



Office of
Environment
& Heritage

Developer guidelines

BioNet Web Services
Release 3.0

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Published by:

Office of Environment and Heritage

59 Goulburn Street, Sydney NSW 2000

PO Box A290, Sydney South NSW 1232

Phone: +61 2 9995 5000 (switchboard)

Phone: 131 555 (environment information and publications requests)

Phone: 1300 361 967 (national parks, general environmental enquiries, and publications requests)

Fax: +61 2 9995 5999

TTY users: phone 133 677, then ask for 131 555

Speak and listen users: phone 1300 555 727, then ask for 131 555

Email: info@environment.nsw.gov.au

Website: www.environment.nsw.gov.au

Report pollution and environmental incidents

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1 Introduction

BioNet is the trusted source of biodiversity data for New South Wales (NSW) and a resource for all. The BioNet Web Service provides an application-level open application programming interface (API). It enables developers to directly integrate biodiversity data into their software systems and unlock the innovation potential of this valuable dataset.

1.1 What data are available?

Release 3.0 of the BioNet Web Services makes the following data collections available:

- **Species Sightings** data currently available through the [BioNet Atlas](#) user interface.
- **Vegetation Classification** data on plant community types currently available through [BioNet Vegetation Classification](#) user interface
- **NSW Landscapes** data on Mitchell landscapes (overcleared landscapes) currently available as a report that can be downloaded through the BioNet Vegetation Classification user interface.
- **Threatened Biodiversity** profile data for species, populations, ecological communities and key threatening processes currently available through the [BioNet Atlas](#) user interface.
- **Species Names** provides the full list of species names used across BioNet services. In addition to the taxonomic data provided, the service also includes information on the legislative status of the species (e.g. is it listed at a state or national level) as well as some additional attributes for filtering.

In addition to the data collections above, the following two services have been provided for app developers:

- A **Thesaurus** service, which provides a set of searchable terms and links for the species sightings, species taxonomy and threatened biodiversity web services. It is intended for use by application developers seeking provide a BioNet search feature in their applications.

The data available via the web service are updated daily from the source data (see Figure 1).

