



PO Box 685
DUNSBOROUGH WA 6281

Ph: +61 8 9759 1960

Fax: +61 8 9759 1920

Mobile: 0427 591 960

info@ecosystemsolutions.com.au

www.ecosystemsolutions.com.au

Bushfire Emergency Response Analysis

Southern Bunbury Outer Ring Road Review

14 September 2021

Prepared for:
Shire of Capel
Attn: Kristen McKeachie



This report has been prepared in accordance with the Agreement between Ecosystem Solutions Pty Ltd and The Shire of Capel Attn: Kristen McKeachie (“Client”). It has been solely prepared for an analysis of the potential impact on bushfire appliance response times as a result of the Bunbury Outer Ring Road within the Shire of Capel (“Site”).

Information

In undertaking this work the authors have made every effort to ensure the accuracy of the information used. Unless otherwise stated in the report, Ecosystem Solutions Pty Ltd has not independently verified such information and cannot guarantee its accuracy or completeness.

Conclusions

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This report is valid for a period of two years only from the date of its issue.



Gary McMahon

B.Sc. M. Env Mgmt. PG Dip Bushfire Protection. C.EnvP, BPAD Level 3 (35078)

Document Control

Client - Shire of Capel

Site - Southern Bunbury Outer Ring Road Review

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1. Introduction

The Shire of Capel received a petition from a group of residents concerned that the northern part of the Stratham area within the Shire may be compromised by the development of the Bunbury Outer Ring Road (BORR). The petitioners specifically make reference to an isochronic map showing response times for different localities in the Shire, from approximately 2014, however the exact details of this map were not available. They wanted to understand the changes in response times once the BORR is completed.

Ecosystem Solutions were commissioned to conduct an independent analysis of bushfire emergency response times within the Shire of Capel, inside each brigade response area, once the Southern section of the BORR is built with its proposed road closures, sound walls, bridges and roundabouts.

This report outlines our findings and analysis of the available data on this project, with a particular focus on the northern section of the Shire where the BORR project is located.

The information and content of this report is not the stated and formal position of the Shire of Capel. This report was commissioned by the Shire of Capel in response to Council Decision OC223/2020 as follows: **That Council, via the CEO, writes to Main Roads Management Review and Audit Committee requesting a risk assessment be completed as to the risks and delays associated with emergency vehicles accessing the western side of Bussell Highway upon the removal of all median crossings between Jaymon Road in Stratham and the BORR.** Upon learning that this is not the role of the Main Roads Management Review and Audit Committee to conduct such research, the Shire of Capel undertook to have this work carried out.

The Department of Fire and Emergency Services (DFES) have been consulted extensively throughout the development of this report, including provision of opportunity to comment on finalisation of the draft report.

2. Background

2.1 The Bunbury Outer Ring Road

The BORR is a 27 km highway, linking Forrest Highway to the north of Bunbury to Bussell Highway in the south of Bunbury. Main Roads WA state the BORR will improve safety and access for the Bunbury Port and decrease travel time between north and south of Bunbury (Main Roads WA, accessed online <https://www.mainroads.wa.gov.au/projects-initiatives/projects/regional/bunbury-outer-ring-road>).

The project is designed to be constructed in three stages:

- Northern Section - Forest Highway to Boyanup Picton Road;
- Central Section - Boyanup Picton Road to South West Highway; and
- Southern Section - South West Highway to Bussell Highway.

The southern section included developing interchanges at Bussell Highway and Centenary Road and a connection to Jules Road.

Figure 1 shows a map of the proposed project. The project is located in the northern section of the Shire. The proposed location of the BORR against the satellite image is shown in Figure 2.

2.1 Emergency Fire Services

The Shire of Capel is served by both Fire and Rescue Services (FRS) and Bushfire Brigade (BFB) services.

Fire and Rescues Services are provided by:

Table 1 Fire and Rescue Brigades in the district

Brigade	Address	Fire Appliances
Bunbury Career FRS	262 Bussell Highway, South Bunbury	2 x Heavy Duty & 2 x Country Pumps
Bunbury Volunteer FRS	4 Stokes Way Davenport	Country Pump and Light Tanker
Donnybrook VFRS	Lot 2 Bently Street Donnybrook	3.4 Urban & Light Tanker & Rescue Trailer
Busselton VFRS	Albert St, Busselton	Country Pump, 3.4 Urban Tanker, Light Tanker & a Rescue Trailer

There are five BFB brigades within the Shire:

Table 2 Bushfire Brigades within the Shire

Brigade	Address	Fire Appliances
Gelorup BFB	40 Hastie Rd, Gelorup	2.4 and Light tanker
Stirling BFB	26 Hayfield Drive Peppermint Grove	2.4
Boyanup BFB	25 Turner St Boyanup	3.4 and Light Tanker
Capel	2 Stirling St Capel	3.4 & Light Tanker
Elgin	412 Elgin Rd, Elgin	1.4 & Light Tanker.

