HIBISCUS AFF. CAMPANULATUS

TARGETED SURVEY – CATHEDRAL GORGE

PREPARED FOR: BHP WAIO

Spectrum ECOLOGY & SPATIAL

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EXECUTIVE SUMMARY

Spectrum Ecology & Spatial (Spectrum) was engaged by BHP Western Australian Iron Ore (WAIO) to conduct a targeted survey for *Hibiscus* aff. *campanulatus* within the OB32 west, OB28 and OB33 Survey Area. *Hibiscus* aff. *campanulatus* is likely to be raised to a phrase-named entity and assigned a Priority status in the near future. *Hibiscus* aff. *campanulatus* is a large, typically erect shrub growing to 3 m**.** The habitat preference of *Hibiscus* aff. *campanulatus* is varied, ranging from hillslopes, base of hillslopes, sheltered gullies or rock drainage lines (with a low clay content), and below associated cliff-lines or rocky ridges. To date *Hibiscus* aff. *campanulatus* has primarily been recorded in the vicinity of Newman, Western Australia.

Spectrum performed Species Distribution Modelling based on existing *Hibiscus* aff. *campanulatus* locations provided by BHP WAIO and sourced from the Western Australian Herbarium. Due to the clustered nature of records, they were filtered during the analysis to avoid spatial dependencies where possible that would bias the model's results. Twenty-nine environmental variables were chosen according to the species abiotic and biotic interactions with its environment. These included landscape and soil attributes, vegetation indices, and GIS generated predictors from categorical variables of geological attributes. Modelling was implemented using maximum entropy algorithms within the Maxent software with parameters selected for best results as per peer-reviewed literature. The results were used to identify target areas with a high and medium likelihood of containing *Hibiscus* aff. *campanulatus* within a Survey Area. Model results were found to be effective at predicting species occurrence.

A targeted field survey was undertaken from 4 to 12 July 2022 (18 person days), during which approximately 142 km of traverses were surveyed. A total of 51,679 *Hibiscus* aff. *campanulatus* individuals were recorded from 1,234 locations in the Survey Area. Counts of individuals were typically estimated as accurately as possible as *Hibiscus* aff. *campanulatus* grew in large groups. *Hibiscus* aff. *campanulatus* was found in shaded areas, such as protected laterite ridgelines, crevasses, and drainage lines with a low clay content. All *Hibiscus* aff. *campanulatus* plants recorded were considered to belong to a single population as the records were separated by < 500 m, two subpopulations were identified due to the isolation of these groups of records.

No other significant flora taxa were recorded during the assessment.

1. PROJECT INFORMATION

1.1. Project Background

Populations of *Hibiscus* aff. *campanulatus* were recorded following the 2021 flora and vegetation surveys of the OB32 west, OB28 and OB33 Survey Area (GHD, 2022). *Hibiscus* aff. *campanulatus* is likely to be raised as a phrase-name entity and assigned a Priority flora status in the near future. As there is the potential for proposed future mining operations within the area to impact the localised population of *Hibiscus* aff. *campanulatus*, BHP Western Australian Iron Ore (WAIO) commissioned Spectrum Ecology & Spatial (Spectrum) to conduct a targeted survey to identify additional records of *Hibiscus* aff. *campanulatus* in the Survey Area (Map 1.1). Species Distribution Modelling (SDM) was conducted to identify presence of suitable habitat across a large portion of the Pilbara and to be targeted during the in-field assessment.

1.2. Scope of Work

The scope of works included:

- A desktop assessment for previous records and survey effort for *Hibiscus* aff. *campanulatus*;
- A SDM for *Hibiscus* aff. *campanulatus* to identify target areas for the field assessment; and
- A targeted survey within the Survey Area to record additional populations of *Hibiscus* aff. *campanulatus*.

1.3. Legislation & Guidelines

Flora and vegetation in Western Australia are protected by various legislation, including:

- *Biodiversity Conservation Act 2016* – BC Act (Western Australian Government, 2016);
- *Environmental Protection Act 1986* (Western Australian Government, 1986); and
- *Environment Protection and Biodiversity Conservation Act 1999* – EPBC Act (Australian Government, 1999).

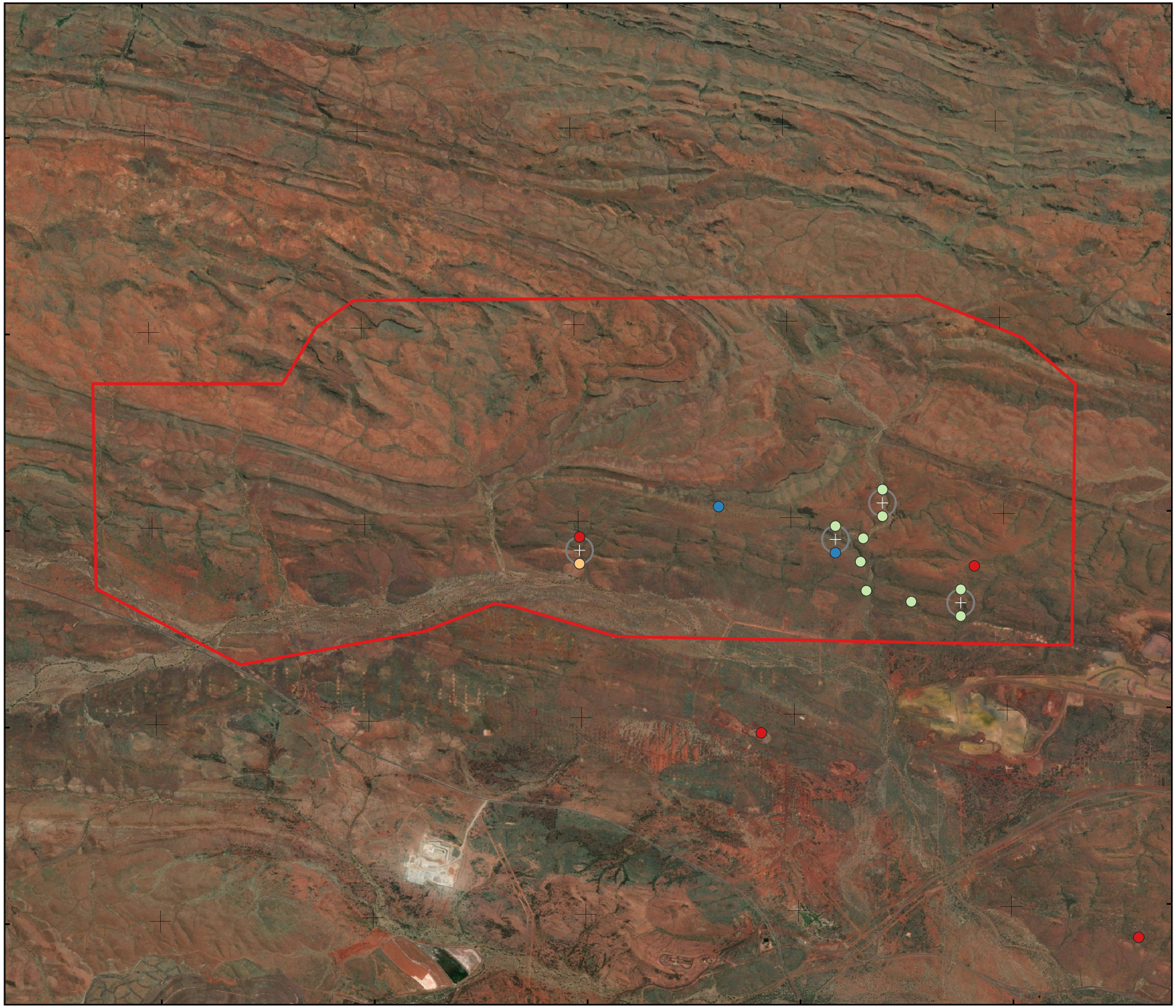
The survey was compliant with survey guidelines, as outlined in:

- Environmental Protection Authority (EPA) Environmental Factor Guideline: Flora and Vegetation (EPA, 2016a);
- EPA Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016b);
- EPA Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA, 2002);
- EPA Statement of Environmental Principles, Factors and Objectives (EPA, 2021):
- Department of Biodiversity Conservation and Attractions (DBCA) Threatened and Priority Flora Report Form – Field Manual (Department of Biodiversity Conservation and Attractions, 2017);
- National Vegetation Information System (NVIS) Australian Vegetation Attribute Manual (ESCAVI, 2003);
- Latest version of BHP WAIO's Biological Survey Spatial Data Requirements (SPR-IEN-EMS-015); and
- Latest version of BHP WAIO's Vegetation and Flora Survey Procedure (0124627).

Significant flora can include (Environmental Protection Authority, 2016a):

- Species identified as Threatened: Critically Endangered, Endangered, or Vulnerable (state listed Biodiversity conservation - BC Act and/or nationally listed - EPBC Act);
- Locally endemic species or those associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems);
- New species or those presenting anomalous features that indicate a potential new species;
- Species that are representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- Unusual species, including restricted subspecies, varieties or naturally occurring hybrids; or
- Species that have relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

A detailed description of conservation codes and significance definitions can be found in Appendix A.



Legend

- Survey Area
- Town or City

Hibiscus aff. campanulatus Records

- GHD (2022)
- Bennelongia (2019)
- Onshore Environmental (2016)
- Western Australian Herbarium

N

0 1 2 km

Scale 1:50,000 @ A4

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Units: Meter

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Author: CS

Date: 01-12-2022

Survey Area & Previous Records

Hibiscus aff. campanulatus
Targeted Survey

MAP 1.1

Prepared for
BHP WAIO

2. METHODS

2.1. Desktop Assessment

2.1.1. Biological Database Searches

Database searches of relevant and available biological data sources that may yield records of *Hibiscus* aff. *campanulatus* within the Survey Area are presented in Table 2.1 and Map 1.1. One record from the DBCA database and BHP WAIO database overlapped.

Table 2.1: Database Searches

Data Source	Custodian	Details	Records Returned
DBCA Threatened & Priority Flora Databases (TPFL / Western Australian Herbarium (WAH))	Department of Biodiversity, Conservation and Attractions	Within the SDM Study Area envelope Reference: 27-0422FL	15
BHP WAIO Species Database	BHP WAIO	Within the SDM Study Area envelope	12

2.2. Species Distribution Modelling

Species distribute in space and time according to their dispersal capabilities, ecophysiology needs, and the interaction with other species (Guisan, Thuiller and Zimmermann, 2017). SDMs look to predict the locations of a species, associating known records (presences) to a set of environmental predictor variables that might help to describe any abiotic and biotic interactions. The relationship between known presences and environmental predictors are statistically compared using a wide arrange of mathematical techniques (Zurell *et al.*, 2020). Some mathematical models require presence and known absence locations, whereas others require presence and randomly generated background points. Some models may also only require presence data, in order to expand the opportunities to model understudied or rare species. Amongst the presence background mathematical models available, maximum entropy algorithms using MaxEnt is one of the most popular methods amongst the peer-reviewed literature (Elith *et al.*, 2011). Spectrum has also addressed possible SDM limitations and improved the model's predictability by utilising additional environmental variables as model inputs within the advanced MaxEnt (Maximum Entropy), which allows full control over the model's input parameters.

The distribution of *Hibiscus aff campanulatus* was predicted using an occurrence based (presence-background) SDM approach (Bull, Dillion and Brearley, 2019). The SDM Study Area covered an area of 132,921 km^2 (13,292,100 ha), encompassing the southern half of the Pilbara Interim Biogeographic Regionalisation for Australia (IBRA) region.

2.2.1. Species Data & Environmental Variables

SDMs predict species probable locations from known "presences" and randomly generated "pseudo-absences", which are locations where the species is not present. Existing *Hibiscus aff. campanulatus* locations provided by BHP WAIO and sourced from the WAH were used as occurrence records to train the model. Species records that were located within 20 m of each other were removed to address possible data duplication and model bias. To account for sampling bias and spatial autocorrelation, sampling intensity across the SDM Study Area was represented as a separate variable. To achieve this, a bias layer was constructed from occurrence points of all species using a two-dimensional Kernel Density estimate in ArcGIS (Phillips and Dudík, 2008; Fourcade *et al.*, 2014).

Thirty-seven environmental variables were selected to represent the habitat preferences of *Hibiscus aff. campanulatus* and predict potential occurrence within the SDM Study Area (Table 2.2). These variables were selected to meet ecophysiological requirements of the species related to the abiotic landscape and soil characteristics, geology, and climate preferences. Commonwealth Scientific and Industrial Research Organisation's (CSIRO's) soil and landscape grids were chosen focusing on: slope, ridges and valleys, soil composition, and a Digital Elevation Model (DEM) obtained from the United States Geological Survey (USGS) Earth Explorer service (Grundy *et al.*, 2015; O'Brien and Searie, 2021).

Two vegetation indices were calculated from Landsat 8 level 2 satellite imagery (https://earthexplorer.usgs.gov/). The Normalised Vegetation Index (NDVI) and the Normalised Difference Wetness Index (NDWI) represent the greenness and moisture in vegetation (Qi *et al.*, 1994; Gao, 1996; Xue and Su, 2017). A set of categorical variables were used to represent the SDM Study Areas' environment: Soil Landscape Systems (Department of Primary Industries and Regional Development (DPIRD), 2022), Vegetation Units of Western Australia (Western Australian Government, 2020), and identified Soil types (Northcote *et al.*, 1968). All environmental datasets were set at the same resolution provided by CSIRO's soil and landscape grids at 88 m pixels (Table 2.2). To avoid multicollinearity and ensure selection of only the most representative variables, a correlation test was undertaken. Environmental variables were assessed against each other for the SDM Study Area. Variables with correlation higher than 0.7 were excluded when performing the SDM (Dormann *et al.*, 2013).

Table 2.2: Environmental Predictor Variables

Environmental Variable	Description	Type	Source
Landscape Attributes			
Slope (%)	Slope measures the inclination of the land surface from the horizontal.	Numeric	CSIRO
Slope (%) Median 300 m	The median slope within a 300 m radius representing the typical slope in the local landscape.	Numeric	
Slope Relief Class	Soil relief landform pattern classification based on (Speight, 2016).	Categorical	
Aspect	The direction in which a land surface slope face is expressed in degrees from north.	Numeric	
Depth of Regolith	Metres of in situ and transported material overlying unweathered bedrock.	Numeric	
Topographic Wetness Index (TWI)	TWI estimates the relative wetness within moist catchments but is more commonly used as a measure of position on the slope with larger values indicating a lower slope position.	Categorical	
Topographic Position Index	Topographic classification identifying upper, middle and lower parts on the slope with larger values indicating a lower slope position.	Numeric	
Multiresolution Index of Valley Bottom Flatness (MrVBF)	MrVBF is a topographic index designed to identify areas of deposited material at a range of scales based on the observations that valley bottoms are low and flat relative to their surroundings and that large valley bottoms are flatter than smaller ones.	Categorical	
Roughness	Measure of the deviation of surface from its ideal form.	Numeric	
Relief	The difference between a locations highest and lowest elevations.	Numeric	
Relief 1000 m Radius	The elevation range measures the full range of elevation within a 1000 m circular radius and can be used as a representation of local relief.	Numeric	
Relief 300 m Radius	The elevation range measures the full range of elevations within a 300 m circular radius and can be used as a representation of local relief.	Numeric	
Plan Curvature	Contour is the rate of change of aspect (across the slope and represents topographic convergence or divergence).	Numeric	
Profile Curvature	The rate of change of potential gradient down a flow line and represents the changes in flow velocity down a slope.	Numeric	

Environmental Variable	Description	Type	Source
Digital Elevation Model (DEM)	Height above sea level.	Numeric	USGS
Soil Attributes			
Soils	National description of Australian soil types.	Categorical	CSIRO
Depth to Soil	Depth of soil profile (A & B horizons) in metres.	Numeric	
Bulk Density	Bulk Density of the soil (g/cm^3) at a depth of 0- 5 cm.	Numeric	
pH	pH in Calcium Chloride of the soil within the 0- 5 cm depth layer.	Numeric	
Soil Available Water Capacity	Computed plant-available water capacity of the soil at a depth of 0-5 m.	Numeric	
Soil Sand (%)	Percentage of sand content of the soil at a depth of 0-5 cm.	Numeric	
Soil Silt (%)	Percentage of silt content of the soil at a depth of 0-5 cm.	Numeric	
Soil Clay (%)	Percentage of clay content of the soil at a depth of 0-5 cm.	Numeric	
Soil Organic Carbon	Mass fraction of carbon by weight in the < 2 mm soil material as determined by dry combustion at 900 Celsius.	Numeric	
Soil Total Phosphorus	Percentage of phosphorus content of the soil at a depth of 0-5 cm.	Numeric	
Soil Total Nitrogen	Mass fraction of total nitrogen in the soil by weight.	Numeric	
Effective Cation Exchange Capacity	Cations extracted using barium chloride ($BaCl_2$) plus exchangeable H + Al.	Numeric	
Geology, Land systems, & Water Courses			
Geology 1M	Seamless national coverage of outcrop and surficial geology.	Categorical	Geoscience Australia
Land Systems	Soil-landscape mapping at the systems level.	Categorical	
Lakes & Flats	Euclidean distance from lakes and flats (swamps, saline coastal flats, and land subject to inundation).	Numeric	Calculated by Spectrum
Minor Watercourse	Euclidean distance from minor watercourse.	Numeric	
Major Watercourse	Euclidean distance from major watercourse.	Numeric	
Vegetation			
Pre-European Vegetation	Pre-European vegetation (Western Australian Government, 2019) maps original natural vegetation assumed to have existed prior to European settlement in Western Australia.	Categorical	DPIRD
Vegetation Indices			
NDVI	Normalised Difference Vegetation Index from Landsat 8 Imagery.	Numeric	Calculated by Spectrum
NDWI	Normalised Difference Water Index from Landsat 8 Imagery.	Numeric	
Bioclimatic			
Bioclim1	Annual Mean Temperature.	Numeric	Hijmans et al., 2005
Bioclim12	Annual Precipitation.	Numeric	

2.2.2. Maximum Entropy Model Parametrization & Validation

The SDM was generated using the software package MaxEnt v.3.4.1 (Phillips, Anderson and Schapire, 2006). MaxEnt models species' distributions to predict the probability of species occurrence based on a set of environmental variables in conjunction with known occurrence records and pseudo-absences (Phillips, Dudík and Schapire, 2004). Model settings and input parameters were optimised over five unique models. Key settings include 10,000 background points, 10 iterations, and a subsample replicate run type where presences were randomly partitioned into testing (80%) and training (20%) datasets to validate the model independently.