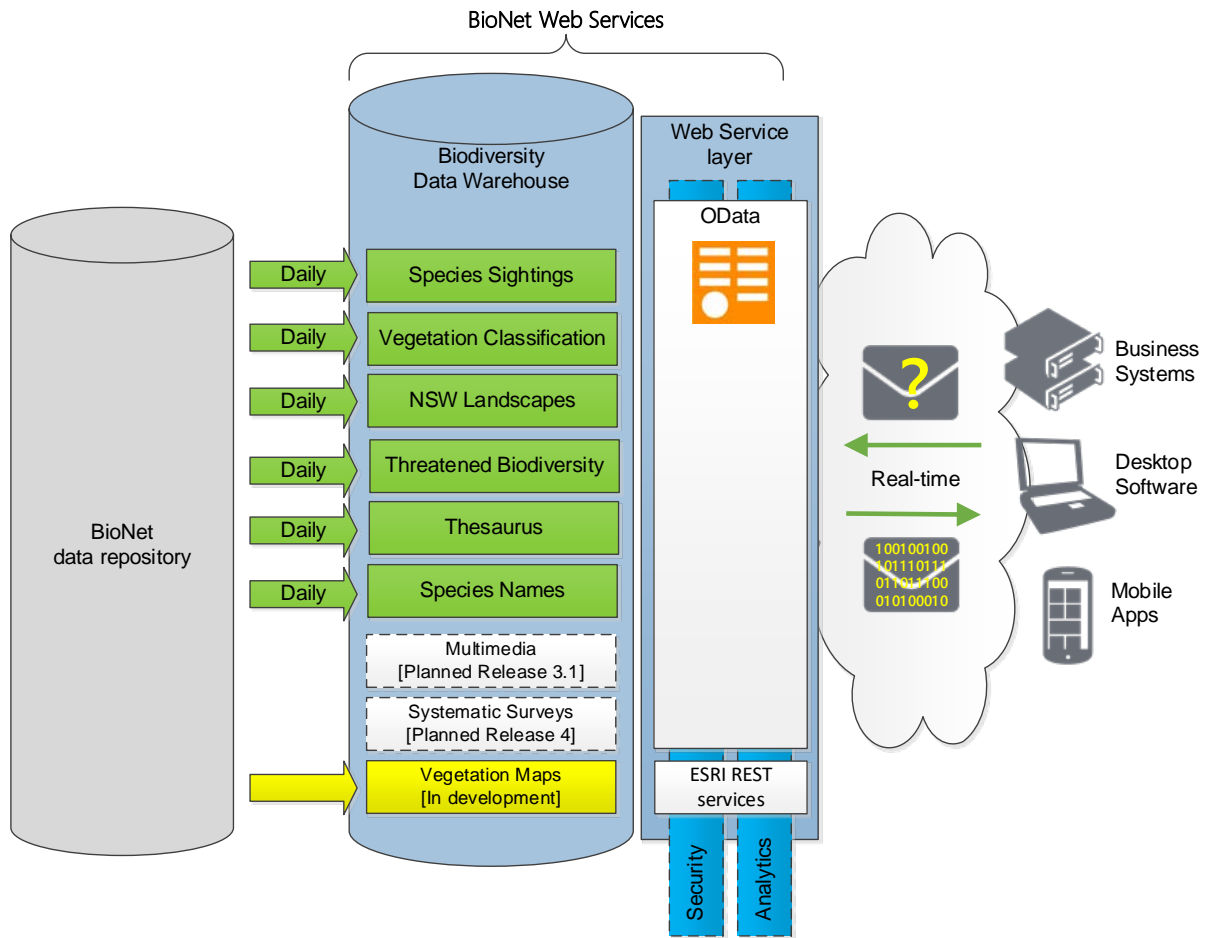


Figure 1 Overview of the BioNet Web Service implementation

2 Before you begin



This section contains important information you need to understand and consider before you start the development of your application.

2.1 How do I go about developing an application using data from BioNet?

Download and fill out the Data Use Case form from [BioNet for developers](#) and submit to bionet@environment.nsw.gov.au. We will use the information provided to support you through the process and to issue you with an App Token.

Once you have received your App Token, read this guide and start developing.

2.2 What support do you provide?

We provide advice to help guide you in your development decision making, particularly about the use and interpretation of data made available via the service. This advice will be provided based on the information you supply in the Data Use Case form.

We will provide technical support for the server side services. That is, for the correct functioning and availability of the API itself, and for the data that are served through that API.

We do not provide technical support for client side applications, development toolkits or libraries. Support of these should be sourced from the vendor/supplier of the software, or in the case of open source solutions, from the developer community.

For support, email bionet@environment.nsw.gov.au.

2.3 What is your SLA?

Our target for the web service is to support 50 simultaneous connections and process a well-formed request retrieving up to 1000 records within one second of the web service receiving the request. The service will be unavailable from 3am to 6am, to allow us to run the daily data update.

For more details on a well-formed request, see Section 2.8.

The service uses the OASIS OData v4.0 Protocol. Documentation on the protocol is available at [OData](#).

2.4 Where do I find documentation on the data available via the Biodiversity Web Services?

Detailed information on the data available via the BioNet Web Services is documented in the following standards which are available at [BioNet for developers](#):

- *BioNet Web Services Species Sightings Web Service Data Standard*
- *BioNet Web Services Vegetation Classification Web Service Data Standard*
- *BioNet Web Services NSW Landscapes Web Service Data Standard*

- *BioNet Web Services Threatened Biodiversity Web Service Data Standard*
- *BioNet Web Services Species Names Web Service Data Standard*
- *BioNet Web Services Thesaurus Web Service Data Standard*
- *BioNet Web Services MultiMedia Web Service Data Standard.*

2.5 Are there any security restrictions placed on the data?

Yes, the Species Sightings web service implements and uses the existing security model applied to the BioNet Atlas of NSW web application. For more details on the levels of access, refer to Section 3 of the BioNet Atlas User Manual.