The location of the BFB stations are shown in Figure 2.

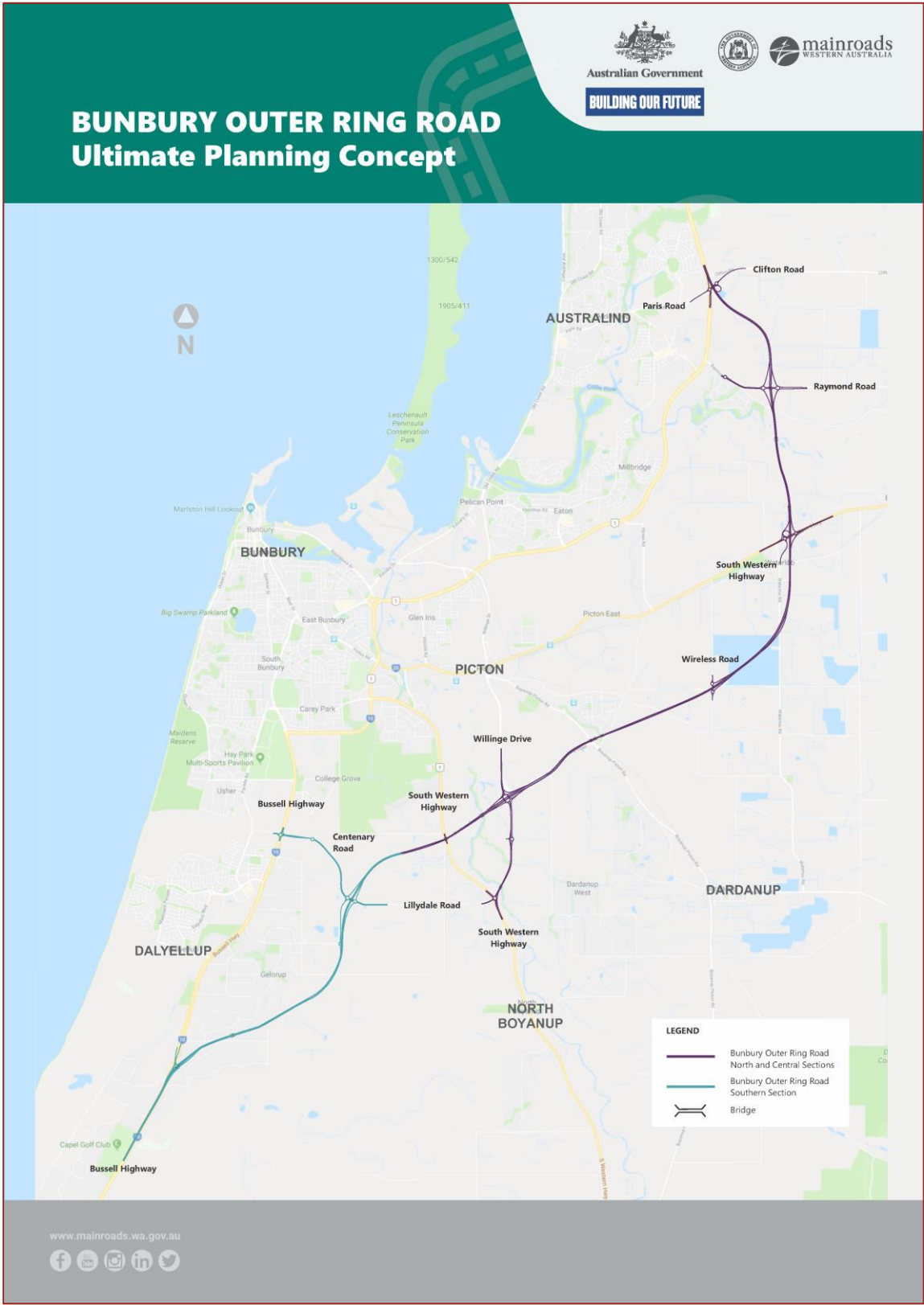
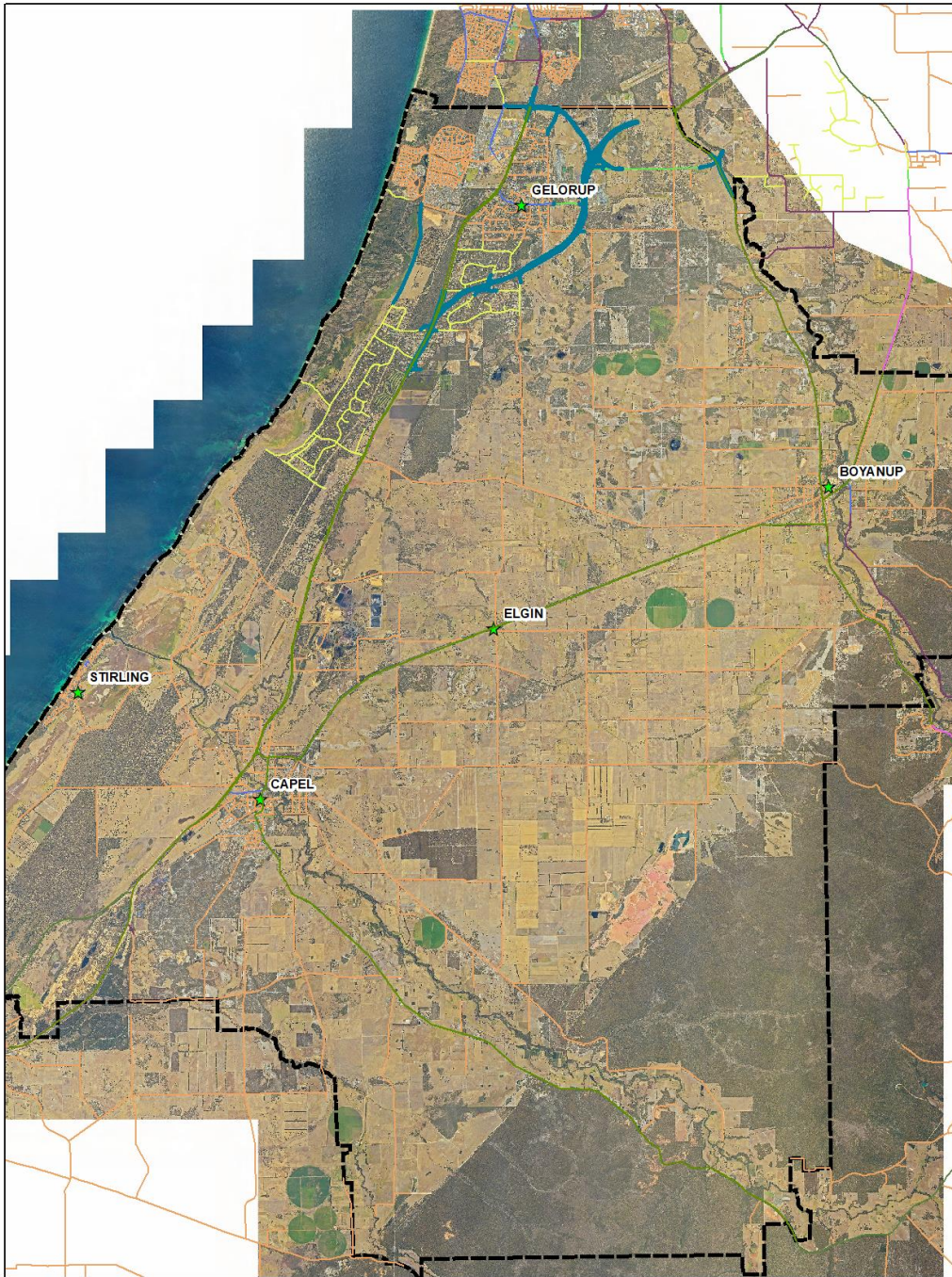


