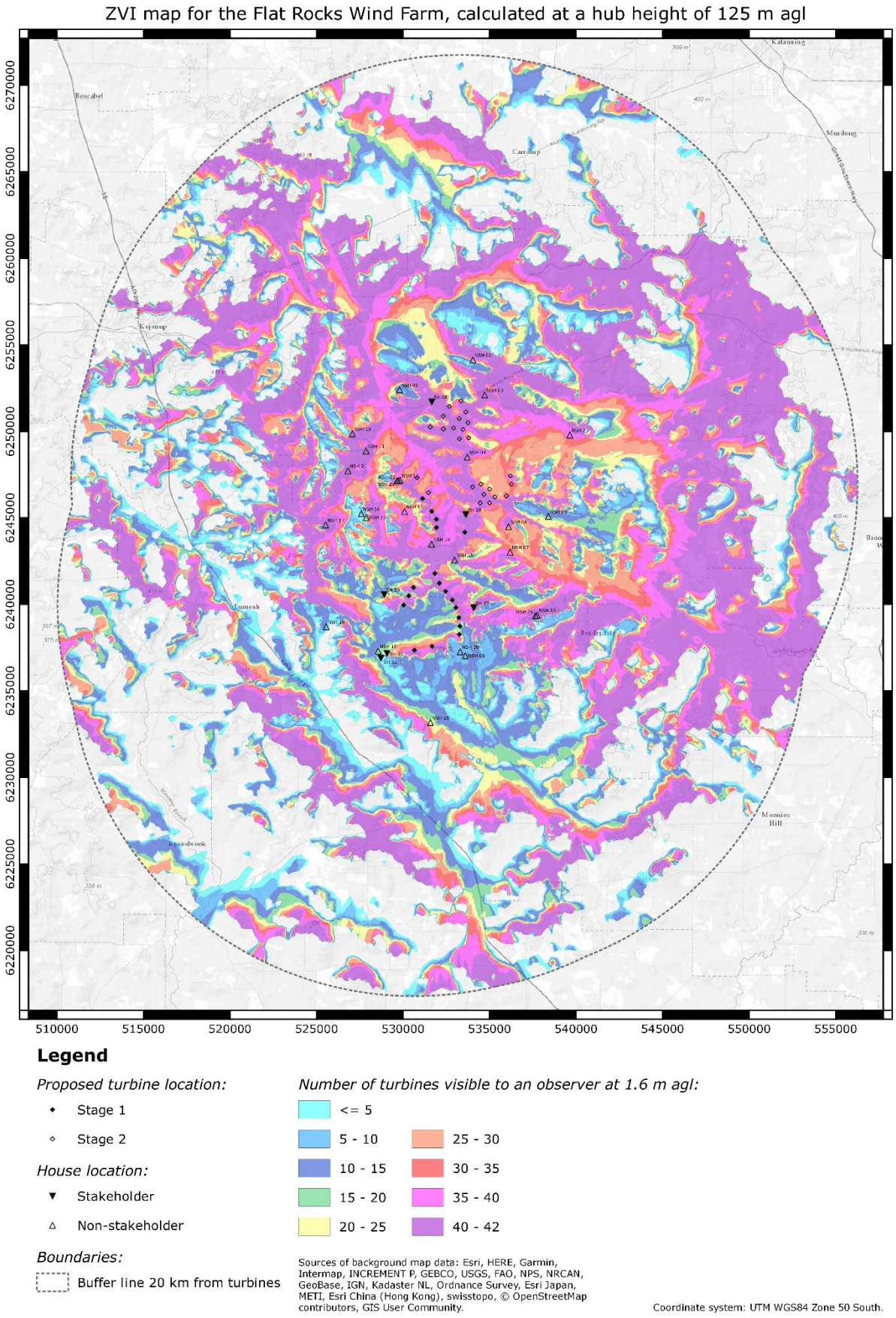


**Figure A-1 ZVI map of Flat Rocks Wind Farm – Calculated at hub height (Far view).**

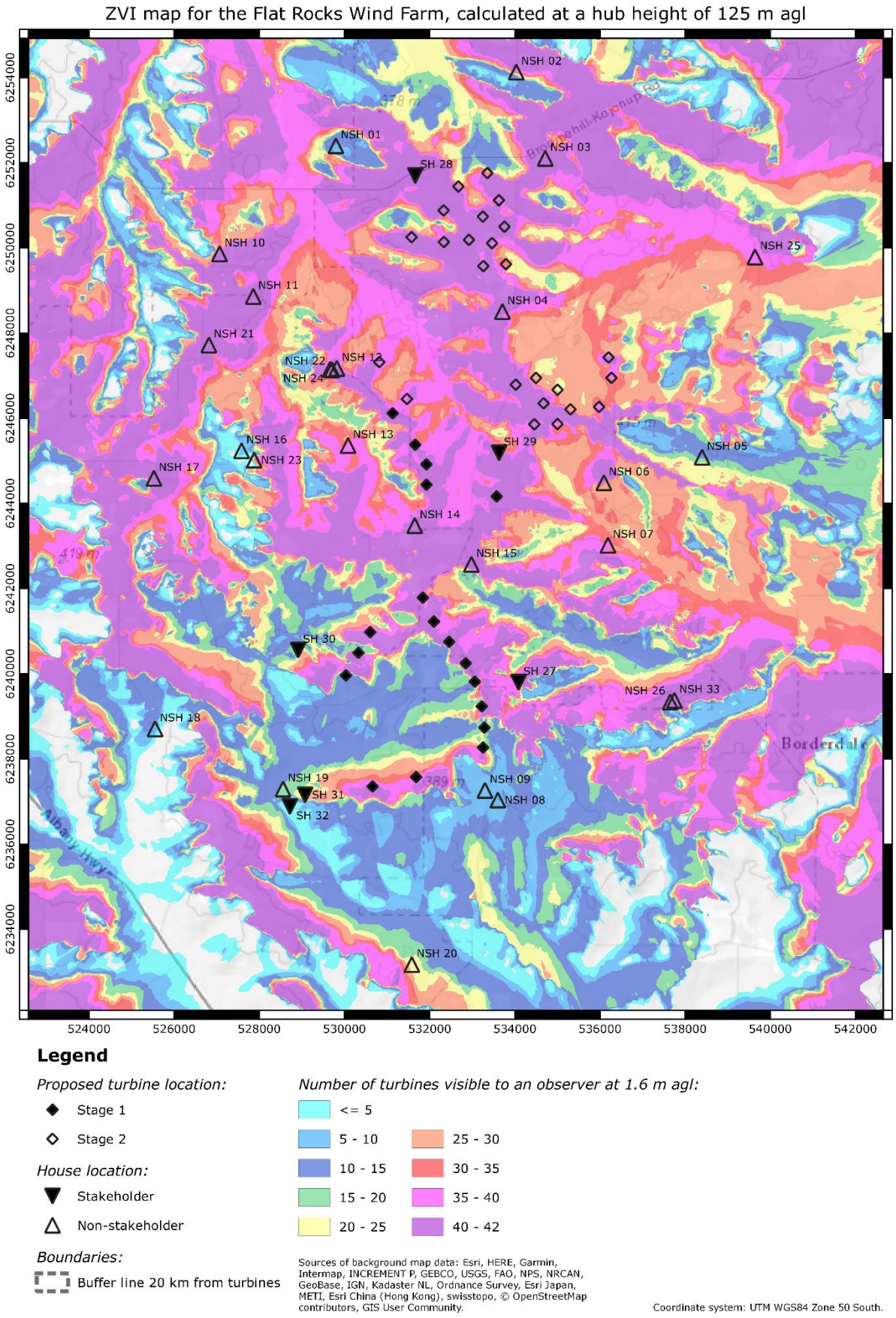


**Figure A-2 ZVI map of Flat Rocks Wind Farm – Calculated at hub height (Close view).**

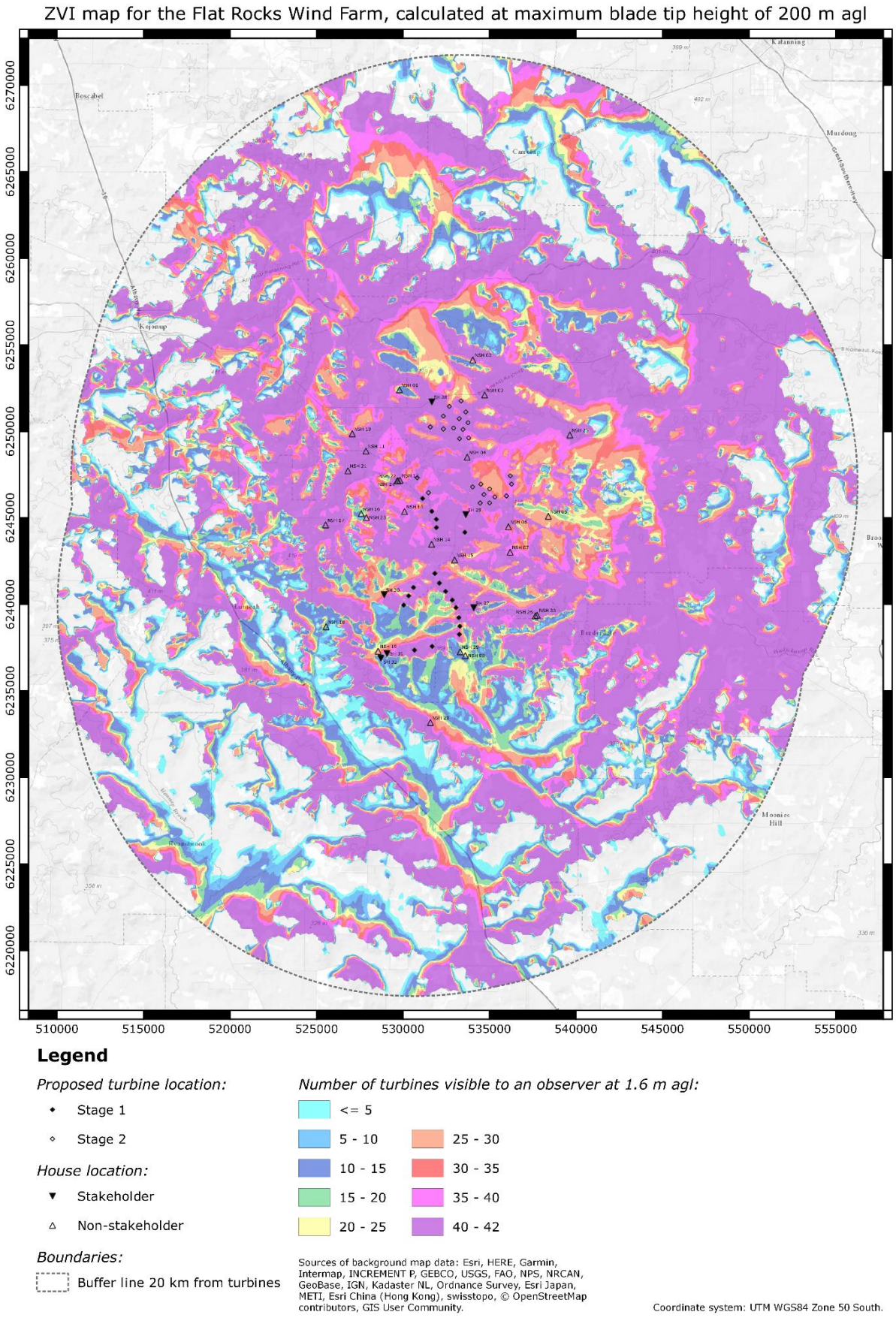