As the same model is used, existing user credentials for the BioNet Atlas of NSW Wildlife or the VIS-C web apps will work for the Web Services. New user credentials should also be requested via the existing application process for login access to either the BioNet Atlas of NSW Wildlife or VIS-C.

However, authentication is not mandatory. If you do not pass a user name and password to the web service, it will return the publicly available data as per the query submitted. It should be noted that, for the Species Sightings Web Service, these data will contain obfuscated data for species listed in the Sensitive Species Policy. This will be made clear in the dataGeneralizations field and will withhold some fields as listed in the dataWithheld field. There are also records that we do not have permission to share publicly. These are withheld and will not appear in the data returned.

2.6 Are there any terms and conditions I should be aware of when using data from the web service?

Yes, there are specific terms and conditions for the data shared via the Species Sightings web service that should be read and accepted before developing your application.

Users who develop an application that uses data from the Species Sightings web service are considered to have accepted the terms and conditions of the applications's developer.

2.7 Are there any restrictions on your implementation of OData that I should be aware of?

2.7.1 \$orderby query option

To prevent sorting on properties that are not indexed in the database, \$orderby has been restricted to the following fields for the Species Sightings Web Service:

- catalogNumber
- scientificNameID
- consequence
- locationID
- PNFFilter
- occurrenceStatus
- taxonRank
- stateProvince
- coordinatePrecision

- datasetID
- occurrenceID.

2.7.2 any and all functions

The any () and all () functions have been disabled to mitigate the risk of slow query performance and enable the service to enforce the Page limits. This will not restrict the data that a user can extract; rather, it limits data served to 100,000 rows per page.

2.7.3 Filtering of navigation properties

Support for filtering on navigation properties will not be implemented. Filtering on navigation properties can result in a join, which will affect the performance of the service.

This will not affect the usability of the service for users, as the underlying data model does not support this type of filtering.

2.7.4 Server-side queryable attributes

We have implemented server-side queryable attributes to safe guard against large data returns and provide query optimisations. The attributes that have been implemented include:

- PageSize = 100,000
- MaxNodeCount = 50.

2.8 What best practice guidance should I be aware of when creating OData queries?

2.8.1 \$select operator

All queries that an application submits should use the \$select operator to return only the fields you require. Using the \$select operator is critical to shield your application from changes to the data standard. It means that adding new fields to an entity set, or removing fields not used by your application, will not affect your application's ability to process the data returned by the web service.

2.8.2 \$filter operators

The best practice is to use the eq operator in preference to other operators such as startswith or endswith. This is because the eq operator is the most efficient from a server resource consumption point of view, and will help ensure that performance of the service remains high for all users.

For example, if you know you are searching for Square-tailed Kite you should use `?$filter=vernacularName eq 'Square-tailed Kite'`.

The contains operator should be avoided, as this operator is very resource intensive and can result in query time outs. This is especially so for the Species Sightings web service, because it is a very large data collection comprising millions of records. In this case, it would be preferable to use the startswith operator.

2.8.3 \$apply operator

The \$apply operator is used for aggregations, and its intended use in the BioNet Web Service is to produce lists of unique names using the groupby transformation. The best practice is to limit the number of fields to which you are applying the groupby to the minimum required to achieve your use case. For example, the following query to generate a species list for a national park is limited to just the reserve name, scientific name and common (vernacular) name. The \$apply feature can be used to dynamically generate [picklists for apps to filter the data](#).

2.8.4 \$orderby query option

The \$orderby query option sorts result returned in either descending or ascending order. Best practice is to not use this option and undertake sorting, if needed, on the client side in your application.

However, if sorting on the server side is required it should be noted that ordering is very resource intensive and can result in query time outs. In this instance, best practice is to combine the \$orderby with a \$filter operator to limit the result set that is being sorted. In testing, it was found that sorting result sets of ±500,000 records performed acceptably.

For example, ?\$filter=vernacularName eq 'Square-tailed Kite'&\$orderby=locationID desc.

2.8.5 Which fields should my query target?

The eq operator can be used on any field.