Figure 1: Map of the proposed route of the BORR (Main Roads WA)




<p>Location details: Shire of Capel (Northern Section) Project: 201020 Assessment date: Jan 2021 Prepared by: G McMahon Accreditation level: Level 3 Accreditation number: 35078 Accreditation expiry date: Nov 2021 Date aerial photo: Jan 2018</p>	<p>Shire of Capel BORR Route & BFB Station Locations</p> <p>Meters 0 550 1,100 2,200 3,300 4,400</p> <p>N</p>	<p>Legend</p> <ul style="list-style-type: none"> — BORR Alignments Shire Boundary ★ Fire Stations <table border="0"> <tr> <th style="text-align: left;">Speed Limit (km/h)</th> <td style="color: purple;">—</td> <td>80</td> </tr> <tr> <td style="color: lightblue;">—</td> <td>40</td> <td style="color: green;">—</td> <td>90</td> </tr> <tr> <td style="color: orange;">—</td> <td>50</td> <td style="color: darkgreen;">—</td> <td>100</td> </tr> <tr> <td style="color: blue;">—</td> <td>60</td> <td style="color: purple;">—</td> <td>110</td> </tr> <tr> <td style="color: yellow;">—</td> <td>70</td> <td></td> <td></td> </tr> </table>	Speed Limit (km/h)	—	80	—	40	—	90	—	50	—	100	—	60	—	110	—	70			<p> www.ecosystemsolutions.com.au (08) 9759 1960</p>
Speed Limit (km/h)	—	80																				
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—	60	—	110																			
—	70																					

Figure 2: Shire of Capel showing BORR alignment, BFB stations and Roads

3. Critical Considerations

According to the DFES Bushfire Prone Mapping available via Landgate most of the southwest is bushfire prone. Bushfire can happen anywhere and anytime. This can include areas of grass and/or paddocks. Fire can start easily and move quickly in this landscape.