The predictive performance of models were tested by the area under the receiver operating curve (AUC) to the independent testing dataset (Hao *et al.*, 2019; Zurell *et al.*, 2020). AUC is considered as the probability that a presence location has a higher occurrence value than an absence location. Models with AUC values

above 0.75 were considered of high performance. Environmental predictor variables were selected or extracted from the models according to the percent contribution and the permutation importance until the best performing model was found. A high permutation importance indicates that an environmental variable contains information that isn't present in other variables.

2.2.3. Model Output

The model extent was expressed in a map showing the probability of occurrence within the SDM Study Area. The map shows the probability of occurrence in three ranks as; "Low" (0.05-0.64), "Moderate" (0.64-0.91) and "High" (0.91-1.00). These ranks were defined using a data driven approach where the threshold of each represents the 95 % (moderate) and 50 % (high) occurrence of known presence records over the predicted model output values.

2.3. Field Assessment

2.3.1. Survey Timing

The targeted survey was undertaken over nine days between 4 July and 12 July 2022, following higher rainfall in the preceding three and 12-month periods compared to the long-term median (Figure 2.1).

Monthly climate data was sourced from the nearest Bureau of Meteorology (BOM) station with complete data (Newman Airport #7176), located approximately 20 km south-west of the Survey Area (Bureau of Meteorology, 2022). Rainfall recorded 12 months prior to the survey and median monthly rainfall are presented in Figure 2.1.

The following rainfall was recorded at Newman Airport prior to the survey:

- The 12 months preceding the field survey (July 2021 to July 2022) recorded 226 mm of rainfall, 97 mm lower than the sum of the long-term annual median of 323 mm; and
- The three-months preceding the field survey (May 2022 to July 2022) recorded 82 mm of rainfall, 68 mm higher than the sum of the long-term annual median for the same three months (14 mm).

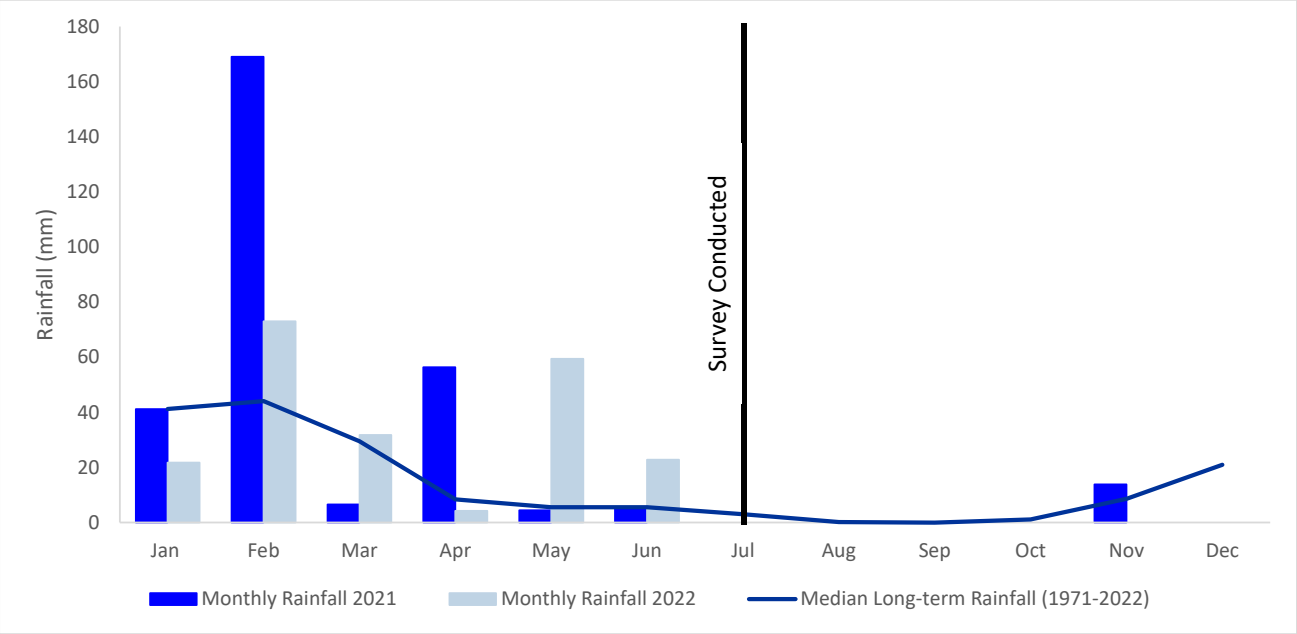


Figure 2.1: Rainfall & Median Long Term Rainfall Data

2.3.2. Field Methods & Sampling Effort

A targeted survey for *Hibiscus* aff. *campanulatus* was undertaken at the Survey Area taking into consideration the results of the SDM. The survey was completed by a botanist and spatial ecologist (refer to Section 2.4.3) over a nine-day period. A total of 142 km of traverses were sampled during the assessment (Map 2.1).

To effectively cover the search areas as determined by SDM, the field team was spaced 50-100 m apart (depending on terrain) during each traverse. This spacing was sufficient to cover the target areas and with a high confidence level. Traverses conducted during the survey are mapped on Map 2.1. Where individuals of *Hibiscus* aff. *campanulatus* were encountered, data collected was compliant with the Threatened and Priority Flora Report Form Manual (DBCA, 2017b).

When *Hibiscus* aff. *campanulatus* was encountered, the survey intensity surrounding that point was increased to search for additional individuals and to delineate the population. When other significant flora taxa were encountered (i.e. Priority 1 (P1) to P4, and other significant flora as defined by EPA (2016a)), they were opportunistically recorded along the traverse.

Hibiscus aff. *campanulatus* was recorded at an individual plant level where possible (i.e. a GPS co-ordinate for each plant). However, due to the large local group sizes and steep terrain, this was not always possible. Where individual counts of *Hibiscus* aff. *campanulatus* were not practical, records were spaced by 20 m and an estimate of the number of individuals within that area (400 m^2) was taken. When *Hibiscus* aff. *campanulatus* was encountered sufficient information was collected to be compliant with the requirements of the Threatened and Priority flora report form, and included:

- Observation date;
- Observer, role, organisation;
- Description of location, land tenure;
- GPS coordinates;
- Abundance count; count method;
- Reproductive state (of collected specimens);
- Condition of population;
- Habitat information;
- Vegetation classification; and
- Condition of habitat (e.g. fire history etc.).

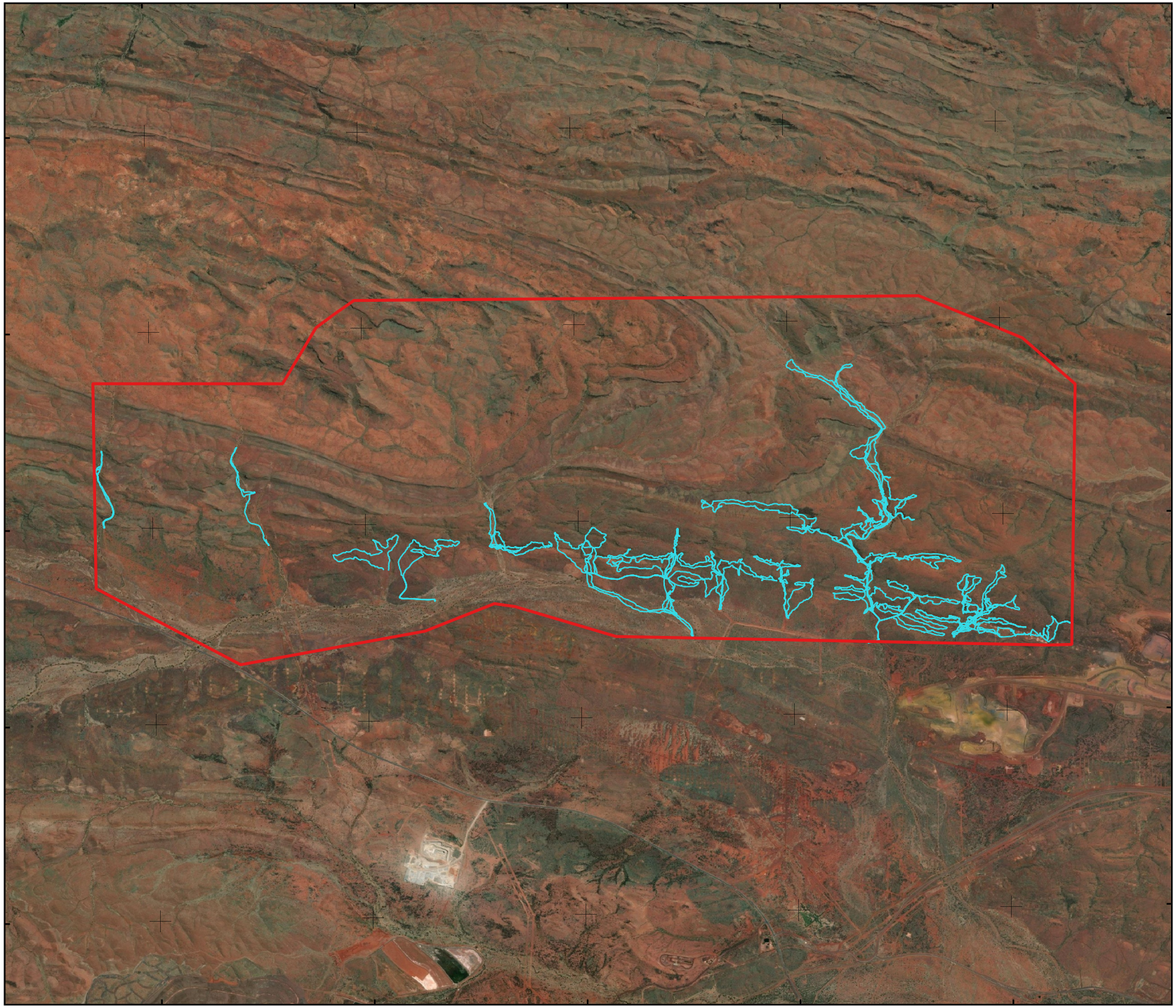
A sub-set of specimens were submitted to the WAH for formal identification.

2.3.3. Personnel & Licences

Spectrum staff involved with this assessment are listed in Table 2.3, along with their project involvement, years of experience, and relevant licences.

Table 2.3: Personnel & Licences

Staff	Qualification	Role	Project Tasks	Years of Experience	Flora Licence
Melissa Hay	BSc Hons	Principal Botanist	Review	16 years	n/a
Susan Murrey	BSc, MSc	Senior Botanist	Field Survey, Data Management	6 years	FB62000101-2
Brandi Simmons	BSc	Spatial Ecologist	Field Survey, Reporting	4 years	FB62000421
Chris Shaw	BSc Hons, PhD	Senior Botanist	Reporting	6 years	n/a



Legend

- Survey Area
- Traverses

N

0 1 2 km

Scale 1:50,010 @ A4

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Units: Meter

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Author: CS

Date: 29-11-2022

Sampling Effort

Hibiscus aff. campanulatus
Targeted Survey

MAP 2.1

Prepared for
BHP WAIO

2.4. Limitations & Constraints

No significant limitations were experienced during this assessment. Survey specific limitations and constraints for the targeted flora survey are discussed in Table 2.4.

Table 2.4: Limitations & Constraints

Limitation	Constraint	Comment
Availability of contextual information at a regional and local scale.	No	Background information for the region was available and sufficient, including broad information on land systems and vegetation associations. A basic database search was undertaken prior to the field survey, which provided a list of approximate locations for target species and non-target species.
Competency/experience of the team carrying out the survey, including experience in the bioregion surveyed.	No	Field survey team lead, Susan Murrey, has six years' experience in conducting botanical surveys throughout Western Australia including targeted flora surveys within the Hamersley IBRA sub-region of the Pilbara region. Field team member, Brandi Simmons, has four years' experience in conducting spatial and botanical assessments which includes vegetation health surveys within the Hamersley IBRA sub-region of the Pilbara region.
Restrictions to, or functionality of survey equipment and tools to complete the flora and vegetation assessment.	No	Equipment supplied was sufficient for the survey and there were no functionality or access issues with equipment and tools used during the survey.
Proportion of flora recorded and/or collected, any identification issues.	No	There was adequate floristic material available for field identification of *H.* aff. *campanulatus*.
Survey effort and extent.	No	Due to time constraints and terrain, it was not possible to access two small High and Medium probability sites identified by the SDM modelling within the Survey Area. These two sites were located in the north east corner of the survey area. All of the other High to Medium probability sites were surveyed.
Access restrictions within the Survey Area.	Slight	There vast majority of the Survey Area was accessible via vehicle tracks. There were no vehicle tracks close to the north of the Survey Area where two small areas of High and Medium likelihood occurred and could not be surveyed.
Survey timing, rainfall, season of survey.	No	The survey was conducted during the optimum flowering period for *H.* aff *campanulatus*, following a period of higher-than-median rainfall for the three months preceding the survey (68 mm above median for the same time period).
Disturbance that may have affected the results of survey such as fire, flood or clearing.	No	No disturbances, including fire, were recorded at the Survey Area that would have affected survey results.

3. RESULTS & DISCUSSION

3.1. Desktop Assessment

3.1.1. Previously Conducted Biological Assessments

Hibiscus aff. *campanulatus* was first recorded within BHP WAIO's Cathedral Gorge tenement (AML7000244) during a detailed flora and vegetation survey (Onshore Environmental, 2016). *Hibiscus* aff. *campanulatus* was recorded twice by Bennelongia (2019) and nine times by GHD (2022) during subsequent surveys in the area (Map 1.1). The DBCA database contained 15 records of *Hibiscus* aff. *campanulatus*, 14 of the records were unique as one specimen from the previously conducted sources was lodged to the Western Australian Herbarium.

Table 3.1: Previously Conducted Assessments

Source	Survey Type	Author
OB32 West, OB33 and OB29 Part IV Detailed Flora and Vegetation Survey	Detailed	GHD (2022)
OB32 Riparian and GDV Reconnaissance Flora and Vegetation Survey	Reconnaissance	Bennelongia (2019)
Cathedral Gorge Level 2 Flora and Vegetation Survey	Detailed	Onshore Environmental (2016)

3.1.2. *Hibiscus* aff. *campanulatus* Description & Habitat Preferences

Hibiscus aff. *campanulatus* is a large, typically erect shrub growing to 3 m. Habitat preference for *Hibiscus* aff. *campanulatus* is varied, ranging from hillslopes, base of hillslopes, sheltered gullies or rock drainage lines (with a low clay content), and below associated cliff-lines or rocky ridges. To date, *Hibiscus* aff. *campanulatus* has only been recorded in the vicinity of Newman, Western Australia. Detailed photos of diagnostic features and habitat preference is displayed in Appendix B.