**Figure A-3 ZVI map of Flat Rocks Wind Farm – Calculated at maximum tip height (Far view).**

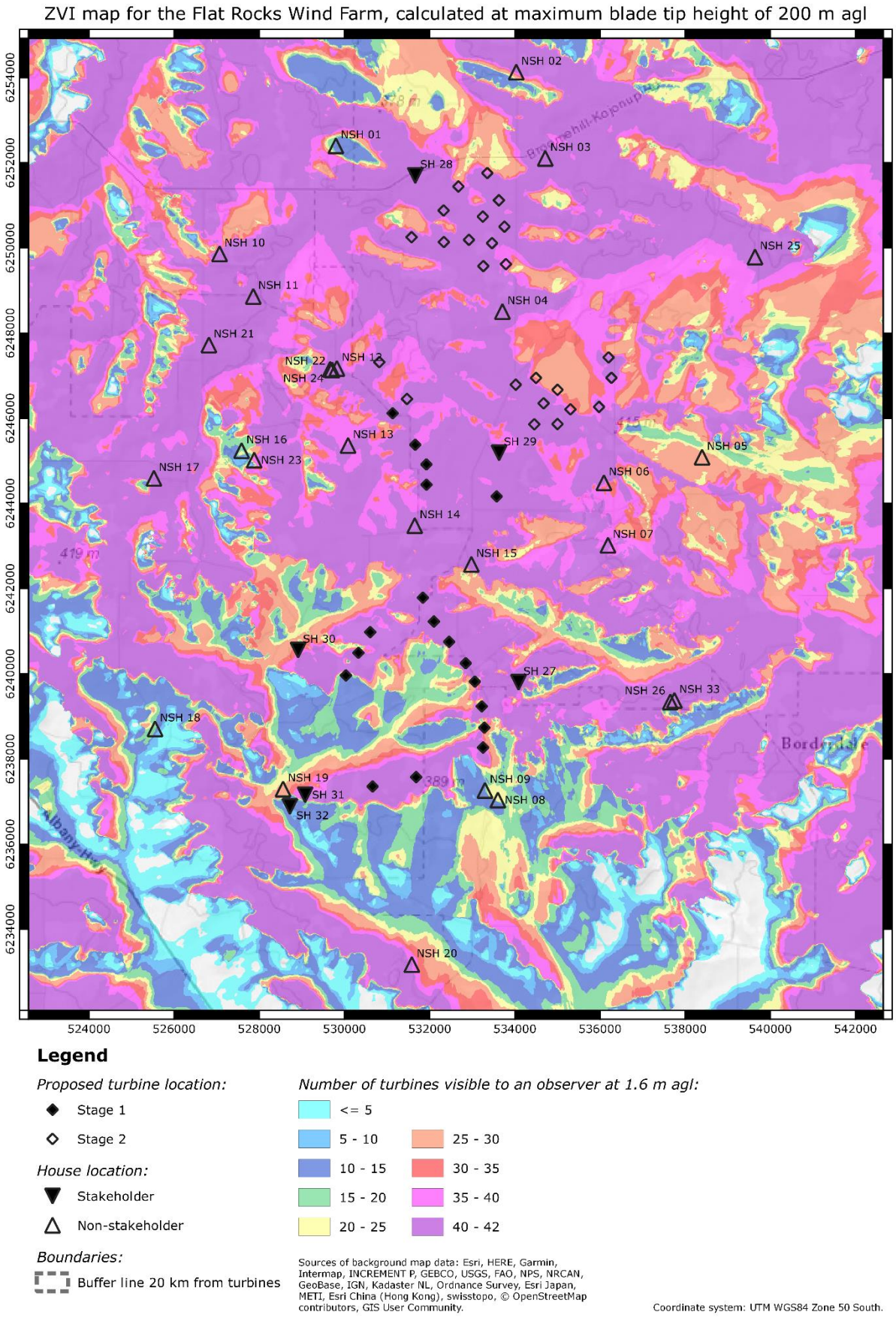


**Figure A-4 ZVI map of Flat Rocks Wind Farm – Calculated at maximum tip height (Close view).**

## About DNV

Driven by our purpose of safeguarding life, property and the environment, DNV enables organizations to advance the safety and sustainability of their business. We provide classification and technical assurance along with software and independent expert advisory services to the maritime, oil and gas, and energy industries. We also provide certification services to customers across a wide range of industries. Operating in more than 100 countries, our 16,000 professionals are dedicated to helping our customers make the world safer, smarter and greener.