It is important to recognise that landowners' have the primary responsibility to understand their risk from bushfires and implement actions to minimise the potential impact of a bushfire. These actions included;

- Ensuring there is an area of low fuel around their house or sheds (this is called an Asset Protection Zone)
- Fire breaks in accordance with the Shire of Capel's Bush Fire Mitigation Notice
- Maintaining grasses under 10cm over summer
- Having a hose that can reach all parts of the dwelling
- Suitable water supply
- Triggers and pathway for a possible evacuation are understood by all within the house. These are outlined in the Shires' Annual Bush Fire Mitigation Notice.

The Department of Fire and Emergency Services (DFES) have extensive resources for people to develop their own bushfire plan (www.mybushfireplan.wa.gov.au). There are worksheets and advice on helping people determine their specific bushfire risks and working through what to do in a bushfire in their neighbourhood.

It also needs to be acknowledged that bushfire brigades within the south west are maintained by volunteers within the community. There is no guarantee that a fire appliance will turn out to every bushfire within the Shire. Resources may be spread throughout the region depending on the situation. Similarly, even in high-risk times, there is no guarantee that air bombers or fire appliances can attend every call out.

Within this analysis, it is assumed that a standard turn out will result in a bushfire appliance being able to attend and the calculations used are only models based on broad assumptions and cannot be used as a benchmark or a guaranteed time frame for a bushfire response.

The focus of this report is on bushfire response. DFES are responsible for structure fires in gazetted fire district (Dalyellup) and the Shire of Capel is responsible outside the gazetted fire district, although does not have the capacity for structural fire entry and requests support from Fire and Rescue Services. Road crash rescues and hazmat incidents are managed by DFES and will be responded to primarily by Bunbury Fire and Rescue (which is staffed 24/7), to support Donnybrook and Busselton Volunteer Fire and Rescue Services as

required. These services can attend as priority 1 under lights and sirens so the calculations within this report do not refer to these.

Bushfire safety is a shared responsibility between governments, fire agencies, communities and landowners. The planning and building controls reduce the risk of bushfire to people and property. It will not remove all risk however. People interpret risk differently. The way they prepare and maintain their properties, buildings and assets and the actions they take (e.g., evacuate early or stay and defend) greatly influence their personal safety. All residents within the Shire need to maintain self-reliance and not wait or expect warnings or assistance from emergency services.

4. Methodology

To evaluate the potential impact, we used the following procedures.

- Reviewed the current brigade response areas;
- Obtained data on the Shire road network as it currently exists and the road network as it is proposed under the BORR;
- Obtained any data from the Department of Fire and Emergency Services regarding response times;
- Liaised with DFES staff regarding response map mentioned in the petition;
- Utilised Geographic Information System (GIS) to analyse travel response times from the current fire stations throughout the Shire, as it currently stands and after the BORR has been developed;
- Prepared isochronic maps of the Shire showing the before and after impact of the BORR on potential travel times;
- Prepared a report outlining the findings.

5. Analysis

5.1 Emergency Response

Response time is defined as the time taken between the initial call to a communication centre to alert an emergency (in this instance, a bushfire) and the arrival of the first fire crew at the scene and the time taken to set up and deploy hose lines and apply water to the fire. There are several stages in this, including time taken to report the incident, the time taken to dispatch a fire crew, the time taken for the fire appliance to leave the station, the travel time to the scene and the time taken to get hoses set up and apply water to the fire (Penney, *et al*, 2020).

This timeline is categorised in Figure 3.