Diagnostic features of *Hibiscus* aff. *campanulatus* are:

- Inflorescence, corollas are funnel form, mauve with a dark maroon to purple spot at the internal base of each petal (Plate 3.1);
- The stellate hairs on the adaxial leaf surface are smaller, up to 2.5 mm in diameter (up to approximately 4.6 mm in diameter); and
- The articulation is relatively close to the flower with the pedicel 1.5–4(–6) mm long (cf. 5–17 mm long) (S. Dillon pers. comm.).

Plate 3.1: *Hibiscus campanulatus* and *Hibiscus* aff. *campanulatus* flower comparison. a.) *Hibiscus campanulatus* pink/mauve and white flower colouration (Perkins, 2017), and b.) *Hibiscus* aff. *campanulatus* with distinctive purple spots at base of petal/corolla.

3.2. Species Distribution Modelling Results

3.2.1. Correlation Test Amongst Environmental Predictors

The correlation test amongst environmental predictor variables for the SDM Study Area revealed a number are not independent. Clay, Silt, MrVBF, Relief Range 300 m, Relief Range 1,000 m, Roughness, Slope Relief Class, and Slope (%) Median 300 m all showed correlation above 0.7. These variables were not included in the SDM. The final selected variables to feed the initial model are shown in Appendix C.

3.2.2. Maximum Entropy Model Performance

Five models were tested in the selection process, choosing a best model that presented a very high performance with an AUC of 0.99 (Figure 3.1; Map 3.1). This means that the model was highly efficient at measuring "presences" and "pseudo-absences".

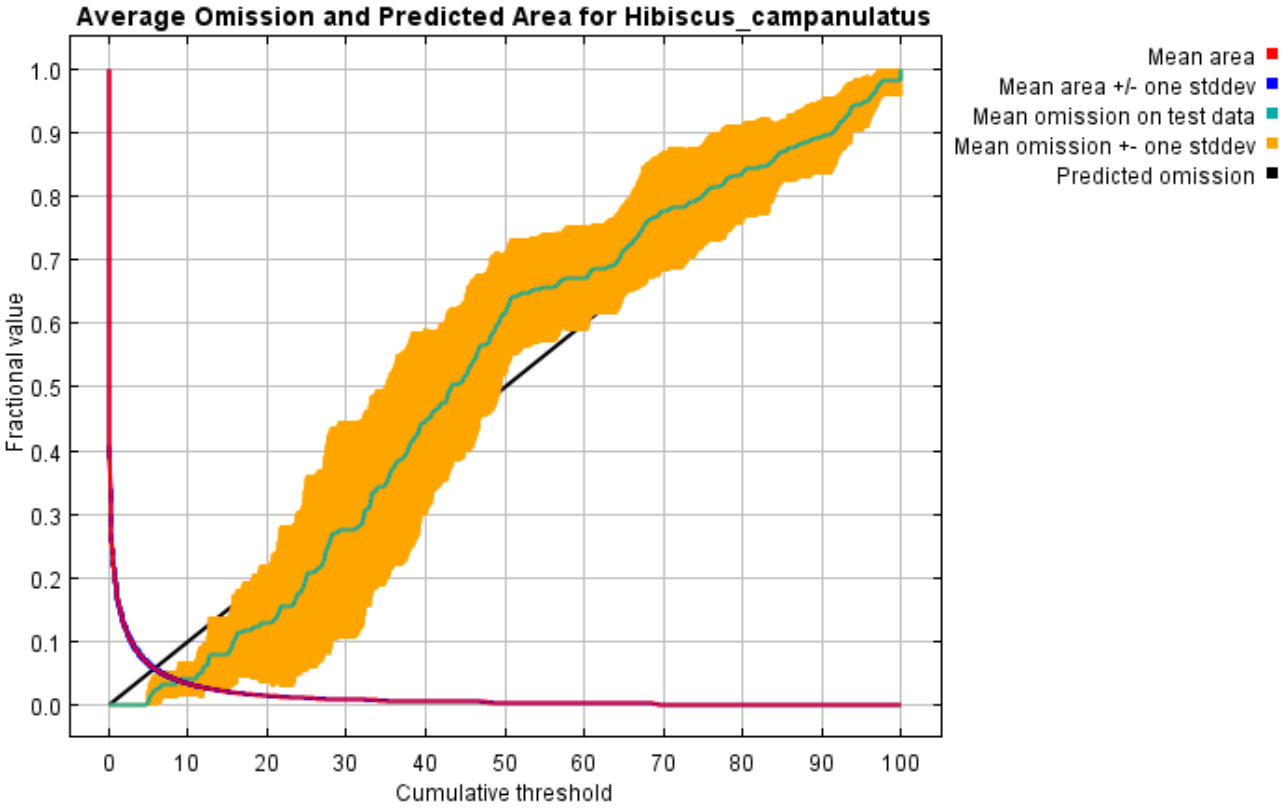


Figure 3.1: Average Omission & Predicted Area for *Hibiscus* aff. *campanulatus*

3.2.3. Environmental Variable Importance & Contribution

Amongst the 28 unique predictor variables tested (Appendix C), fourteen were the most influential when explaining the distribution of *Hibiscus* aff. *campanulatus*. Table 3.2 details the environmental variables retained in the final model selected. Mean Annual Precipitation and Relief were the most influential predictors, with 30.9% and 15.6% contribution, respectively.

Based on the model outputs, the Newman Land System was identified as a land system of importance. *Hibiscus* aff. *campanulatus* appears to be found closely associated with the Brockman and Boolgeeda Iron formations as well as the Mount McRae Shale and Mount Sylvia Formations. Soil type Fa13 associated with shales and iron-ore formations was highlighted within the Soils variable, consistent with habitat preferences

observed in the field. The species preference for hillslopes, gullies, and drainage lines was also apparent by the contribution of Slope, Relief, and Distance to Minor Watercourse variables.

Table 3.2: Variable Importance of the Best Performing Model

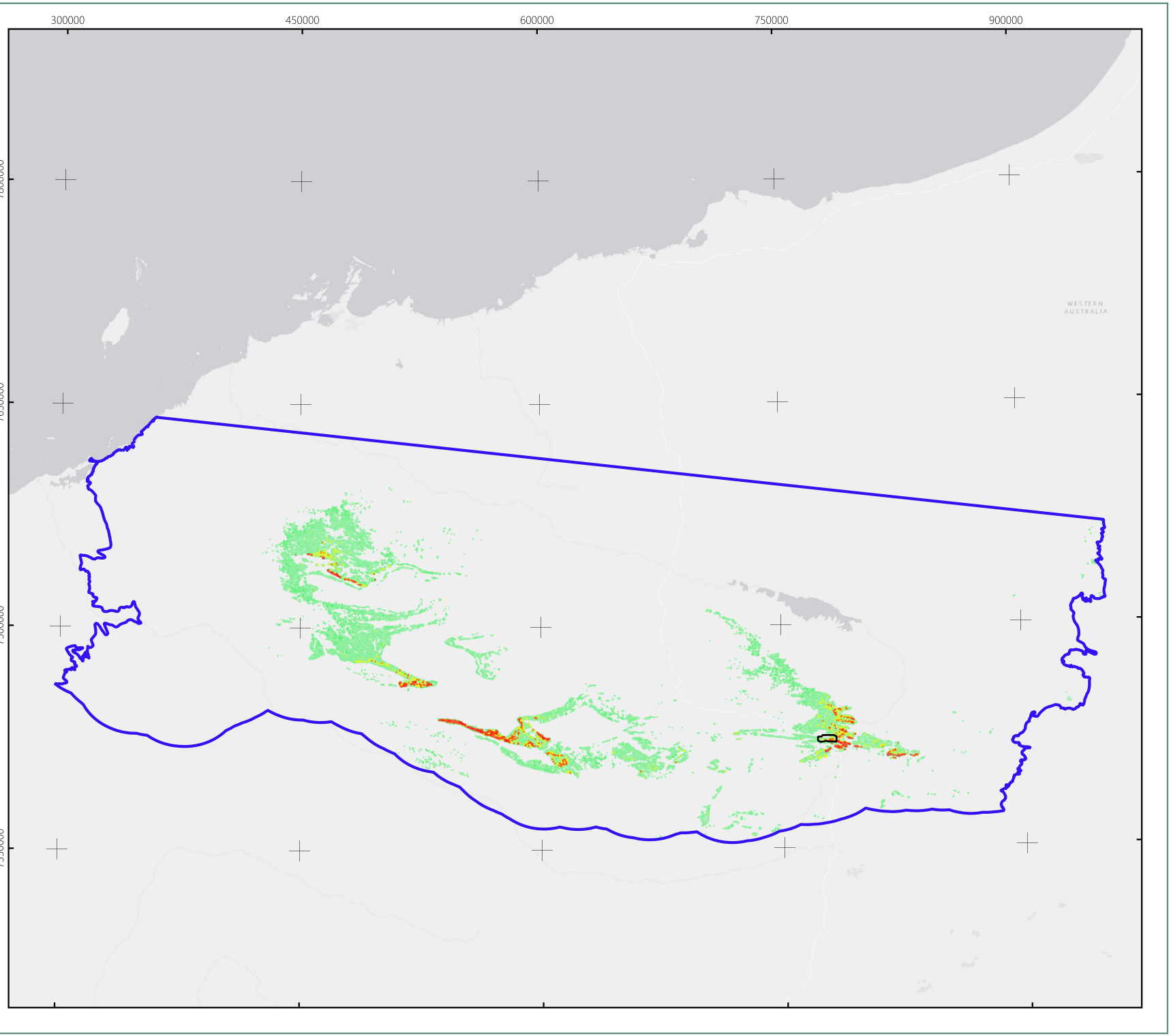
Variable	Percent Contribution (%)	Permutation Importance
Mean Annual Precipitation	30.9	69.9
Relief	15.6	26.1
Pre-European Vegetation	14.4	0.5
Land System	12.6	0.7
Slope (%)	10.9	0.2
Soils	8.4	0.4
Geology 1m	2.4	0.3
NDWI	1.9	0.3
Topographic Position Index	1.3	0.1
Distance to Minor Watercourse	0.7	0.1
Depth of Soil	0.3	0.4
Aspect	0.3	0.2
Depth of Regolith	0.2	0.7
Distance to Lakes & Flats	0.1	0.1

3.3. Representation of Predicted Areas within the Survey Area

The model extent, defined as areas with greater than 0.05 probability of occurrence or classified as Low to High probability ranks (Section 2.2.3), covered 427,014 ha (3.2%) of the SDM Study Area (Map 3.1). An assessment of the extent of probability of occurrence of suitable habitat for *Hibiscus* aff. *campanulatus* within the Survey Area was performed, with the total predicted extent occupying 2,297.9 ha (50.2%) of the Survey Area (Table 3.3; Map 3.2). Within the Survey Area, 34.4% (1,575.2 ha) was classified as having a Low probability of occurrence of the species. Areas of Moderate and High probability covered 523.0 ha (11.4%) and 199.7 ha (4.4%) of the Survey Area, respectively. Areas modelled as Moderate or High within the Survey Area were used to help target survey efforts (Map 3.3).

Table 3.3: Probability of Occurrence in Survey Area & SDM Study Area

Area	Low (0.05 – 0.64)		Moderate (0.64 – 0.91)		High (0.91 – 1.00)	
	Extent (ha)	%	Extent (ha)	%	Extent (ha)	%
Survey Area	1,575.23	34.4	523.01	11.4	199.67	4.4
SDM Study Area	392,637.36	3.0	23,438.96	0.2	10,938.22	0.1