The following fields in the Species Sightings web service have been tuned to enable their use with the startswith, endswith and contains operators, if necessary:

- scientificName
- vernacularName
- family
- datasetName
- county.

2.8.6 Are there any specific fields you recommend I should use?

We recommend that you should return the dcterms_bibliographicCitation and a unique identifier for the records (e.g. catagloueNumber for Species Sightings, PCTID for Vegetation Classification, profileID for Threatened Biodiversity). These fields enable us to know when the record was retrieved in case there have been changes to the data since the time of retrieval, and which record the data refers to.

2.9 How should I acknowledge BioNet Web Services in my application?

Please contact us for a logo that you can use in your application to acknowledge the source of the data.

3 Getting started

Make sure you have received your App Token before proceeding further. See Section 2.1 for more about the App Token.

3.1 BioNet Web Services url

Go to the [BioNet Web Services website](#).

3.2 Architecture

All requests are made using https to the relevant service url.

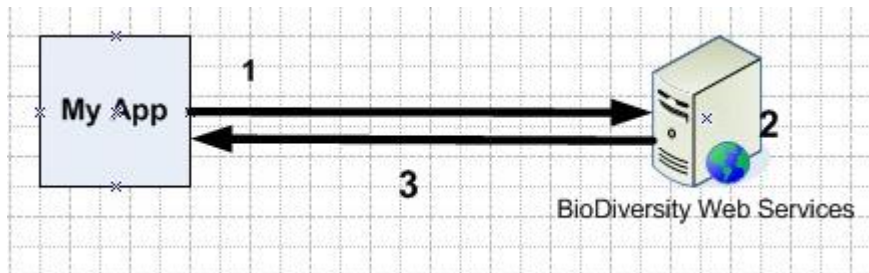


Figure 2 Service architecture

1. HTTPS request with App Token in header and conforming to the OData protocol.
2. Web service processes request and sends response in JSON format. No other formats are supported at this time.
3. OData response contains results. Results are paged at 100,000 rows per page with a 'NEXTLINK' link embedded in the data. Note that this only occurs if the resultant record count is greater than 100,000. For example, '@odata.nextLink';'https://data.bionet.nsw.gov.au/biosvcapp/odata/SpeciesSightings_CoreData?\$skip=100000'.

3.3 How to use the App Token

The following information must be supplied in the HTTPS request when using an App Token to access the service:

- AppID: is Application ID we supply to you
- UT: is always set to the value PUB
- access_token: this is the app token we supplied to you.

An example of a request and response using an App Token is given below with the fields required highlighted in bold.

Request:

GET

http://webdev.environment.nsw.gov.au/BioSvcApp/odata/SpeciesSightings_CoreData?\$to
p=1 HTTP/1.1

Host: webdev.environment.nsw.gov.au

User-Agent: Mozilla/5.0 (Windows NT 6.1; WOW64; rv:35.0) Gecko/20100101
Firefox/35.0

Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Connection: keep-alive
AppID:5
UT:PUB
access_token:9waEWNalJ6k=:KvDKDEs2QymAHMo9JbBhDzZX8W/Ppd4+g753kSdherAtHzgQ+x4a12v8HJPDYqSSCYI3uByibc8mY+7voHf1PFqp/e+7i6M9CpNqBFwcAzw=

Response:

HTTP/1.1 200 OK
Cache-Control: no-cache
Pragma: no-cache
Expires: -1
Server: Microsoft-IIS/8.5
AppID: 5
access_token:
9waEWNalJ6k=:KvDKDEs2QymAHMo9JbBhDzZX8W/Ppd4+g753kSdherAtHzgQ+x4a12v8HJPDYqSSCYI3uByibc8mY+7voHf1PFqp/e+7i6M9CpNqBFwcAzw=
UT: PUB
OData-Version: 4.0
X-AspNet-Version: 4.0.30319
X-Powered-By: ASP.NET
X-UA-Compatible: IE=EmulateIE9
Access-Control-Allow-Origin: *
Date: Thu, 23 Feb 2017 01:00:18 GMT
Content-Length: 3057
Content-Type: application/json; odata.metadata=minimal
Via: 1.1 lidcopx01.dec.int:8080 (Cisco-WSA/9.1.1-074)
Connection: keep-alive
Proxy-Connection: keep-alive

```
{
"@odata.context": "http://webdev.environment.nsw.gov.au/BioSvcApp/odata/$metadata#SpeciesSightings_CoreData", "value": [
{
"PKID":28213045,"basisOfRecord":"HumanObservation","collectionCode":"BioNet Atlas of NSW Wildlife","dataGeneralizations":"The observer name has been changed to a unique User ID","datasetID":1,"datasetName":"OEH Default Sightings","dcterms_bibliographicCitation":"BioNet Atlas of NSW Wildlife 22/12/2016 3:35 PM +11:00","dcterms_language":"en","dcterms_modified":"2001-02-15T16:29:56+11:00","dcterms_rights":"Creative Commons by Attribution","dcterms_rightsHolder":"Office of Environment and Heritage","dcterms_type":"Event","botanicalDivision":"South Coast","CMA":"Southern Rivers","CMASubregion":"South East Coastal Ranges","floraReserve":"N/A","IBRA":"South East Corner
```

```
(NSW),"reserve":"N/A","stateForest":"N/A","TSProfileID":"N/A","BFMCS":"N/A","geog
Extent":"N/A","vulnerability":"N/A","potentialImpact":"N/A","speciesFireDescriptio
n":"N/A","mechanicalHRDescription":"N/A","informationWithheld":"The following
fields have been withheld and are only available to licensed or OEH staff:
locality, locationRemarks, occurrenceRemarks","institutionCode":"NSW Office of
Environment and Heritage","ownerInstitutionCode":"Office of Environment and
Heritage","associatedReferences":null,"catalogNumber":"*","consequence":null,"esta
blishmentMeans":"Introduced","estimateTypeCode":null,"individualCount":null,"indiv
idualID":null,"observationType":"Observed","occurrenceID":"urn:catalog:NSW Office
of Environment and Heritage:BioNet Atlas of NSW
Wildlife:*","occurrenceRemarks":"occurrenceRemarks
withheld","occurrenceStatus":"Present","otherCatalogNumbers":null,"PNFFilter":null
,"recordedBy":"HIGJ","recordNumber":null,"reproductiveCondition":null,"sex":null,"
stateConservation":"Not Listed","countryConservation":"Not
Listed","protectedInNSW":"false","sensitivityClass":"Not
Sensitive","migratorySpeciesAgreement":null,"status":"Valid and accepted without
modification","eventDate":"1983-12-01/1983-12-
28","eventID":null,"eventRemarks":null,"eventTime":null,"habitat":null,"samplingEf
fort":null,"samplingProtocol":null,"coordinatePrecision":"9","coordinateUncertain
tyInMeters":100.0000,"country":"Australia","countryCode":"AU","county":"BEGA
VALLEY","decimalLatitude":-
36.864246125,"decimalLongitude":149.927962884,"easting":761013,"geodeticDatum":"GD
A94","georeferenceProtocol":null,"locality":"locality
withheld","locationRemarks":"locationRemarks withheld","mapSheetNumber":"8824 -
BEGA","maximumElevationInMeters":null,"minimumElevationInMeters":null,"northing":5
916184,"stateProvince":"NSW","zone":55,"class":"Aves","family":"Sturnidae","genus"
:"Sturnus","infraspecificEpithet":null,"kingdom":"Animalia","nomenclaturalCode":"I
CZN","order":"Passeriformes","populationName":null,"scientificName":"Sturnus
vulgaris","scientificNameAuthorship":"Linnaeus,
1758","scientificNameID":"0999","sortOrder":3240,"locationID":"WD3565","specificEp
ithet":"vulgaris","taxonRank":"Species","vernacularName":"Common Starling"
}
]
```

3.4 Reference material for developers

The following material is given to get you started. Please note that it is not exhaustive. It is suggested you search for OData and your development platform online to find specific reference material, if available, for your project.