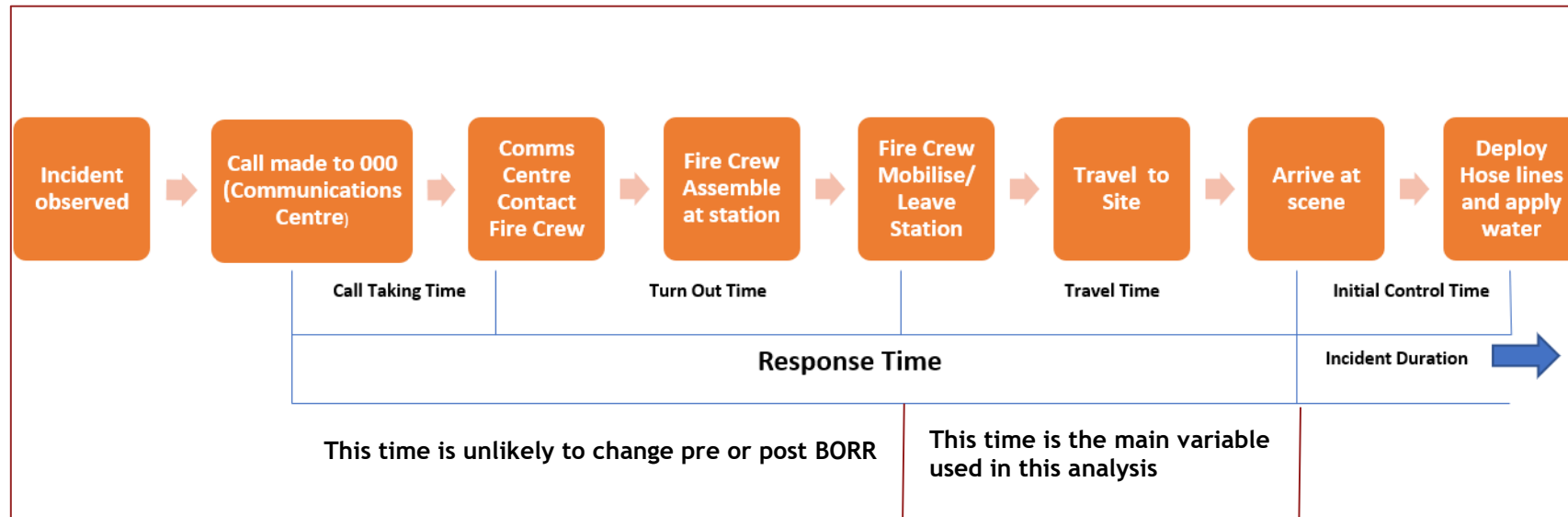


Figure 3: Emergency Response Flow Chart (Australian Government Report on Government Services. Productivity Commission 2021)

Turn out time records for volunteer brigades are not kept and have many variables that can impact on their exact times. The author of this report spoke extensively with Emergency Service Managers throughout the south west to try to formulate a relatively accurate estimate of turnout times. While all were unable to provide specific data an estimated time allowance of 20 minutes was considered reasonable by the interviewees.

The estimated turn out time of 20 minutes has been adopted for the purposes of in this analysis and included in the total response times which are mapped in Figures 4 & 5.

The construction of the BORR is unlikely to affect any other aspects of the overall incident duration as shown in Figure 3 above.

1.1 Assumptions

The Bunbury Fire and Rescue Service (FRS) is a permanently staffed fire station with career fire fighters. This means that there is a crew on duty 24 hours a day/7 day a week on station.

All other FRS services (Bunbury, Busselton, and Donnybrook) and the Bushfire Brigades are volunteer stations. This means that they do not run on call 24/7 rosters, as such their notification, assembly and turn out time can be varied depending on the distribution of members and the area/distance they may have to travel to the station before the appliance is mobilised out of the station.

The analysis that forms the basis of this review and report is using the travel time based on the Shire road system (datasets provided by the Shire) and maximum legal road speeds. Therefore, this report refers only to the potential travel time impacts of the BORR on the relevant Brigades.

We were only able to access road data from within the Shire of Capel, therefore no analysis was conducted on areas outside the Shire boundary.

Preliminary discussion with DFES on FRS/VFRS travel times confirmed that these brigades are authorised to travel at Priority One under the Emergency Vehicle Provision of the Road Traffic Code (2000) for the period of their deployment as an Emergency Vehicle.

The northern section of the Shire is served by the Bunbury FRS/VFRS. In this situation, the BORR alignment will not effectively impact upon any Priority 1 deployment for structural fire impacts (or road crash rescue). Given that the BORR may deviate some of the tourist traffic from the northern section of Bussell Highway, there is potential the BORR may allow a faster travel time for Bunbury Priority 1 turn outs to the northern section of the Shire.

After extensive discussions with DFES GIS branch in Cockburn, we were unable to locate the isochronic map showing travel times, as discussed in the initial petition. We were able to view an early 2000s analysis DFES had conducted but as this data was nearly 20 years old, the department was reluctant to provide this for public release as it was no longer relevant due to changing road conditions, different call out protocol,

updated communications technology, and updated fire appliances. We therefore used the format of the 2000 analysis as a guide to present our data so that if the previous map did surface, then our approach would be at least as consistent as possible with the previous approach.

Our rationale to proceed without this additional data was based on the assumption that as long as our approach was consistent with the before and after BORR data, then a comparison between the two would highlight any discrepancies or variations in potential travel times.

Our analysis was conducted on QGIS software using the QNEAT3 plug in. Our inputs included, the bushfire brigade locations, the Shire Road Maps and the maximum speed limit of those roads.