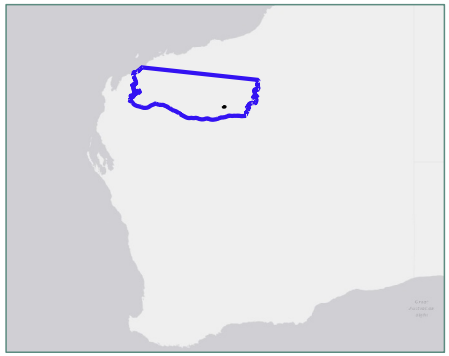


Legend

- Survey Area
- SDM Model Extent

Model Output - Probability Ranks

- Low
- Moderate
- High



N

0 50 100 km

Scale 1:2,619,743 @ A4

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Units: Meter

Spectrum ECOLOGY • SPATIAL

Author: CS

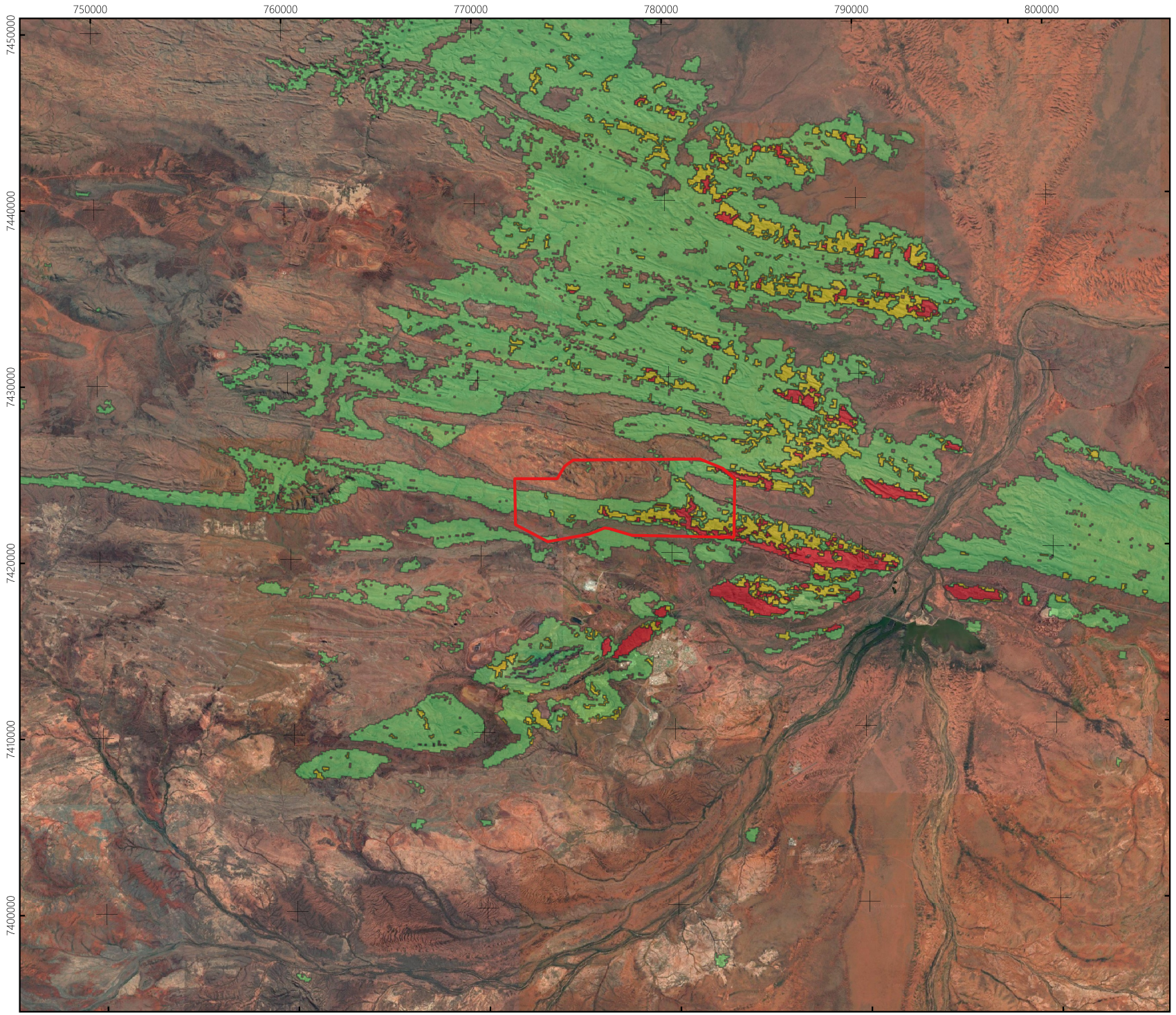
Date: 01-12-2022

Species Distribution Model

Hibiscus aff. campanulatus
Targeted Survey

MAP 3.1

Prepared for
BHP WAIO



Legend

- Survey Area

Probability Ranks

- Low
- Moderate
- High

N

0 2.5 5 km

Scale 1:220,000 @ A4

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Units: Meter

Spectrum ECOLOGY • SPATIAL

Author: CS

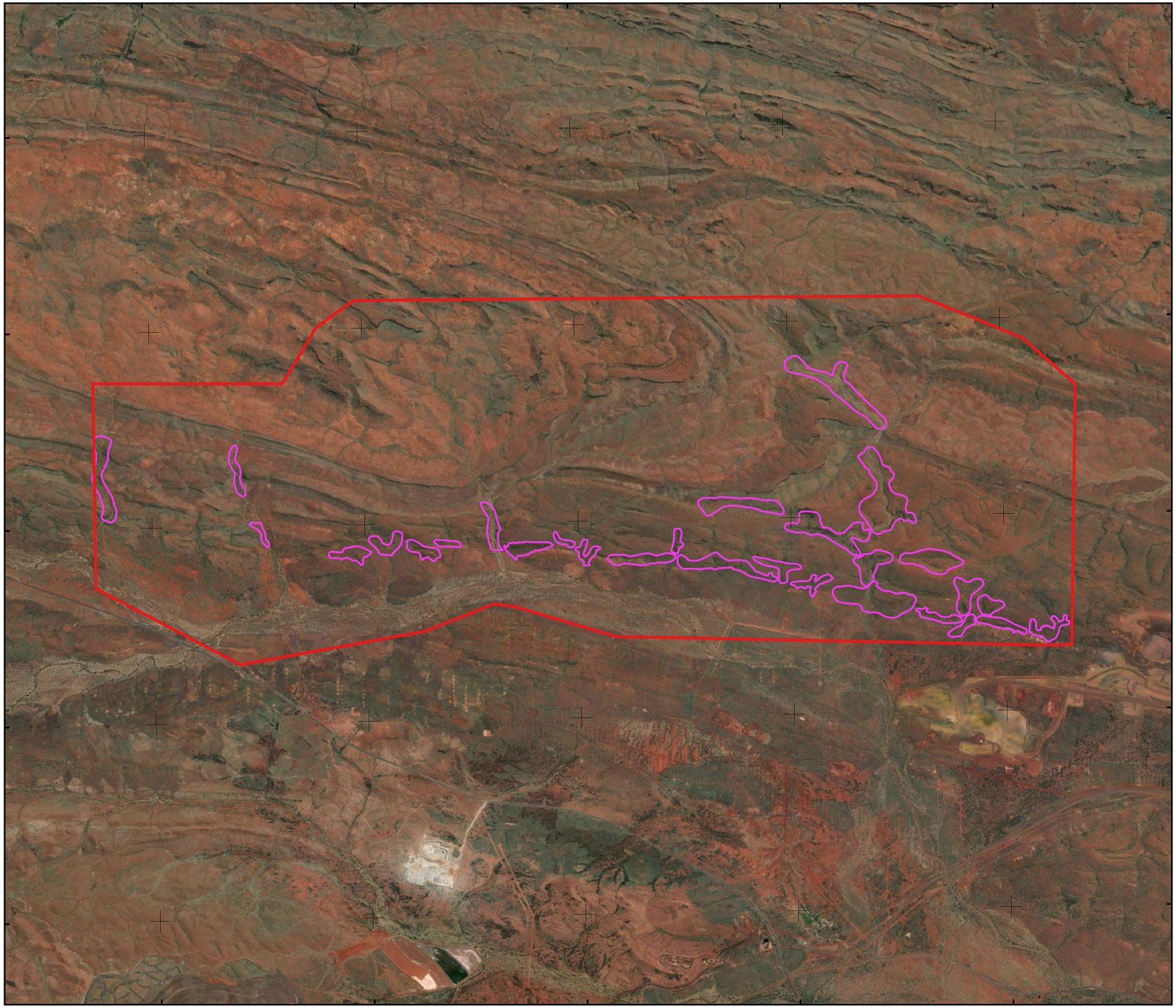
Date: 29-11-2022

Species Distribution Model Survey Area

Hibiscus aff. campanulatus
Targeted Survey

Prepared for
BHP WAIO

MAP
3.2



Legend

- Survey Area
- Target Areas

N

0 1 2 km

Scale 1:50,000 @ A4

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Units: Meter

Spectrum ECOLOGY • SPATIAL

Author: CS

Date: 29-11-2022

Proposed Target Areas

Hibiscus aff. campanulatus
Targeted Survey

MAP 3.3

Prepared for
BHP WAIO

3.4. Field Assessment

A total of 51,679 *Hibiscus* aff. *campanulatus* individuals were recorded from 1,234 locations in the Survey Area (Map 3.4), records were often estimated counts (approximately 78% of the locations) as the plant grows in large groups. All *Hibiscus* aff. *campanulatus* plants recorded in the field survey belonged to a single population (records separated by < 500 m).

There appear to be two subpopulations of *Hibiscus* aff. *campanulatus* situated away from most of the records that make up the population within the Survey Area (Map 3.4). Subpopulations can be defined as "geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange" (International Union for Conservation of Nature (IUCN) Standards and Petitions Committee, 2022) or "plants that occur on different land tenure parcels, or those that have considerable, recognisable separation between them" (DBCA, 2017b). The first subpopulation was comprised of 440 individuals of *Hibiscus* aff. *campanulatus* and was located approximately 480 m away from nearest record on the opposite side of a hill. The second subpopulation was located approximately 400 m away from the nearest record and was comprised of a single plant. The two subpopulations were identified due to the isolation of these records within the larger population, and none were identified based on changes in land tenure. Subpopulations could not be identified based on the likelihood of genetic exchange as nothing is published on the pollination of this species.

Hibiscus aff. *campanulatus* was typically found in shaded areas, such as protected laterite ridgelines, crevasses, and drainage lines with a low clay content (Plate 3.2). *Hibiscus campanulatus* has been associated with accumulated detrital material (Perkins, 2017) and, based on the location of populations recorded during this survey, *Hibiscus* aff. *campanulatus* appears to have a similar habitat preference.

The field assessment indicated that the SDM was accurate at predicting the occurrence of *Hibiscus* aff. *campanulatus* habitat. The High and Moderate probability classes were expected to contain 95% of records, these classes contained 92.3% of records or 94.7% of individuals found in the field assessment (Table 3.4). Records located in Low probability classes or outside the modelled extent typically occurred just outside High and Moderate probability classes and followed gullies or drainage lines leading away from these areas. No records were found in large areas that were assigned a Low probability class or were outside the model extent.

Table 3.4: The Field Assessment Records & Individuals Located within SDM Probability Classes

Probability Class	Records		Individual Plants	
	Count	Percentage (%)	Count	Percentage (%)
High (0.91 – 1.00)	502	40.7	27,132	52.5
Moderate (0.64 – 0.91)	637	51.6	21,795	42.2
Low (0.05 – 0.64)	82	6.6	2,465	4.8
Outside Extent (<0.05)	13	1.1	287	0.5

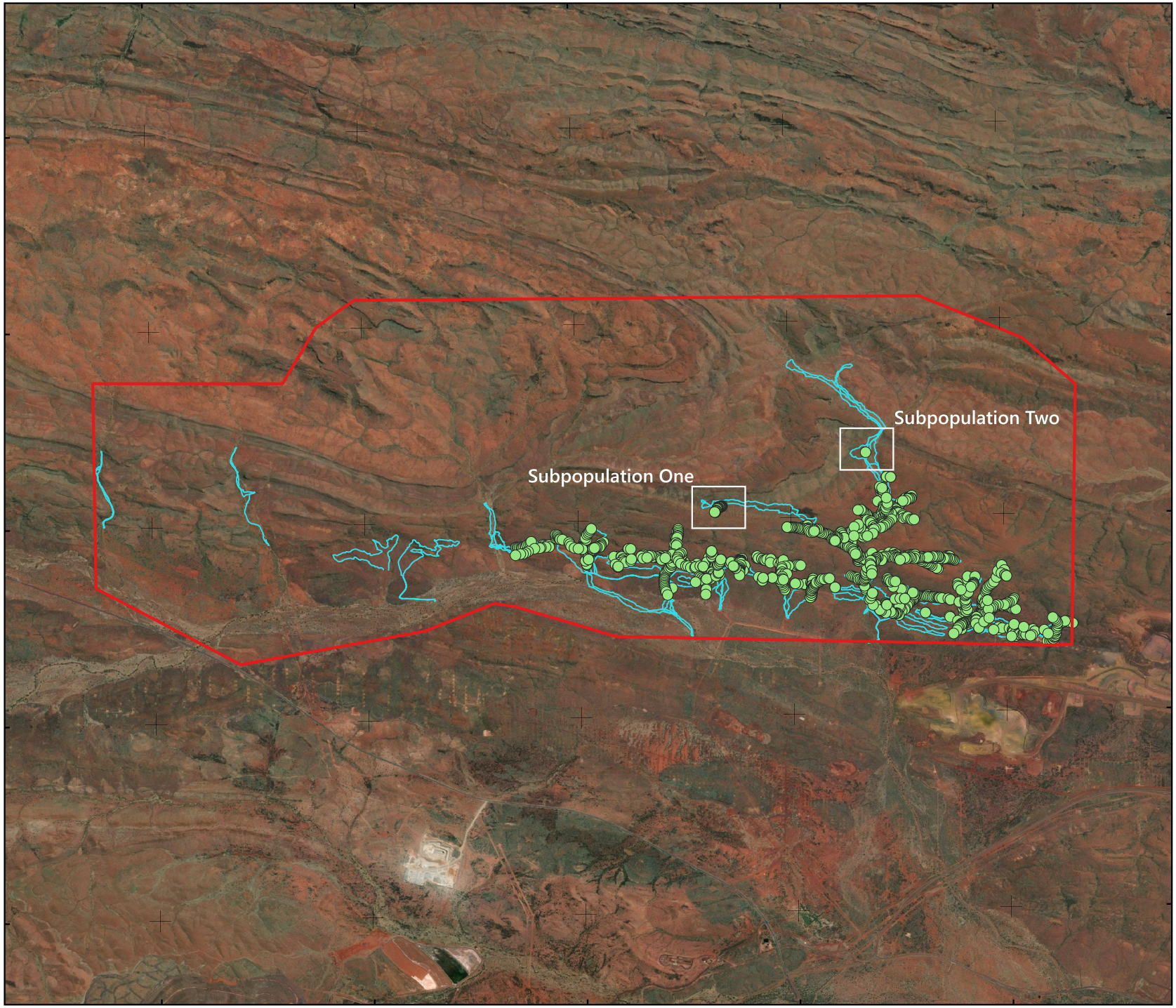
Hibiscus aff. *campanulatus* was associated with the Newman Land System, Brockman Iron Formation and Mount McRae Shale and Mount Sylvia Formation Geological Units, Fa13 Soil Unit, and the 82.3 Pre-European Vegetation sub-association. The records identified in the field assessment were all identified as the most important variables or units by the SDM. This was expected given the high accuracy of the model and *Hibiscus* aff. *campanulatus* has been recorded previously through the Survey Area (Table 3.4). The likelihood

of recording *Hibiscus* aff. *campanulatus* was greatest in the field assessment within these formations or units when specific laterite ridgeline and drainage line habitat occurred.

Hibiscus aff. *campanulatus* locations recorded during the field survey are presented in Map 3.4. Threatened and Priority Flora Report Forms are presented in Appendix D. The location and number of individuals for each record are presented in Appendix E, and photographs are provided electronically with the report.

No other significant flora taxa were recorded during the assessment.

Plate 3.2: *Hibiscus* aff. *campanulatus* Habitat. a) Stoney plain at base of ridge, b) Dense population growing in caves on laterite ridge/cliff face; and c) Population on semi-exposed laterite ridge slope.



Legend

- Survey Area
- Traverses
- Hibiscus aff. campanulatus Records

N

0 1 2 km

Scale 1:50,000 @ A4

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Units: Meter

Spectrum ECOLOGY • SPATIAL

Author: CS

Date: 01-12-2022

Hibiscus aff. campanulatus Records

Hibiscus aff. campanulatus Targeted Survey

Prepared for BHP WAIO

MAP 3.4

4. CONCLUSION

Hibiscus aff. *campanulatus* is likely to be raised to a phrase-named entity and assigned a Priority status in the near future. An SDM was used to identify areas which the plant is likely to occur with a High and Moderate likelihood. A targeted field survey was then undertaken to map the distribution of the species in the Survey Area using the results of the SDM.

The model indicated that *Hibiscus* aff. *campanulatus* could present a restricted distribution within the SDM Study Area. The model extent covered 50.2% of the Survey Area, of which 15.8% of the extent had a Moderate to High probability of the species' occurrence. The species showed higher probability of occurrence in areas close to the Brockman and Boolgeeda BIF. This study also indicated that annual precipitation and relief are important environmental predictors for the presence of the species. The SDMs Moderate and High model outputs were efficient at predicting species presence, as validated by field survey results.

The targeted field survey was undertaken from 4 to 12 July 2022 (18 person days), during which approximately 145.7 km of traverses were surveyed. A total of 51,679 *Hibiscus* aff. *campanulatus* individuals were recorded from 1,234 locations in the Survey Area. Counts of individuals were typically estimated as accurately as possible as *Hibiscus* aff. *campanulatus* grew in large groups. *Hibiscus* aff. *campanulatus* was typically found in shaded areas, such as protected laterite ridgelines, crevasses, and drainage lines with a low clay content. All *Hibiscus* aff. *campanulatus* plants recorded were considered to belong to a single population as the records were separated by < 500 m, two subpopulations were identified due to the isolation of these groups of records.

No other significant flora taxa were recorded during the assessment.

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Appendix A: Conservation Codes & Significant Definitions

Appendix A1: Definitions of Conservation Categories under the EPBC Act

Category	Definition
Extinct	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	A native species is eligible to be included in the endangered category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable	A native species is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Conservation Dependent	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered, or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

Appendix A2: Definitions of Priority Species Classification (DBCA 2019)

Priority species: Possibly Threatened species that do not meet the criteria for listing under the BC Act due to insufficient survey or otherwise data deficient, are added to the Priority flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as Threatened flora.

Species that are adequately known, are rare but not Threatened, or meet criteria for near Threatened, or that have been recently removed from the Threatened species, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in Western Australia is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Category	Definition
P1	**Priority 1: Poorly-known species** Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2	**Priority 2: Poorly-known species** Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
P3	**Priority 3: Poorly-known species** Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4	**Priority 4: Rare, Near Threatened and other species in need of monitoring** (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently Threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of Threatened species during the past five years for reasons other than taxonomy

Appendix A3: Significant Flora & Vegetation Definitions

Significant flora can include (EPA, 2016a):

- Being identified as Threatened: Critically Endangered, Endangered or Vulnerable (state listed BC Act and/or nationally listed EPBC Act);
- Being identified as Priority flora species: Priority 1 to 4 (DBCA, 2019);
- Locally endemic or association with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems);
- New species or anomalous features that indicate a potential new species;
- Representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- Unusual species, including restricted subspecies, varieties or naturally occurring hybrids; or
- Relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

Significant vegetation can include (EPA, 2016a):

- Threatened Ecological Community (TEC): Critically Endangered, Endangered or Vulnerable (state listed BC Act and/or nationally listed EPBC Act);
- Priority Ecological Community (PEC): Priority 1 to 5 (Department of Biodiversity Conservation and Attractions, 2022);
- Restricted distribution;
- Degree of historical impact from threatening processes;
- A role as a refuge; or
- Providing an important function required to maintain ecological integrity of a significant ecosystem.