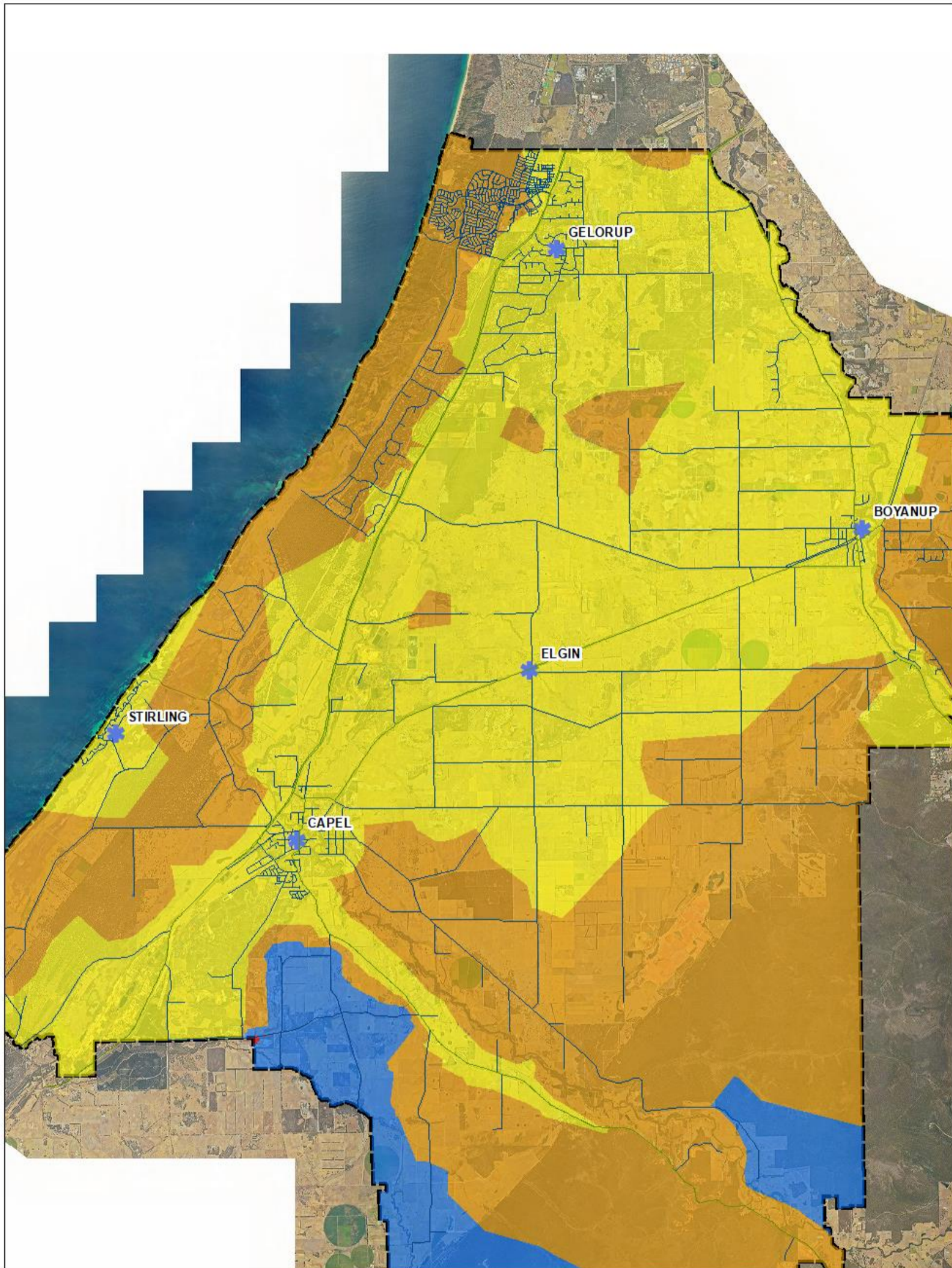
The QNEAT analysis provides an isochronic output showing the time of travel from a point (in this instance, the locations of the BFB stations within the Shire) along the recognised Shire roads, at the prescribed speed limit of those roads, to all areas of the Shire, using the quickest travel time. An isochrone map shows lines on a map connecting points at which something arrives at the same time from a designated point. This can be used to depict areas of equal travel time based on these known parameters.

It should be noted that some literature on travel times shows that bushfire appliances are often unable to travel at the full length of the road at the prescribed speed.

6. Results

An example of the raw isochrone mapping is provided in Appendix A. Note there are some anomalies in the output in the maps, which are caused by issues with the triangulation algorithms used in network analysis. This was manually rectified where possible.

To display the results with more clarity, we aggregated the travel times into 10 minute increments and the resulting data is mapped in Figures 4 & 5.



Location details: Shire of Capel
 Project: 201020
 Assessment date: Jan 2021
 Prepared by: G McMahon
 Accreditation level: Level 3
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**Response Time
 Pre BORR
 (refer to text for
 assumptions)**

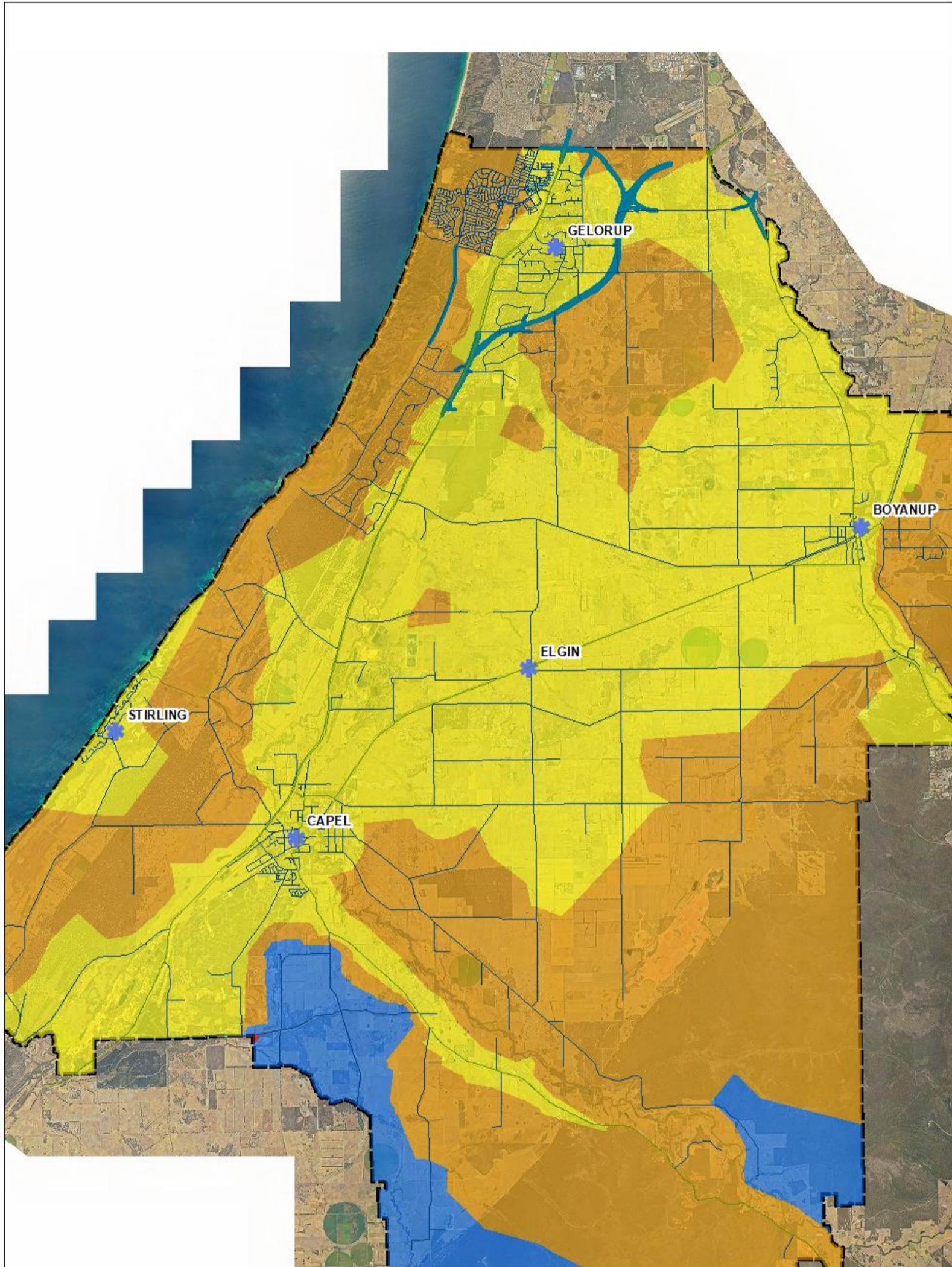


Legend

- | | |
|----------------|--------------------------|
| Shire Boundary | Response Category |
| Fire Stations | 30 mins or less |
| | 31-40 mins |
| | 41-50 mins |
| | 51-70 mins |



Figure 4: Modelled Response Time Pre BORR



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Response Time Post BORR (refer to text for assumptions).



Legend

- Shire Boundary
 - Fire Stations
 - BORR Alignments
- | Response Category | |
|-------------------|-----------------|
| | 30 mins or less |
| | 31-40 mins |
| | 41-50 mins |
| | 51-70 mins |



Figure 5: Modelled Response Time Post BORR

7. Discussion

The analysis highlights a number of areas where there is a difference in travel times. These are restricted to the northern area of the Shire and focus on the turn out times of the Gelorup brigade due to the change to the local road network following the construction of the BORR and the impact of onramps and offramps into the area.