Appendix B: Species & Habitat Description

Appendix B.1: *Hibiscus* aff. *campanulatus* inflorescence; a-c) corollas are funnel form, mauve with internal dark maroon to purple spot at the base of each petal & d) pedicel is the portion above the articulation

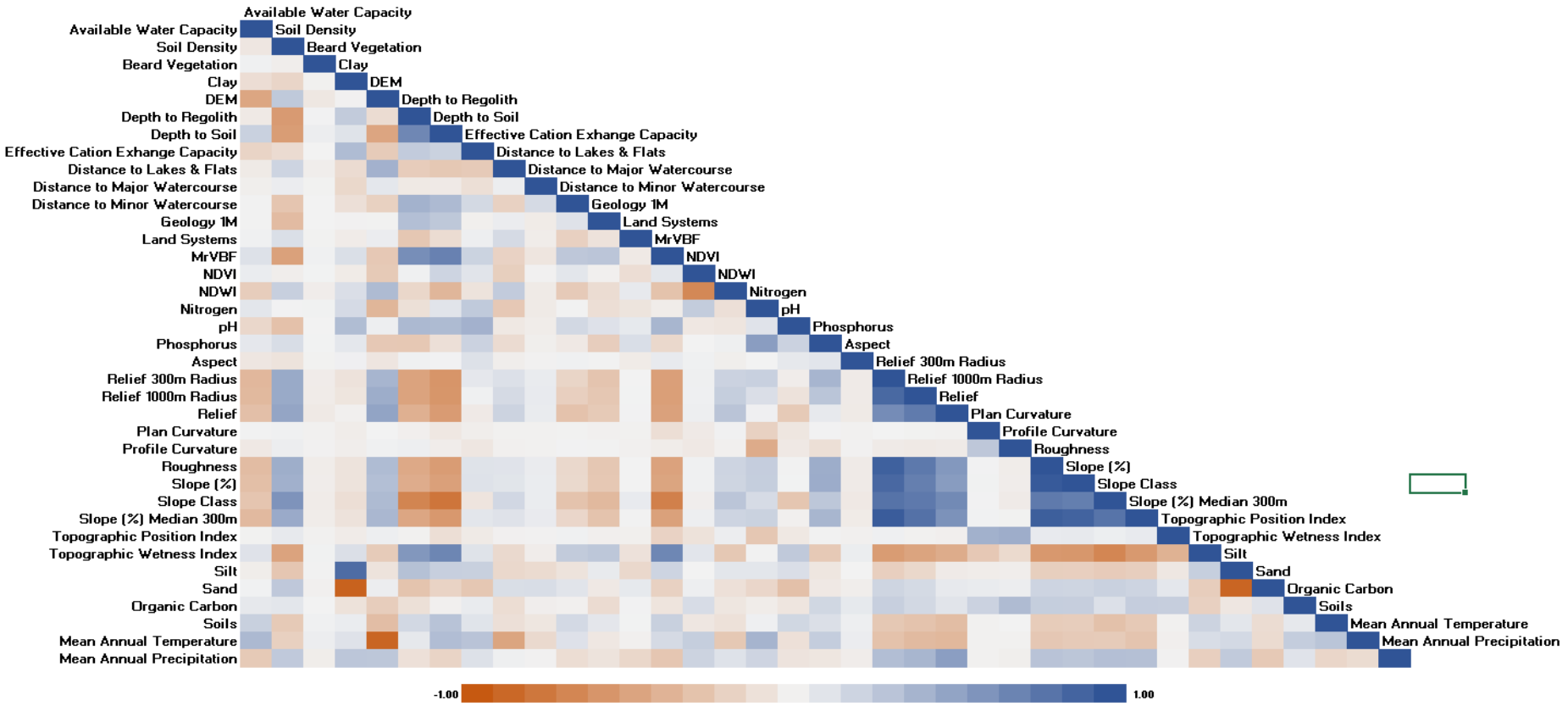
Appendix B.2: Vegetative Features; a) growth habit, b-d) leaf stellate hairs on the adaxial surface (2.5 mm cf. up to 4.6 mm in diameter), & e-f) calyx with 8–10 epicalyx lobes.

Appendix B.3: Habit Preference a) at base of ridge, b) sheltered gully, c) in small crevasse on ridgeline, & d) past base of ridgeline

Appendix C: Correlation Test

Appendix C1: Selected Variables after Correlation Test

Environmental Variable		Description	Source	Type
Landscape Attributes	Slope (%)	Slope measures the inclination of the land surface from the horizontal.	CSIRO	Numeric
	Aspect	The direction in which a land surface slope face is expressed in degrees from north.		Numeric
	Depth of Regolith	Metres of *in situ* and transported material overlying unweathered bedrock.		Numeric
	Topographic Wetness Index	TWI estimates the relative wetness within moist catchments but is more commonly used as a measure of position on the slope with larger values indicating a lower slope position.		Numeric
	Topographic Position Index	Topographic classification identifying upper, middle and lower parts on the slope with larger values indicating a lower slope position.		Categorical
	Relief	The difference between a locations highest and lowest elevations.		Numeric
	Plan Curvature	Contour is the rate of change of aspect (across the slope and represents topographic convergence or divergence).		Numeric
	Profile Curvature	The rate of change of potential gradient down a flow line and represents the changes in flow velocity down a slope.		Numeric
	Digital Elevation Model (DEM)	Height above sea level.	USGS	Numeric
Soil Attributes	WA Soils	Digitalised soil landscapes from Northcote et al. (1960-1968).	CSIRO	Categorical
	Soil Bulk Density	Bulk density of the whole soil (including coarse fragments) in mass per unit volume		Numeric
	Soil Organic Carbon	Mass fraction of carbon by weight in the < 2 mm soil material as determined by dry combustion at 900 Celsius		Numeric
	Soil Sand (%)	Percentage of sand content of the soil at a depth of 0-5 cm		Numeric
	Depth to Soil	Depth of soil (A & B horizons) to 2m		Numeric
	Total Phosphorus	Percentage of phosphorus content of the soil at a depth of 0-5 cm		Numeric
	Total Nitrogen	Mass fraction of total nitrogen in the soil by weight.		Numeric
	Effective Cation Exchange Capacity	Cations extracted using barium chloride ($BaCl_2$) plus exchangeable H + Al		Numeric
	Available Water Capacity	Computed plant-available water capacity of the soil at a depth of 0-5 m.		Numeric
	pH	pH in Calcium Chloride of the soil within the 0-5 cm depth layer.		Numeric
Geology & GIS	Geology 1M	Seamless national coverage of outcrop and surficial geology.	Geoscience Australia	Categorical
	Pre-European Vegetation	Pre-European Vegetation of Western Australia (DPIRD-006) (ID:7)	DPIRD	Categorical
	Land Systems	Soil Landscape systems	DPIRD	Categorical
	Minor Watercourse	Euclidean distance from minor watercourse.	Calculated by Spectrum	Numeric
	Major Watercourse	Euclidean distance from major watercourse.		Numeric
	Lakes & Flats	Euclidean distance from lakes and flats (swamps, saline coastal flats, and land subject to inundation).		Numeric
Vegetation Indices	NDVI	Normalised Vegetation Index from Landsat 8 Imagery	Landsat 8	Numeric
	NDWI	Normalized Wetness Index from Landsat 8 Imagery	Landsat 8	Numeric
Bioclimatic	Bioclim12	Annual Precipitation	Hijmans 2005	Numeric



Appendix B2: Correlation Test of Environmental Predictors.

Appendix D: Threatened & Priority Flora Report Forms

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.4 March 2021

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DBCA website at www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants

TAXON: Hibiscus aff. campanulatus **TPFL Pop. No:**

OBSERVATION DATE: 08/07/2022 **CONSERVATION STATUS:** **New population** ☒

OBSERVER/S: Brandi Simmons **PHONE** 9317 8233

ROLE: Spatial Ecologist **ORGANISATION:** Spectrum Ecology & Spatial

EMAIL: brandi@spectrumecology.com.au

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place)**:**

9.1km N of Newman; 12.6km W of Marble Bar Road

Reserve No:

DBCA DISTRICT: Karratha **LGA:** Shire of East Pilbara Land manager present: ☐

DATUM:
GDA94 / MGA94 ☒
AGD84 / AMG84 ☐
WGS84 ☐
Unknown ☐

COORDINATES: (If UTM coords provided, **Zone** is also required)
DecDegrees ☐ DegMinSec ☐ UTMs ☒
Lat / Northing: **7423314**
Long / Easting: **780898**
ZONE: 50

METHOD USED:
GPS ☒ Differential GPS ☐ Map ☐
No. satellites: 12 Map used:
Boundary polygon captured: ☐ Map scale:

LAND TENURE:
Nature reserve ☐ Timber reserve ☐ Private property ☐ Rail reserve ☐ Shire road reserve ☐
National park ☐ State forest ☐ Pastoral lease ☐ MRWA road reserve ☐ Other Crown reserve ☐
Conservation park ☐ Water reserve ☐ UCL ☐ SLK/Pole _____ to _____ Specify other: Mineral Lease

AREA ASSESSMENT: Edge survey ☐ Partial survey ☐ Full survey ☒ Area observed (m²):

EFFORT: Time spent surveying (minutes): No. of minutes spent / 100 m²:

POP'N COUNT ACCURACY: Actual ☐ Extrapolation ☐ Estimate ☒ Count method: Estimate
(Refer to field manual for list)

WHAT COUNTED: Plants ☒ Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:	**Mature:**	**Juveniles:**	**Seedlings:**	**Totals:**
Alive	1			1
Dead				

Area of pop (m²):
Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. ___ Size _____ Data attached ☐ Total area of quadrats (m²):

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☐ Flowerbud ☐ Flower ☐
Immature fruit ☐ Fruit ☒ Dehisced fruit ☐ Percentage in flower: ____%

CONDITION OF PLANTS: Healthy ☒ Moderate ☐ Poor ☐ Senescent ☐

COMMENT:

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
• Complete Vegetation Clearing	N	H	M
•			

Please return completed form to **Species And Communities Program** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Program.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.4 March 2021

HABITAT INFORMATION:

LANDFORM:
Crest ☐
Hill ☐
Ridge ☐
Outcrop ☒
Slope ☐
Flat ☐
Open depression ☐
Drainage line ☐
Closed depression ☐
Wetland ☐

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☒
Limestone ☐
Quartz ☐
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% ☐
10-30% ☒
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☒
Sandy loam ☐
Loam ☐
Clay loam ☐
Light clay ☐
Peat ☐
Specify other: Clay Sand

SOIL COLOUR:
Red ☒
Brown ☐
Yellow ☐
White ☐
Grey ☐
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☒
Seasonally inundated ☐
Permanently inundated ☐
Tidal ☐

Specific **Landform** Element: _____
(Refer to field manual for additional values)

CONDITION OF SOIL: Dry ☒ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (M.tetragona)

1. Hummock Grassland of Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)
2. High Open Shrubland of Acacia inaequilatera
3.
4.

ASSOCIATED SPECIES:

Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☒ Very good ☐ Good ☐ Degraded ☐ Completely degraded ☐

COMMENT:

FIRE HISTORY: **Last Fire:** Season/Month: _____ Year: 2016 **Fire Intensity:** High ☐ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☒ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☒ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

Population was comprised of a single mature individual

Fire age estimated at > 6 years, fire year esitmated.

FLORA AUTHORISATION / LICENCE No: FB62000421 Note if only observing plants (i.e. no specimens or plant matieral is taken) then no authorisation/licence is required. For further information on authorisation and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under authorisations/licences should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: 564 WA Herb. ☒ Regional Herb. ☐ District Herb. ☐ Other: _____

LODGEMENT: WA Herb Lodgement No: _____

ATTACHED: Map ☐ Mudmap ☐ Photo ☐ GIS data ☐ Field notes ☐ Other: _____

COPY SENT TO: Regional Office ☐ District Office ☐ Other: _____

Submitter of Record: Christopher Shaw Role: Senior Botanist Signed: _____ Date: 28/11/2022

Please return completed form to **Species And Communities Program** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Program.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.4 March 2021

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DBCA website at www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants

TAXON: Hibiscus aff. campanulatus **TPFL Pop. No:**

OBSERVATION DATE: 08/07/2022 **CONSERVATION STATUS:** **New population** ☐

OBSERVER/S: Susan Murrey **PHONE** 9317 8233

ROLE: Senior Botanist **ORGANISATION:** Spectrum Ecology & Spatial

EMAIL: susan@spectrumecology.com.au

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place)**:**

8.3km N of Newman; 14km W of Marble Bar Road

Reserve No:

DBCA DISTRICT: Karratha **LGA:** Shire of East Pilbara Land manager present: ☐

DATUM:
GDA94 / MGA94 ☒
AGD84 / AMG84 ☐
WGS84 ☐
Unknown ☐

COORDINATES: (If UTM coords provided, **Zone** is also required)
DecDegrees ☐ DegMinSec ☐ UTMs ☒
Lat / Northing: 7422654
Long / Easting: 779170
ZONE: 50

METHOD USED:
GPS ☒ Differential GPS ☐ Map ☐
No. satellites: 12 Map used:
Boundary polygon captured: ☐ Map scale:

LAND TENURE:

Nature reserve ☐	Timber reserve ☐	Private property ☐	Rail reserve ☐	Shire road reserve ☐
National park ☐	State forest ☐	Pastoral lease ☐	MRWA road reserve ☐	Other Crown reserve ☐
Conservation park ☐	Water reserve ☐	UCL ☐	SLK/Pole _____ to _____	Specify other: Mineral Lease

AREA ASSESSMENT: Edge survey ☐ Partial survey ☐ Full survey ☒ Area observed (m²):

EFFORT: Time spent surveying (minutes): No. of minutes spent / 100 m²:

POP'N COUNT ACCURACY: Actual ☐ Extrapolation ☐ Estimate ☒ Count method: Estimate
(Refer to field manual for list)

WHAT COUNTED: Plants ☒ Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:

	Mature:	Juveniles:	Seedlings:	Totals:
Alive	198		242	440
Dead				

Area of pop (m²):
Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. Size Data attached ☐ Total area of quadrats (m²):

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☐ Flowerbud ☐ Flower ☐
Immature fruit ☐ Fruit ☒ Dehisced fruit ☐ Percentage in flower: %

CONDITION OF PLANTS: Healthy ☒ Moderate ☐ Poor ☐ Senescent ☐

COMMENT:

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
• Complete Vegetation Clearing	N	H	M
•			

Please return completed form to **Species And Communities Program** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Program.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.4 March 2021

HABITAT INFORMATION:

LANDFORM:
Crest ☐
Hill ☒
Ridge ☐
Outcrop ☐
Slope ☐
Flat ☐
Open depression ☐
Drainage line ☐
Closed depression ☐
Wetland ☐

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☒
Limestone ☐
Quartz ☐
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% ☐
10-30% ☒
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☒
Sandy loam ☐
Loam ☐
Clay loam ☐
Light clay ☐
Peat ☐
Specify other: Clayey Sand

SOIL COLOUR:
Red ☒
Brown ☐
Yellow ☐
White ☐
Grey ☐
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☒
Seasonally inundated ☐
Permanently inundated ☐
Tidal ☐

Specific **Landform** Element: _____
(Refer to field manual for additional values)

CONDITION OF SOIL: Dry ☒ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (M.tetragona)

1. Hummock Grassland of Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)
2. High Open Shrubland of Acacia inaequilatera
3.
4.

ASSOCIATED SPECIES:

Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☒ Very good ☐ Good ☐ Degraded ☐ Completely degraded ☐

COMMENT:

FIRE HISTORY: **Last Fire:** Season/Month: _____ Year: 2016 **Fire Intensity:** High ☐ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☒ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☒ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

Population was comprised of 21 records spanning approx. 130 m. All records within the population are attached to this form on the last page

Fire age estimated at > 6 years, fire year esitmated.

FLORA AUTHORISATION / LICENCE No: FB62000101-2 Note if only observing plants (i.e. no specimens or plant matieral is taken) then no authorisation/licence is required. For further information on authorisation and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under authorisations/licences should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: 224 WA Herb. ☒ Regional Herb. ☐ District Herb. ☐ Other: _____

LODGEMENT: WA Herb Lodgement No: _____

ATTACHED: Map ☐ Mudmap ☐ Photo ☐ GIS data ☐ Field notes ☐ Other: _____

COPY SENT TO: Regional Office ☐ District Office ☐ Other: _____

Submitter of Record: Christopher Shaw Role: Senior Botanist Signed: _____ Date: 28/11/2022

Please return completed form to **Species And Communities Program** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Program.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.4 March 2021

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DBCA website at www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants

TAXON: Hibiscus aff. campanulatus **TPFL Pop. No:**

OBSERVATION DATE: 09/07/2022 **CONSERVATION STATUS:** **New population** ☐

OBSERVER/S: Susan Murrey **PHONE** 9317 8233

ROLE: Senior Botanist **ORGANISATION:** Spectrum Ecology

EMAIL: susan@spectrumecology.com.au

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place)**:**

Record occurs 7.8km NNW of Newman and 15.1km W of Marble Bar Rd

Reserve No:

DBCA DISTRICT: Karratha **LGA:** Shire of East Pilbara Land manager present: ☐

DATUM:
GDA94 / MGA94 ☒
AGD84 / AMG84 ☐
WGS84 ☐
Unknown ☐

COORDINATES: (If UTM coords provided, **Zone** is also required)
DecDegrees ☐ DegMinSec ☐ UTMs ☒
Lat / Northing: 7421941
Long / Easting: 777599
ZONE: 50

METHOD USED:
GPS ☒ Differential GPS ☐ Map ☐
No. satellites: 12 Map used:
Boundary polygon captured: ☐ Map scale:

LAND TENURE:

Nature reserve ☐	Timber reserve ☐	Private property ☐	Rail reserve ☐	Shire road reserve ☐
National park ☐	State forest ☐	Pastoral lease ☐	MRWA road reserve ☐	Other Crown reserve ☐
Conservation park ☐	Water reserve ☐	UCL ☐	SLK/Pole _____ to _____	Specify other: Mineral Lease

AREA ASSESSMENT: Edge survey ☐ Partial survey ☐ Full survey ☒ Area observed (m²):

EFFORT: Time spent surveying (minutes): No. of minutes spent / 100 m²:

POP'N COUNT ACCURACY: Actual ☐ Extrapolation ☐ Estimate ☒ Count method: Estimation
(Refer to field manual for list)

WHAT COUNTED: Plants ☒ Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:

	Mature:	Juveniles:	Seedlings:	Totals:
Alive	2			2
Dead				

Area of pop (m²):

Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. Size Data attached ☐ Total area of quadrats (m²):

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☐ Flowerbud ☒ Flower ☒
Immature fruit ☐ Fruit ☐ Dehisced fruit ☐ Percentage in flower: %

CONDITION OF PLANTS: Healthy ☒ Moderate ☐ Poor ☐ Senescent ☐

COMMENT:

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
• Complete Vegetation Clearing	N	H	M
•			
•			

Please return completed form to **Species And Communities Program** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Program.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.4 March 2021

HABITAT INFORMATION:

LANDFORM:
Crest ☐
Hill ☒
Ridge ☐
Outcrop ☐
Slope ☐
Flat ☐
Open depression ☐
Drainage line ☐
Closed depression ☐
Wetland ☐

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☒
Limestone ☐
Quartz ☐
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% ☐
10-30% ☒
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☐
Sandy loam ☒
Loam ☐
Clay loam ☐
Light clay ☐
Peat ☐
Specify other: _____

SOIL COLOUR:
Red ☒
Brown ☐
Yellow ☐
White ☐
Grey ☐
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☒
Seasonally inundated ☐
Permanently inundated ☐
Tidal ☐

Specific **Landform** Element: _____
(Refer to field manual for additional values)

CONDITION OF SOIL: Dry ☒ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (M.tetragona)

1. Eucalyptus gamophylla and Corymbia hamerselyana isolated trees
2. Acacia dictyophleba, Acacia pyrifolia var. pyrifolia and Gossypium robinsonii
3. Themeda triandra, Aristida holathera var. holathera and Cymbopogon ambiguus open tussock grassland
4.

ASSOCIATED SPECIES:

Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☐ Very good ☒ Good ☐ Degraded ☐ Completely degraded ☐

COMMENT:

FIRE HISTORY: **Last Fire:** Season/Month: _____ Year: 2016 **Fire Intensity:** High ☐ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☒ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☒ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

Population extends appox. 6.6km E to W and 2km N to S

Survey mix of actual counts and estimates

Total new individual records found to existing population was 51,238

FLORA AUTHORISATION / LICENCE No: FB62000101-2 Note if only observing plants (i.e. no specimens or plant matieral is taken) then no authorisation/licence is required. For further information on authorisation and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under authorisations/licences should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: 280 WA Herb. ☒ Regional Herb. ☐ District Herb. ☐ Other: _____

LODGEMENT: WA Herb Lodgement No: _____

ATTACHED: Map ☐ Mudmap ☐ Photo ☐ GIS data ☐ Field notes ☐ Other: _____

COPY SENT TO: Regional Office ☐ District Office ☐ Other: _____

Submitter of Record: Christopher Shaw Role: Senior Botanist Signed: _____ Date: 28/11/2022

Please return completed form to **Species And Communities Program** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Program.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Appendix E: *Hibiscus* aff. *campanulatus* Locations

Site ID	Count	Zone	Easting	Northing
BS100	65	50	782022	7421271
BS101	70	50	782013	7421247
BS102	100	50	782009	7421289
BS103	80	50	782005	7421310
BS104	40	50	782015	7421342
BS105	50	50	782002	7421363
BS106	22	50	781998	7421379
BS107	56	50	781999	7421384
BS108	60	50	782009	7421402
BS109	6	50	782018	7421406
BS110	60	50	782016	7421424
BS111	12	50	782022	7421430
BS112	58	50	782021	7421446
BS113	50	50	782023	7421468
BS114	80	50	782006	7421482
BS115	50	50	782008	7421505
BS116	24	50	782008	7421525
BS117	15	50	782014	7421542
BS118	8	50	782043	7421581
BS119	17	50	782050	7421616
BS120	15	50	782051	7421628
BS121	21	50	782062	7421675
BS122	45	50	782067	7421712
BS123	1	50	782155	7421710
BS124	34	50	781970	7421121
BS125	46	50	781846	7421212
BS126	1	50	781852	7421201
BS127	2	50	781566	7421262
BS128	30	50	781564	7421262
BS129	5	50	781942	7421151
BS131	41	50	776767	7422181
BS132	19	50	776782	7422182
BS133	1	50	776794	7422178
BS134	7	50	776810	7422180
BS135	50	50	776830	7422183
BS136	2	50	776841	7422176
BS137	50	50	776842	7422172

Site ID	Count	Zone	Easting	Northing
BS138	50	50	776861	7422186
BS139	75	50	776881	7422191
BS140	1	50	776884	7422185
BS141	6	50	776900	7422209
BS142	50	50	776921	7422216
BS143	25	50	776940	7422225
BS144	25	50	776948	7422249
BS145	11	50	777090	7422211
BS146	21	50	777102	7422202
BS147	75	50	777128	7422197
BS148	1	50	777155	7422202
BS149	8	50	777159	7422179
BS150	4	50	777118	7422178
BS151	4	50	777062	7422170
BS152	7	50	777047	7422166
BS153	19	50	776986	7422160
BS154	6	50	776910	7422126
BS155	15	50	776880	7422109
BS156	40	50	776850	7422096
BS157	25	50	776818	7422094
BS158	2	50	776761	7422080
BS159	38	50	778627	7421973
BS160	8	50	778639	7421988
BS161	21	50	778644	7422013
BS162	7	50	778653	7422017
BS163	18	50	778654	7422028
BS164	28	50	778645	7422045
BS165	100	50	778636	7422066
BS166	50	50	778638	7422088
BS168	75	50	778638	7422122
BS169	100	50	778629	7422142
BS170	50	50	778635	7422163
BS171	50	50	778631	7422192
BS172	26	50	778647	7422237
BS173	30	50	778644	7422250
BS174	18	50	778644	7422275
BS175	3	50	778648	7422284

Site ID	Count	Zone	Easting	Northing
BS176	40	50	778659	7422301
BS177	1	50	778663	7422351
BS178	29	50	778678	7422380
BS179	100	50	778677	7422359
BS180	50	50	778679	7422337
BS181	60	50	778678	7422316
BS182	25	50	778676	7422294
BS183	35	50	778669	7422286
BS184	30	50	778664	7422269
BS185	50	50	778651	7422204
BS186	60	50	778664	7422186
BS187	40	50	778655	7422168
BS188	1	50	780908	7421440
BS189	80	50	780868	7421564
BS190	15	50	780510	7421602
BS191	21	50	780508	7421602
BS192	50	50	780869	7421591
BS193	20	50	780864	7421589
BS194	15	50	780853	7421619
BS195	20	50	780854	7421615
BS196	12	50	780698	7421745
BS197	3	50	780715	7421735
BS198	40	50	780734	7421729
BS199	50	50	780754	7421722
BS200	40	50	780775	7421716
BS201	30	50	780776	7421719
BS202	30	50	780785	7421698
BS203	30	50	780808	7421697
BS204	30	50	780808	7421698
BS205	50	50	780829	7421691
BS206	30	50	780849	7421681
BS207	3	50	780850	7421697
BS208	50	50	780863	7421709
BS209	40	50	780865	7421711
BS210	30	50	780878	7421723
BS211	30	50	780884	7421745
BS212	30	50	780882	7421746

Site ID	Count	Zone	Easting	Northing
BS213	25	50	780893	7421763
BS214	40	50	780873	7421765
BS215	100	50	780875	7421787
BS216	10	50	780899	7421801
BS217	80	50	780903	7421836
BS218	100	50	780890	7421852
BS219	80	50	780887	7421850
BS220	40	50	780808	7421927
BS221	25	50	780782	7421933
BS222	30	50	780786	7421933
BS223	30	50	780784	7421955
BS224	15	50	780784	7421956
BS225	30	50	780778	7421981
BS226	50	50	780803	7421996
BS227	25	50	780814	7421976
BS228	60	50	780830	7421965
BS229	80	50	780829	7421965
BS230	100	50	780848	7421953
BS231	50	50	780849	7421952
BS232	100	50	780868	7421954
BS233	30	50	780868	7421954
BS234	100	50	780933	7422012
BS235	10	50	780952	7422033
BS236	1	50	781067	7422003
BS237	50	50	781150	7422032
BS238	5	50	781206	7422027
BS239	100	50	781234	7422007
BS240	50	50	781215	7421997
BS241	50	50	781202	7421994
BS242	9	50	781180	7421989
BS243	50	50	781159	7421986
BS244	30	50	781137	7421980
BS245	30	50	781115	7421985
BS246	20	50	781091	7421979
BS247	10	50	781091	7421979
BS248	60	50	781074	7421969
BS249	1	50	781061	7421938

Site ID	Count	Zone	Easting	Northing
BS250	80	50	781017	7421978
BS251	30	50	781014	7421975
BS252	20	50	780995	7421966
BS253	50	50	780994	7421964
BS254	100	50	780988	7421947
BS255	20	50	780988	7421945
BS256	80	50	780981	7421927
BS257	40	50	780978	7421925
BS258	50	50	780961	7421920
BS259	40	50	780940	7421906
BS260	100	50	780938	7421932
BS261	100	50	780932	7421934
BS262	75	50	780924	7421894
BS263	100	50	780930	7421875
BS264	80	50	780930	7421875
BS265	100	50	780943	7421811
BS266	40	50	780945	7421811
BS267	3	50	780942	7421765
BS268	2	50	780150	7421651
BS269	11	50	780073	7421653
BS270	30	50	780040	7421661
BS271	25	50	780041	7421660
BS272	16	50	780224	7421666
BS273	50	50	780236	7421651
BS274	30	50	780236	7421651
BS275	60	50	780251	7421718
BS276	50	50	780252	7421718
BS278	8	50	780249	7421693
BS279	20	50	780248	7421694
BS280	11	50	780241	7421631
BS281	25	50	780240	7421632
BS282	40	50	780244	7421606
BS283	30	50	780233	7421588
BS284	60	50	780233	7421587
BS285	25	50	780237	7421558
BS286	40	50	780235	7421537
BS287	15	50	780235	7421517

Site ID	Count	Zone	Easting	Northing
BS288	20	50	780228	7421487
BS289	20	50	780228	7421488
BS290	40	50	781225	7421966
BS291	50	50	781246	7421966
BS292	60	50	781265	7421966
BS293	20	50	781265	7421966
BS294	1	50	781265	7421966
BS295	140	50	781285	7421960
BS296	80	50	781307	7421956
BS297	30	50	781309	7421951
BS298	50	50	781329	7421963
BS299	100	50	781335	7421983
BS300	40	50	781335	7421983
BS301	40	50	781356	7421984
BS302	80	50	781376	7421980
BS303	60	50	781376	7421981
BS304	40	50	781396	7421996
BS305	30	50	781396	7421997
BS306	40	50	781417	7421997
BS307	30	50	781436	7421999
BS308	70	50	781457	7422001
BS309	3	50	781826	7421975
BS310	6	50	781825	7421974
BS311	5	50	781844	7421972
BS312	80	50	781844	7421973
BS313	40	50	781860	7421974
BS314	60	50	781860	7421974
BS315	30	50	781912	7421924
BS316	15	50	781911	7421923
BS317	100	50	781893	7421932
BS318	50	50	781893	7421932
BS319	40	50	781874	7421937
BS320	30	50	781873	7421937
BS321	60	50	781854	7421942
BS322	40	50	781856	7421945
BS323	40	50	781832	7421946
BS324	20	50	781831	7421946

Site ID	Count	Zone	Easting	Northing
BS325	30	50	781812	7421946
BS326	20	50	781812	7421946
BS327	20	50	781795	7421947
BS328	100	50	781695	7421861
BS329	25	50	781714	7421847
BS330	30	50	781721	7421815
BS331	30	50	781703	7421828
BS332	20	50	781704	7421826
BS333	30	50	781648	7421855
BS334	40	50	781629	7421870
BS335	20	50	781629	7421870
BS336	30	50	781613	7421883
BS337	30	50	781612	7421883
BS338	40	50	781592	7421890
BS339	20	50	781592	7421890
BS340	50	50	781574	7421906
BS341	30	50	781552	7421914
BS342	20	50	781551	7421914
BS343	30	50	781529	7421920
BS344	20	50	781522	7421942
BS345	10	50	781522	7421942
BS346	20	50	781524	7421962
BS347	80	50	781542	7421974
BS348	40	50	781542	7421974
BS349	30	50	781562	7421965
BS350	50	50	781584	7421960
BS351	40	50	781603	7421958
BS352	30	50	781604	7421957
BS353	20	50	781622	7421959
BS354	60	50	781643	7421960
BS355	60	50	781664	7421956
BS356	40	50	781684	7421956
BS357	10	50	781704	7421950
BS358	50	50	781746	7421951
BS359	30	50	781747	7421950
BS360	30	50	781734	7421968
BS361	100	50	781726	7421974

Site ID	Count	Zone	Easting	Northing
BS362	50	50	781706	7421972
BS363	30	50	781686	7421972
BS364	40	50	781664	7421973
BS365	40	50	781663	7421974
BS366	30	50	781628	7421967
BS367	20	50	781606	7421966
BS368	10	50	781606	7421966
BS369	20	50	781504	7421960
BS370	20	50	781485	7421961
BS371	30	50	781464	7421960
BS372	50	50	781454	7421978
BS373	10	50	781443	7421953
BS375	40	50	781411	7421958
BS376	30	50	781393	7421968
BS377	70	50	781370	7421961
BS378	60	50	781353	7421952
BS379	50	50	781334	7421963
BS380	100	50	781334	7421963
BS381	100	50	781278	7421938
BS382	8	50	779917	7421582
BS383	30	50	779905	7421611
BS384	40	50	779897	7421634
BS385	20	50	779890	7421656
BS386	2	50	779889	7421680
BS387	10	50	779889	7421680
BS388	20	50	779869	7421687
BS389	50	50	779867	7421712
BS391	60	50	779848	7421724
BS392	30	50	779848	7421724
BS393	100	50	779868	7421736
BS394	40	50	779870	7421737
BS395	30	50	779882	7421759
BS396	10	50	779873	7421785
BS397	20	50	779873	7421807
BS398	10	50	779877	7421829
BS399	20	50	779879	7421851
BS400	10	50	779875	7421868

Site ID	Count	Zone	Easting	Northing
BS401	15	50	779873	7421885
BS402	15	50	779597	7421990
BS403	20	50	779600	7421992
BS404	20	50	779598	7422017
BS405	10	50	779598	7422017
BS406	2	50	779614	7421989
BS407	20	50	779655	7421982
BS408	20	50	779654	7421983
BS409	60	50	779677	7421968
BS410	40	50	779693	7421962
BS411	30	50	779693	7421963
BS412	20	50	779715	7421973
BS413	9	50	779764	7421970
BS414	15	50	779759	7421977
BS415	50	50	779753	7421931
BS416	50	50	779847	7421924
BS417	20	50	779869	7421903
BS418	15	50	779888	7421943
BS419	10	50	779888	7421943
BS420	350	50	779906	7421959
BS421	70	50	780023	7421890
BS422	10	50	780045	7421885
BS423	10	50	780069	7421896
BS424	30	50	780091	7421894
BS425	5	50	780109	7421889
BS426	30	50	779968	7421885
BS427	5	50	779929	7421881
BS428	20	50	779887	7421870
BS429	20	50	779887	7421849
BS430	40	50	779891	7421808
BS431	10	50	779881	7421785
BS432	100	50	779918	7421785
BS433	40	50	779945	7421783
BS434	25	50	779890	7421749
BS435	60	50	779888	7421725
BS436	80	50	779880	7421707
BS437	6	50	779902	7421711

Site ID	Count	Zone	Easting	Northing
BS438	20	50	778505	7421781
BS439	40	50	778510	7421803
BS440	60	50	778521	7421824
BS441	10	50	778540	7421848
BS442	10	50	778553	7421869
BS443	20	50	778565	7421883
BS444	10	50	778583	7421894
BS445	20	50	778593	7421924
BS446	20	50	778593	7421924
BS447	30	50	778592	7421943
BS448	20	50	778607	7421960
BS449	100	50	778616	7422062
BS450	80	50	778604	7422040
BS451	40	50	778604	7422040
BS452	30	50	778591	7422023
BS453	20	50	778552	7422009
BS454	20	50	778580	7422044
BS455	10	50	778597	7422056
BS456	40	50	778525	7422036
BS457	10	50	778503	7422037
BS458	10	50	778472	7422035
BS459	30	50	778454	7422038
BS460	80	50	778439	7422025
BS461	60	50	778431	7422022
BS462	20	50	778412	7422028
BS463	10	50	778413	7422028
BS464	10	50	778378	7422028
BS465	20	50	778353	7422046
BS466	10	50	778331	7422044
BS467	6	50	778263	7422060
BS468	40	50	778257	7422046
BS469	5	50	778239	7422040
BS470	2	50	778104	7422028
BS471	20	50	778054	7422037
BS472	20	50	778055	7422035
BS473	5	50	778049	7422077
BS474	15	50	778049	7422077