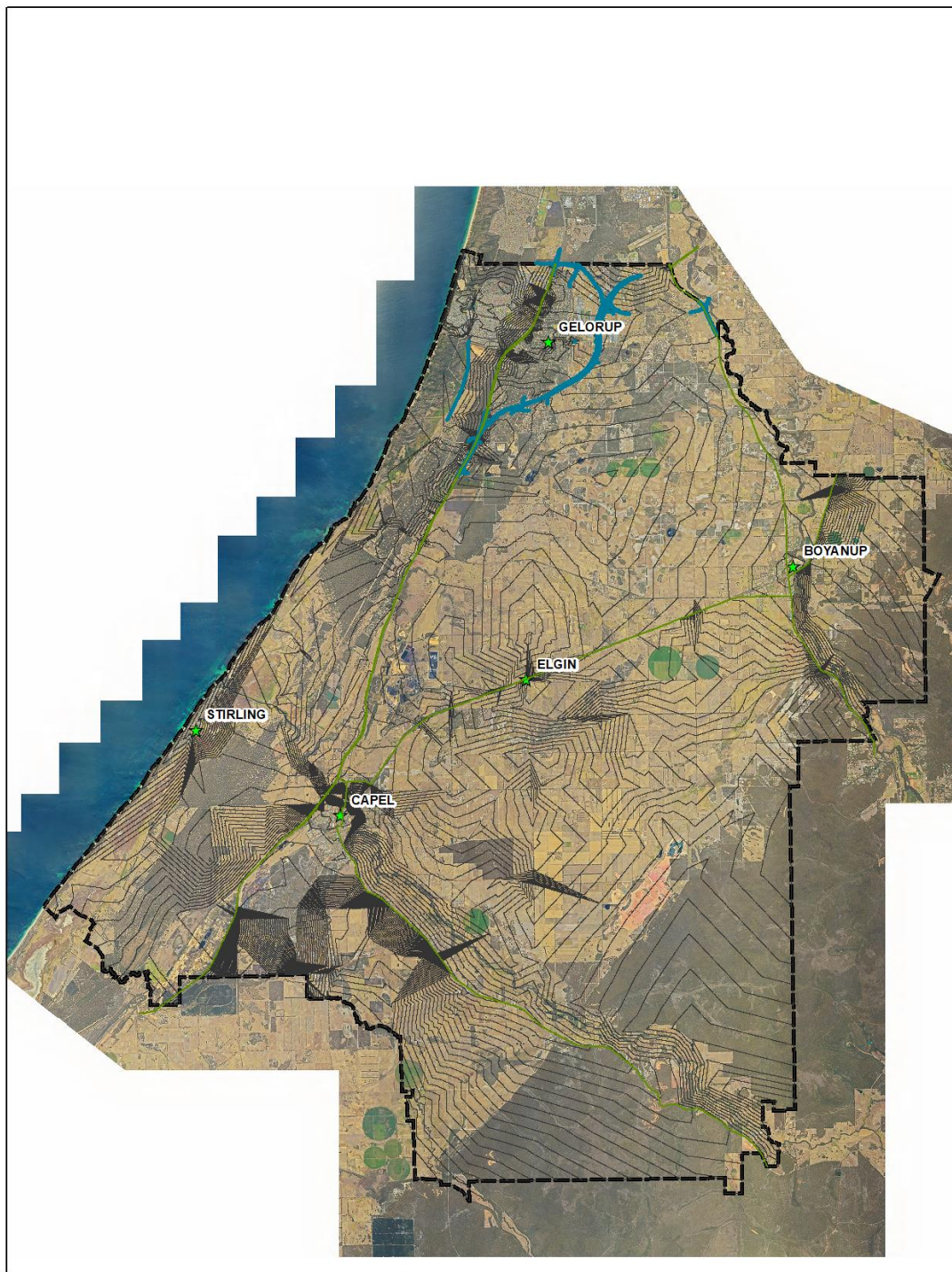
The two northern most areas affected are south of Manea Park, the largest area is an area south of the BORR, east of Bussell Highway and impacting areas around Ducane Road, Ken Bell/Skipping Road and Hair Place (Figure 5). The model shows that the BORR could increase travel times between 3 to 5 minutes (10% to 17% change to overall response time at worst case) to these areas in the current BORR configuration. This pushes some of the areas into a higher category, although the actual time difference is only 5 mins or less.

There are two areas within the Stratham location, around Lakes Road and Jaymon Road being impacted (Figure 5). The model shows that the potential increase on travel time for this area is between 2-4 minutes in the current proposed configuration. Again, this pushes some of the areas into a higher category of response time.

It needs to be noted that this analysis deals only with the modelled travel times to these areas and that there are many other factors that can impact on the arrival time of fire appliances, in particularly the assembly and turn out time of brigades.

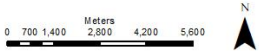
Overall, the construction of the BORR could result in a relatively small impact to a number of properties in the north of the Shire of Capel, with a maximum increase of 5 minutes to the response times of emergency services in the event of a bushfire. In the event of a bushfire, the emergency services response time for all other areas of the Shire will not be impacted by the construction of the BORR.

Appendix A Raw Isochronic output



Location details: Shire of Capel (Northern Section)
 Project: 201020
 Assessment date: Jan 2021
 Prepared by: G McMahon
 Accreditation level: Level 3
 Accreditation number: 35078
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Raw Isochrone Output



Legend

- ★ Fire Stations
- BORR Alignments
- Raw Output
- ▭ Shire Boundary