Site ID	Count	Zone	Easting	Northing
BS475	5	50	778068	7422081
BS476	30	50	778074	7422095
BS477	15	50	778084	7422119
BS478	75	50	778089	7422137
BS479	30	50	778089	7422138
BS480	50	50	778116	7422135
BS481	15	50	777966	7422043
BS482	30	50	777947	7422041
BS483	5	50	777916	7422042
BS484	20	50	778001	7422038
BS485	40	50	778007	7422038
BS486	10	50	778024	7422011
BS487	30	50	778018	7421993
BS488	5	50	777983	7421962
BS489	10	50	777971	7421939
BS490	10	50	777961	7421905
BS491	1	50	777933	7421942
BS492	10	50	778038	7421978
BS493	30	50	778055	7421967
BS495	40	50	778116	7421982
BS496	20	50	778121	7422005
BS497	10	50	778260	7422012
BS498	10	50	778306	7422021
BS499	30	50	778465	7422004
BS500	20	50	778478	7421990
BS501	10	50	778477	7421990
BS502	30	50	778519	7422012
BS503	100	50	779142	7421819
BS504	40	50	779099	7421838
BS505	60	50	779091	7421856
BS506	10	50	779073	7421863
BS507	5	50	779070	7421892
BS508	10	50	779070	7421892
BS509	60	50	779073	7421943
BS510	90	50	779046	7421961
BS511	20	50	779046	7421961
BS512	60	50	779042	7421993

Site ID	Count	Zone	Easting	Northing
BS513	100	50	779032	7422013
BS514	10	50	779007	7421951
BS515	5	50	778891	7421933
BS516	30	50	778835	7421906
BS517	2	50	778740	7421960
BS518	30	50	778710	7421972
BS519	20	50	778695	7421992
BS520	25	50	778690	7422008
BS521	50	50	778704	7422026
BS522	40	50	778712	7422046
BS523	15	50	778713	7422076
BS524	50	50	778695	7422061
BS525	40	50	778680	7422048
BS526	5	50	778665	7422018
BS527	5	50	778665	7422018
BS528	40	50	778662	7421995
BS529	20	50	778677	7421970
BS530	2	50	778702	7421939
BS531	15	50	778761	7421908
BS532	15	50	778761	7421907
BS533	50	50	778785	7421904
BS534	4	50	778817	7421885
BS535	5	50	778865	7421884
BS536	40	50	778875	7421892
BS537	60	50	778928	7421904
BS538	1	50	778962	7421896
BS539	3	50	778963	7421896
BS540	40	50	779100	7421911
BS541	25	50	779099	7421912
BS542	80	50	779110	7421930
BS543	30	50	779112	7421931
BS544	100	50	779106	7421952
BS545	40	50	779105	7421953
BS546	500	50	779102	7421971
BS548	150	50	779085	7421985
BS549	200	50	779077	7422001
BS550	100	50	779066	7422018

Site ID	Count	Zone	Easting	Northing
BS551	25	50	779071	7422052
BS552	40	50	779057	7422075
BS553	50	50	779065	7422090
BS554	20	50	779065	7422091
BS555	60	50	779097	7421889
BS556	20	50	779098	7421890
BS557	60	50	779089	7421868
BS559	60	50	781066	7422810
BS560	8	50	781070	7422831
BS561	40	50	781059	7422853
BS562	10	50	781058	7422875
BS564	1	50	780898	7423314
BS565	2	50	781101	7422697
BS566	60	50	781117	7422676
BS567	20	50	781118	7422675
BS568	20	50	781115	7422654
BS569	5	50	781113	7422654
BS570	50	50	781096	7422647
BS571	100	50	781080	7422660
BS572	80	50	781052	7422681
BS573	70	50	781029	7422689
BS574	60	50	781065	7422531
BS575	100	50	781072	7422534
BS577	10	50	781074	7422512
BS578	10	50	781099	7422505
BS579	30	50	781091	7422481
BS580	2	50	781061	7422431
BS581	100	50	780993	7422426
BS582	50	50	780979	7422442
BS583	50	50	780969	7422457
BS584	150	50	780973	7422477
BS585	40	50	780954	7422472
BS586	60	50	780937	7422471
BS587	40	50	780922	7422457
BS588	50	50	780919	7422486
BS589	50	50	780910	7422501
BS590	30	50	780900	7422522

Site ID	Count	Zone	Easting	Northing
BS591	10	50	780901	7422521
BS592	20	50	780886	7422536
BS593	25	50	780867	7422546
BS594	10	50	780854	7422560
BS595	30	50	780841	7422576
BS596	100	50	780829	7422584
BS597	1	50	780795	7422581
BS598	6	50	780902	7422453
BS599	5	50	780937	7422439
BS600	40	50	780950	7422432
BS601	30	50	780943	7422413
BS602	80	50	781093	7422628
BS603	5	50	781110	7422627
BS604	70	50	781095	7422608
BS605	200	50	781095	7422588
BS606	100	50	781106	7422570
BS607	40	50	781110	7422545
BS608	30	50	781125	7422531
BS609	100	50	781125	7422511
BS610	50	50	781140	7422501
BS611	5	50	781153	7422483
BS612	10	50	781154	7422462
BS613	30	50	781154	7422461
BS614	3	50	781143	7422434
BS615	10	50	781105	7422407
BS616	25	50	781081	7422398
BS617	70	50	781070	7422416
BS618	150	50	781052	7422408
BS619	40	50	781050	7422409
BS620	500	50	781035	7422395
BS621	100	50	781035	7422396
BS622	200	50	781018	7422383
BS623	100	50	780995	7422383
BS624	250	50	780974	7422377
BS625	20	50	780992	7422359
BS626	15	50	781059	7422376
BS627	20	50	781075	7422388

Site ID	Count	Zone	Easting	Northing
BS628	10	50	781094	7422399
BS629	200	50	780967	7422332
BS630	150	50	780947	7422321
BS631	100	50	780937	7422302
BS632	100	50	780910	7422274
BS633	6	50	782186	7421052
BS634	2	50	782201	7421100
BS635	3	50	782154	7421110
BS636	24	50	782148	7421147
BS637	75	50	782178	7421202
BS638	40	50	782197	7421211
BS639	30	50	782218	7421218
BS640	60	50	782188	7421230
BS641	40	50	782188	7421229
BS642	60	50	782213	7421244
BS643	100	50	782219	7421265
BS644	50	50	782231	7421279
BS645	30	50	782238	7421298
BS646	30	50	782239	7421321
BS647	100	50	782234	7421341
BS648	30	50	782224	7421261
BS649	25	50	782232	7421278
BS650	50	50	782241	7421296
BS651	200	50	782243	7421318
BS652	100	50	782242	7421338
BS653	100	50	782231	7421357
BS654	80	50	782238	7421375
BS655	40	50	782241	7421395
BS656	80	50	782241	7421395
BS657	70	50	782236	7421414
BS658	40	50	782236	7421414
BS659	30	50	782244	7421433
BS660	40	50	782244	7421433
BS661	25	50	782274	7421514
BS662	30	50	782283	7421535
BS663	40	50	782291	7421549
BS664	10	50	782300	7421573

Site ID	Count	Zone	Easting	Northing
BS665	40	50	782319	7421590
BS666	5	50	782333	7421604
BS667	25	50	782354	7421620
BS668	40	50	782374	7421640
BS669	7	50	782406	7421696
BS670	15	50	782423	7421775
BS671	20	50	782470	7421848
BS672	6	50	782501	7421786
BS673	25	50	782464	7421747
BS674	50	50	782505	7421726
BS675	40	50	782506	7421726
BS676	60	50	782521	7421712
BS677	20	50	782524	7421711
BS679	20	50	782268	7421395
BS680	25	50	782263	7421370
BS681	20	50	782276	7421341
BS682	2	50	782306	7421276
BS683	20	50	782258	7421251
BS684	30	50	782239	7421248
BS685	70	50	782229	7421229
BS686	60	50	782251	7421231
BS687	80	50	782269	7421233
BS689	100	50	782290	7421232
BS690	50	50	782308	7421242
BS691	100	50	782323	7421258
BS692	90	50	782334	7421274
BS693	200	50	782349	7421289
BS694	150	50	782363	7421304
BS695	100	50	782378	7421313
BS696	250	50	782400	7421321
BS697	100	50	782415	7421333
BS698	50	50	782435	7421342
BS699	30	50	782459	7421335
BS700	60	50	782476	7421332
BS701	50	50	782494	7421341
BS702	60	50	782516	7421328
BS703	60	50	782530	7421321

Site ID	Count	Zone	Easting	Northing
BS704	80	50	782550	7421312
BS705	50	50	782568	7421306
BS706	60	50	782585	7421296
BS707	50	50	782605	7421296
BS708	70	50	782626	7421285
BS709	40	50	782608	7421424
BS710	30	50	782596	7421410
BS711	5	50	782582	7421393
BS712	80	50	782547	7421372
BS713	150	50	782527	7421369
BS714	20	50	782510	7421356
BS715	100	50	782491	7421345
BS716	40	50	782419	7421347
BS717	1	50	782390	7421340
BS718	20	50	782362	7421326
BS719	30	50	782349	7421309
BS720	40	50	782327	7421304
BS721	5	50	782305	7421290
BS722	1	50	782296	7421404
BS723	40	50	781481	7421477
BS724	40	50	781504	7421471
BS725	25	50	781524	7421468
BS726	30	50	781549	7421469
BS727	25	50	781567	7421473
BS728	30	50	781584	7421481
BS729	50	50	781595	7421484
BS730	30	50	781595	7421485
BS731	20	50	781587	7421469
BS732	20	50	781608	7421464
BS733	50	50	781628	7421461
BS734	50	50	781650	7421457
BS735	20	50	781650	7421457
BS736	40	50	781670	7421459
BS737	100	50	781693	7421458
BS738	60	50	781711	7421451
BS739	40	50	781723	7421451
BS740	25	50	781736	7421448

Site ID	Count	Zone	Easting	Northing
BS741	10	50	781735	7421447
BS742	50	50	781761	7421442
BS743	10	50	781834	7421436
BS744	40	50	781859	7421420
BS745	30	50	781859	7421420
BS746	400	50	781963	7421390
BS747	20	50	781444	7421455
BS748	60	50	781434	7421440
BS749	60	50	781417	7421427
BS750	40	50	781252	7421237
BS754	40	50	778596	7421629
BS755	30	50	778506	7421759
BS756	50	50	778504	7421742
BS757	30	50	778504	7421741
BS758	10	50	778500	7421722
BS759	40	50	778501	7421701
BS760	10	50	778501	7421681
BS761	10	50	778502	7421661
BS762	5	50	778503	7421660
BS763	5	50	778507	7421640
BS764	30	50	778511	7421620
BS765	20	50	778517	7421600
BS766	10	50	778523	7421582
BS767	20	50	778539	7421542
BS768	2	50	778915	7421773
BS769	20	50	778927	7421761
BS770	5	50	778927	7421761
BS771	80	50	778946	7421748
BS772	10	50	778946	7421748
BS773	20	50	778964	7421734
BS774	15	50	778966	7421735
BS775	60	50	778982	7421722
BS776	80	50	778981	7421704
BS777	4	50	778997	7421620
BS778	1	50	778994	7421604
BS779	1	50	778987	7421541
BS780	1	50	779151	7421783

Site ID	Count	Zone	Easting	Northing
BS781	7	50	779136	7421802
BS782	20	50	779114	7421809
BS783	30	50	779101	7421822
BS784	25	50	779083	7421838
BS785	20	50	779071	7421834
BS786	30	50	779072	7421834
BS787	40	50	779063	7421818
BS788	20	50	779072	7421790
BS789	10	50	779072	7421791
BS79	6	50	782076	7421110
BS790	40	50	779067	7421772
BS791	3	50	779048	7421737
BS792	100	50	779017	7421741
BS793	75	50	779001	7421738
BS794	60	50	778870	7421699
BS83	5	50	782134	7421165
BS84	26	50	782129	7421165
BS85	30	50	782135	7421175
BS86	2	50	782111	7421181
BS87	1	50	782110	7421179
BS88	20	50	782109	7421182
BS89	1	50	782090	7421184
BS90	22	50	782110	7421160
BS91	5	50	782103	7421163
BS92	6	50	782095	7421144
BS93	5	50	782075	7421136
BS94	6	50	782042	7421100
BS95	8	50	781991	7421071
BS96	1	50	781985	7421056
BS97	4	50	781975	7421047
BS98	5	50	781982	7421043
SM100	10	50	781367	7421448
SM101	100	50	781366	7421459
SM102	50	50	781379	7421459
SM103	50	50	781385	7421454
SM103	150	50	781385	7421454
SM105	50	50	781379	7421447

Site ID	Count	Zone	Easting	Northing
SM106	20	50	781380	7421437
SM107	2	50	781385	7421413
SM108	4	50	781392	7421413
SM109	40	50	781439	7421448
SM110	30	50	781427	7421434
SM111	50	50	781416	7421428
SM112	70	50	781395	7421412
SM113	4	50	781381	7421396
SM114	110	50	781375	7421387
SM115	1	50	781363	7421373
SM115	15	50	781363	7421373
SM116	130	50	781351	7421355
SM117	150	50	781326	7421321
SM118	200	50	781319	7421306
SM119	4	50	781286	7421291
SM120	5	50	781254	7421312
SM121	40	50	781250	7421332
SM122	10	50	781269	7421339
SM123	60	50	781258	7421354
SM124	40	50	781108	7421340
SM125	15	50	780989	7421367
SM126	75	50	780809	7421997
SM127	125	50	780794	7422007
SM128	10	50	780782	7421985
SM129	10	50	780772	7422000
SM130	25	50	780765	7422013
SM131	40	50	780775	7422031
SM132	250	50	780770	7422053
SM133	300	50	780759	7422073
SM134	450	50	780744	7422090
SM135	500	50	780728	7422110
SM136	450	50	780720	7422129
SM137	80	50	780717	7422149
SM138	45	50	780713	7422177
SM139	10	50	780670	7422198
SM140	90	50	780638	7422258
SM141	40	50	780666	7422290

Site ID	Count	Zone	Easting	Northing
SM142	150	50	780685	7422299
SM143	100	50	780703	7422305
SM144	150	50	780722	7422316
SM145	150	50	780746	7422321
SM146	5	50	780852	7422228
SM147	15	50	780843	7422241
SM148	40	50	780857	7422264
SM149	2	50	780886	7422281
SM151	10	50	780820	7422354
SM152	50	50	780794	7422359
SM153	15	50	780795	7422399
SM154	50	50	780745	7422367
SM155	10	50	780588	7422306
SM156	70	50	780594	7422301
SM157	300	50	780602	7422280
SM158	150	50	780613	7422260
SM159	100	50	780598	7422225
SM16	26	50	782159	7421195
SM160	150	50	780585	7422211
SM161	15	50	780560	7422201
SM162	50	50	780546	7422185
SM163	18	50	780584	7422168
SM164	150	50	780600	7422160
SM165	25	50	780618	7422150
SM166	12	50	780635	7422138
SM167	50	50	780641	7422135
SM168	80	50	780661	7422128
SM169	50	50	780668	7422114
SM17	26	50	782160	7421194
SM170	100	50	780683	7422108
SM171	10	50	780708	7422093
SM172	40	50	780725	7422083
SM173	60	50	780732	7422059
SM174	40	50	780741	7422047
SM175	20	50	780756	7422021
SM176	25	50	780216	7421480
SM177	20	50	780226	7421507

Site ID	Count	Zone	Easting	Northing
SM178	6	50	780228	7421538
SM178	10	50	780228	7421538
SM179	4	50	780228	7421564
SM179	10	50	780228	7421564
SM18	11	50	782066	7421149
SM180	20	50	780236	7421576
SM181	30	50	780245	7421595
SM181	50	50	780245	7421595
SM182	50	50	780257	7421610
SM182	60	50	780257	7421610
SM183	40	50	780266	7421627
SM183	80	50	780266	7421627
SM184	50	50	780278	7421646
SM185	20	50	780283	7421660
SM186	15	50	780291	7421669
SM187	5	50	780327	7421680
SM188	10	50	780343	7421696
SM188	50	50	780343	7421696
SM189	15	50	780358	7421711
SM189	40	50	780358	7421711
SM19	1	50	782059	7421150
SM190	30	50	780383	7421708
SM191	20	50	780428	7421720
SM192	30	50	780444	7421717
SM193	20	50	780626	7422231
SM193	30	50	780626	7422231
SM194	40	50	780538	7422222
SM195	60	50	780537	7422226
SM196	50	50	780548	7422235
SM197	80	50	780547	7422236
SM198	100	50	780532	7422240
SM199	90	50	780530	7422241
SM20	9	50	782047	7421144
SM200	250	50	780514	7422246
SM201	300	50	780494	7422244
SM202	200	50	780474	7422253
SM203	150	50	780455	7422264

Site ID	Count	Zone	Easting	Northing
SM204	150	50	780439	7422275
SM205	50	50	780421	7422285
SM206	200	50	780402	7422288
SM207	40	50	780382	7422297
SM208	25	50	780381	7422291
SM209	60	50	780361	7422295
SM21	19	50	782047	7421130
SM210	65	50	780342	7422308
SM211	90	50	780330	7422324
SM212	130	50	780321	7422345
SM213	150	50	780300	7422343
SM214	100	50	780280	7422335
SM215	70	50	780261	7422344
SM216	1	50	780229	7422361
SM217	7	50	779200	7422664
SM218	16	50	779195	7422657
SM219	13	50	779191	7422654
SM220	20	50	779189	7422654
SM221	12	50	779182	7422654
SM222	5	50	779182	7422653
SM223	45	50	779175	7422654
SM224	30	50	779170	7422654
SM225	40	50	779166	7422652
SM226	30	50	779157	7422645
SM227	1	50	779149	7422637
SM227	20	50	779149	7422637
SM228	20	50	779143	7422632
SM229	30	50	779143	7422632
SM23	9	50	782041	7421120
SM230	40	50	779137	7422625
SM231	30	50	779129	7422605
SM232	40	50	779131	7422605
SM233	20	50	779124	7422598
SM234	15	50	779120	7422584
SM235	2	50	779113	7422586
SM236	4	50	779111	7422586
SM237	25	50	780162	7422382

Site ID	Count	Zone	Easting	Northing
SM238	30	50	780163	7422380
SM239	60	50	780151	7422374
SM24	11	50	782023	7421122
SM240	30	50	780150	7422374
SM241	50	50	780134	7422370
SM242	30	50	780134	7422370
SM243	60	50	780190	7422376
SM244	40	50	780192	7422368
SM245	12	50	780198	7422397
SM246	5	50	780199	7422396
SM247	15	50	780205	7422360
SM248	10	50	780206	7422361
SM249	60	50	780196	7422351
SM25	17	50	782016	7421115
SM250	20	50	780195	7422351
SM251	35	50	780171	7422353
SM252	10	50	780153	7422353
SM253	40	50	780126	7422352
SM254	40	50	780113	7422361
SM255	50	50	780099	7422360
SM256	70	50	780081	7422367
SM257	40	50	780080	7422368
SM258	110	50	780059	7422373
SM259	60	50	780039	7422374
SM26	21	50	782009	7421120
SM260	80	50	780039	7422374
SM261	30	50	780020	7422378
SM262	75	50	780012	7422378
SM263	20	50	779997	7422375
SM264	30	50	779998	7422375
SM265	45	50	779978	7422377
SM266	40	50	779979	7422377
SM267	30	50	779959	7422379
SM267	60	50	779959	7422379
SM268	15	50	780210	7422337
SM269	50	50	780222	7422318
SM27	7	50	781997	7421114

Site ID	Count	Zone	Easting	Northing
SM270	10	50	780241	7422308
SM271	75	50	780266	7422310
SM272	25	50	780276	7422322
SM274	150	50	780490	7422224
SM275	80	50	780488	7422213
SM276	15	50	780504	7422206
SM277	20	50	780506	7422207
SM278	40	50	780516	7422197
SM279	50	50	780518	7422195
SM28	11	50	781989	7421117
SM280	2	50	777599	7421941
SM281	3	50	777597	7421950
SM282	1	50	777581	7421994
SM283	5	50	777617	7422035
SM284	3	50	777650	7422087
SM285	1	50	777650	7422089
SM286	2	50	777660	7422112
SM287	8	50	777668	7422115
SM288	1	50	777670	7422117
SM289	20	50	777670	7422124
SM29	14	50	781985	7421106
SM290	10	50	777672	7422123
SM291	30	50	777666	7422131
SM292	15	50	777669	7422138
SM293	150	50	777674	7422154
SM294	50	50	777674	7422153
SM296	5	50	777588	7422246
SM297	2	50	777587	7422245
SM298	1	50	777566	7422220
SM299	1	50	777565	7422214
SM3	18	50	782157	7421161
SM30	5	50	781966	7421093
SM300	15	50	777547	7422181
SM301	10	50	777548	7422180
SM302	1	50	777550	7422170
SM303	3	50	777544	7422166
SM304	3	50	777540	7422157

Site ID	Count	Zone	Easting	Northing
SM305	2	50	777541	7422160
SM306	4	50	777537	7422152
SM307	1	50	777547	7422144
SM308	10	50	777621	7422012
SM309	8	50	777618	7422011
SM31	22	50	781969	7421100
SM310	3	50	779112	7421772
SM311	6	50	779137	7421808
SM312	7	50	779144	7421818
SM313	25	50	779132	7421910
SM314	5	50	779140	7421919
SM315	4	50	779156	7421935
SM316	9	50	779168	7421957
SM317	15	50	779167	7421957
SM318	25	50	779174	7421983
SM319	35	50	779172	7421981
SM32	9	50	781960	7421089
SM320	15	50	779285	7421925
SM321	30	50	779283	7421925
SM322	20	50	779293	7421950
SM323	20	50	779293	7421948
SM324	15	50	779391	7421977
SM325	20	50	779405	7421977
SM326	15	50	779404	7421977
SM326	20	50	779404	7421977
SM327	50	50	779417	7421980
SM328	20	50	779419	7421981
SM329	15	50	779422	7421987
SM33	5	50	781976	7421087
SM330	20	50	779411	7421970
SM331	10	50	779405	7421963
SM332	6	50	779406	7421961
SM333	10	50	779405	7421956
SM334	1	50	779398	7421952
SM335	30	50	779396	7421941
SM336	40	50	779411	7421936
SM337	4	50	779451	7421901

Site ID	Count	Zone	Easting	Northing
SM338	1	50	779613	7421751
SM339	30	50	779770	7421747
SM34	24	50	781953	7421075
SM340	15	50	779773	7421738
SM341	45	50	779666	7421726
SM342	6	50	779664	7421719
SM343	12	50	779655	7421702
SM344	40	50	779664	7421739
SM345	7	50	779664	7421739
SM346	1	50	779432	7421839
SM348	10	50	779406	7421906
SM349	1	50	779393	7421880
SM35	2	50	781941	7421059
SM350	30	50	779390	7421863
SM351	5	50	779389	7421848
SM352	1	50	779387	7421844
SM353	25	50	779387	7421838
SM354	5	50	779387	7421832
SM355	10	50	779387	7421821
SM356	30	50	779389	7421810
SM357	8	50	779387	7421776
SM358	50	50	779345	7421870
SM359	20	50	779346	7421869
SM36	5	50	781930	7421031
SM360	40	50	779328	7421888
SM361	50	50	779318	7421895
SM362	2	50	780742	7422253
SM363	25	50	781106	7422784
SM364	5	50	781094	7422798
SM364	15	50	781094	7422798
SM365	40	50	781106	7422818
SM366	15	50	781105	7422818
SM367	15	50	781087	7422833
SM368	5	50	781088	7422833
SM369	15	50	781083	7422857
SM37	13	50	781889	7420989
SM370	15	50	781138	7423000

Site ID	Count	Zone	Easting	Northing
SM371	20	50	781139	7423000
SM372	45	50	781188	7422995
SM373	20	50	781186	7422994
SM375	1	50	781334	7422698
SM376	25	50	781346	7422712
SM377	30	50	781346	7422713
SM378	6	50	781354	7422719
SM379	15	50	781397	7422735
SM38	6	50	782052	7421266
SM380	20	50	781397	7422735
SM381	10	50	781410	7422738
SM381	35	50	781410	7422738
SM382	20	50	781429	7422752
SM383	15	50	781424	7422723
SM384	40	50	781418	7422717
SM385	20	50	781401	7422713
SM386	10	50	781397	7422713
SM387	20	50	781380	7422711
SM388	25	50	781356	7422690
SM389	1	50	781252	7422610
SM39	10	50	782042	7421271
SM390	40	50	781268	7422623
SM391	20	50	781281	7422631
SM392	50	50	781286	7422651
SM393	15	50	781299	7422676
SM394	6	50	781323	7422687
SM395	70	50	781231	7422604
SM396	30	50	781237	7422592
SM397	150	50	781241	7422583
SM398	80	50	781244	7422556
SM399	30	50	781242	7422553
SM4	6	50	782158	7421151
SM40	11	50	782057	7421293
SM400	50	50	781239	7422539
SM401	40	50	781240	7422538
SM402	90	50	781237	7422524
SM403	70	50	781236	7422510

Site ID	Count	Zone	Easting	Northing
SM404	40	50	781253	7422518
SM405	500	50	781270	7422536
SM406	300	50	781318	7422512
SM407	200	50	781319	7422494
SM408	100	50	781326	7422467
SM409	30	50	781360	7422474
SM41	11	50	782043	7421346
SM410	250	50	781380	7422482
SM411	10	50	781413	7422452
SM412	50	50	781429	7422445
SM413	15	50	781453	7422449
SM414	10	50	781219	7422483
SM415	50	50	781205	7422489
SM416	100	50	781184	7422504
SM417	70	50	781172	7422523
SM418	50	50	781157	7422541
SM419	40	50	781186	7422529
SM42	4	50	782038	7421377
SM420	30	50	781147	7422556
SM421	60	50	781133	7422569
SM422	30	50	781123	7422586
SM423	3	50	781127	7422608
SM424	40	50	781145	7422641
SM425	12	50	781143	7422662
SM426	11	50	781132	7422731
SM427	70	50	781187	7422454
SM428	30	50	781156	7422420
SM429	80	50	781139	7422404
SM43	39	50	782031	7421402
SM430	200	50	781122	7422390
SM431	400	50	781102	7422378
SM432	200	50	781077	7422358
SM433	40	50	781057	7422353
SM434	5	50	780998	7422341
SM435	20	50	780978	7422330
SM436	50	50	780965	7422280
SM437	130	50	780900	7422247

Site ID	Count	Zone	Easting	Northing
SM438	7	50	782418	7421028
SM439	3	50	782417	7421027
SM44	3	50	782039	7421419
SM440	20	50	782418	7421060
SM441	10	50	782418	7421060
SM442	1	50	782461	7421047
SM443	25	50	782546	7421043
SM444	2	50	782581	7421019
SM445	1	50	782583	7421022
SM446	4	50	782592	7421010
SM447	10	50	782598	7420995
SM448	25	50	782590	7420995
SM449	15	50	782608	7420971
SM45	10	50	782034	7421468
SM450	5	50	782618	7420943
SM451	3	50	782645	7420965
SM452	25	50	782662	7420964
SM453	10	50	782698	7420960
SM454	5	50	782711	7420964
SM455	5	50	782722	7420985
SM456	5	50	782740	7420960
SM457	35	50	782801	7420979
SM458	10	50	782801	7420980
SM459	30	50	782803	7420992
SM46	35	50	782042	7421480
SM460	10	50	782803	7420993
SM461	40	50	782807	7420997
SM462	35	50	782806	7421002
SM463	15	50	782813	7421017
SM464	25	50	782813	7421016
SM465	120	50	782822	7421027
SM466	10	50	782844	7421000
SM467	6	50	782844	7421000
SM469	25	50	782956	7421015
SM47	13	50	782053	7421493
SM470	4	50	782955	7421017
SM471	30	50	782989	7420871

Site ID	Count	Zone	Easting	Northing
SM472	35	50	783017	7420876
SM473	6	50	783035	7420887
SM474	80	50	783047	7420906
SM475	16	50	783061	7420899
SM476	35	50	783072	7420920
SM477	140	50	783066	7420930
SM478	45	50	783080	7420936
SM479	100	50	783078	7420960
SM48	1	50	782071	7421510
SM480	80	50	783091	7420965
SM481	40	50	783082	7420986
SM482	200	50	783087	7421005
SM483	250	50	783101	7421022
SM484	80	50	783105	7421046
SM485	50	50	783114	7421065
SM486	30	50	783131	7421096
SM487	60	50	783150	7421098
SM488	30	50	783169	7421109
SM489	110	50	783190	7421112
SM49	5	50	782134	7421633
SM490	250	50	783212	7421120
SM491	200	50	783229	7421120
SM492	50	50	783258	7421105
SM493	50	50	783291	7421096
SM494	60	50	783200	7421124
SM495	3	50	783111	7421099
SM496	40	50	783100	7421123
SM497	100	50	783088	7421140
SM498	80	50	783074	7421156
SM499	60	50	783058	7421173
SM5	5	50	782153	7421110
SM50	30	50	782136	7421620
SM500	1	50	782999	7420968
SM501	2	50	782813	7420955
SM502	9	50	782792	7420944
SM503	15	50	782569	7420940
SM504	2	50	782188	7421055

Site ID	Count	Zone	Easting	Northing
SM505	6	50	782360	7421028
SM506	30	50	781251	7421236
SM507	6	50	781232	7421260
SM508	3	50	781218	7421259
SM509	15	50	781212	7421256
SM509	50	50	781212	7421256
SM51	50	50	782132	7421612
SM510	25	50	781190	7421258
SM511	10	50	781182	7421259
SM512	20	50	781169	7421265
SM513	30	50	781155	7421280
SM515	30	50	781096	7421279
SM516	20	50	781096	7421268
SM517	6	50	781045	7421295
SM518	50	50	781030	7421305
SM519	5	50	781101	7421390
SM52	50	50	782127	7421604
SM520	6	50	781110	7421380
SM521	10	50	781110	7421375
SM522	25	50	781112	7421368
SM523	1	50	781437	7421497
SM524	11	50	781432	7421517
SM525	8	50	781419	7421519
SM526	5	50	781301	7421563
SM527	1	50	781285	7421565
SM528	5	50	781190	7421597
SM529	1	50	781124	7421669
SM53	35	50	782119	7421593
SM530	150	50	781126	7421707
SM531	50	50	781127	7421684
SM532	100	50	781140	7421676
SM533	5	50	781146	7421681
SM534	30	50	781164	7421661
SM535	40	50	781197	7421667
SM536	20	50	781217	7421665
SM54	50	50	782102	7421579
SM540	5	50	777962	7421911

Site ID	Count	Zone	Easting	Northing
SM541	15	50	777965	7421915
SM55	60	50	781950	7421629
SM56	5	50	781947	7421598
SM57	12	50	781957	7421583
SM58	30	50	781987	7421542
SM59	9	50	782248	7421134
SM60	5	50	782601	7421095
SM61	10	50	782714	7421058
SM62	10	50	782311	7421180
SM63	25	50	777249	7422279
SM64	35	50	777238	7422292
SM65	15	50	777238	7422314
SM66	10	50	777238	7422334
SM67	30	50	777255	7422329
SM68	11	50	777263	7422316
SM69	25	50	777272	7422298
SM70	15	50	777280	7422281
SM71	70	50	777290	7422274
SM72	60	50	777316	7422269
SM73	20	50	777392	7422233
SM74	35	50	777403	7422210
SM75	50	50	777416	7422183
SM76	1	50	777455	7422160
SM77	20	50	777501	7422151

Site ID	Count	Zone	Easting	Northing
SM78	10	50	777597	7422262
SM79	2	50	777586	7422284
SM80	40	50	777604	7422327
SM81	50	50	777621	7422344
SM82	25	50	777634	7422362
SM83	60	50	777645	7422384
SM84	70	50	777657	7422400
SM85	30	50	777796	7422227
SM86	50	50	777765	7422210
SM87	20	50	777770	7422193
SM88	70	50	777764	7422180
SM89	20	50	777752	7422168
SM90	30	50	777720	7422164
SM91	40	50	777705	7422163
SM92	30	50	777690	7422154
SM93	1	50	780950	7421370
SM94	1	50	780921	7421455
SM95	80	50	780935	7421490
SM96	1	50	780946	7421522
SM96	5	50	780946	7421522
SM97	1	50	781210	7421441
SM98	4	50	781270	7421447
SM99	5	50	781324	7421444
SM99	40	50	781324	7421444