- [About OData](#)
- OData tutorials
 - [Basic tutorial](#)
 - [Web Api OData V4 Using an Odata T4 generated client, part 8](#)
 - [Tutorial blogs](#)
 - [Create an OData v4 client app](#)
 - [Tutorial: Use the SAP HANA OData interface](#)
 - [Use OData with IBM DB2 and Infomix](#)
 - [WCF data services and OData for Oracle database](#)
- OData libraries and code
 - [OData libraries](#)
 - [stackoverflow: learn, share, build](#) (but make sure you use only approved solutions)
 - [Tutorial blogs](#)

- Getting started with Simple OData Client
- Developing service-oriented applications with WCF
- Vendor products supporting OData
 - OData producers
 - OData libraries
 - stackoverflow: learn, share, build (but make sure you use only approved solutions)
 - Tutorial blogs
 - Getting started with Simple OData Client
 - Developing service-oriented applications with WCF
- Vendor products supporting OData.

4 Samples

4.1 Sample OData queries

Access the structure information for BioNet Atlas data.

Calling the SpeciesSightings service returns the first 100,000 rows of the dataset. All queries return data paged at 100,000 rows at a time, the NEXT link is at the bottom of the output.

Server-side queryable attributes. Note this list is not exhaustive. For a full list of attributes use the metadata query link above.

?\$select=dynamicProperties

?\$filter=catalogNumber eq '065000001'

?\$select=catalogNumber,scientificName,vernacularName

?\$filter=contains(vernacularName,'River Red')

?\$filter=contains(vernacularName,'River Red')&\$count=true

?\$filter=startswith(vernacularName,'Red')

?\$filter=startswith(toupper(vernacularName),'RED')

?\$filter=endswith(scientificName,'camaldulensis')

?\$filter=indexof(vernacularName,'blue') gt -1

?\$select=dynamicProperties&\$filter=contains(dynamicProperties,'CMA=Northern Rivers')

?\$select=dynamicProperties&\$filter=contains(dynamicProperties,'CMA=Sydney')

?\$select=countryConservation&\$filter=countryConservation ne null&\$count=true

?\$select=decimalLatitude,decimalLongitude&\$filter=contains(dynamicProperties,'CMA=Northern Rivers')

?\$filter=(PNFFilter eq

'Y')&\$select=catalogNumber,recordNumber,scientificNameID,scientificName,vernacularName,PNFFilter&\$orderby=scientificNameID

?\$select=catalogNumber,scientificNameID,scientificName,vernacularName,PNFFilter,decimalLatitude,decimalLongitude,geodeticDatum&\$filter=((decimalLongitude ge 142.0) and (decimalLongitude le 142.5)) and ((decimalLatitude lt -32.00000001) and (decimalLatitude gt -32.49999999))&\$orderby=scientificNameID

4.2 Sample OData client

4.2.1 C# .NET

Resources

[OData Client for .NET 6.17.0](#)

[OData v4 Client code generator](#)

Sample C# snippet

```

Uri svcURL = new
Uri(ConfigurationManager.AppSettings["metadataURL"].ToString());

ODataServicesTestingApp.Default.Container container = new
ODataServicesTestingApp.Default.Container(svcURL);

...

if (!string.IsNullOrEmpty(ODataQuery.Text.Trim()))
{
    string queryString = string.Format("/SpeciesSightings{0}",
ODataQuery.Text.Trim());

    dataGridView1.DataSource = container.Execute<TblCUBE_SpeciesSightings>(new
Uri(queryString, UriKind.Relative)).ToList();
}

...

```

4.2.2 HTML5 and JavaScript

Resources

[Leveraging OData endpoints in JSON format with JQuery](#)

[OData libraries](#)

Sample output

```

{
  "@odata.context": "http://webdev.environment.nsw.gov.au/BioSvcApp/odata/$metadata#SpeciesSightings_CoreData", "value": [
    {
      "PKID": 36438659, "basisOfRecord": "HumanObservation", "collectionCode": "BioNet Atlas of NSW Wildlife",
      "dataGeneralizations": "The observer name has been changed to a unique User ID",
      "datasetID": 1, "datasetName": "OEH Default Sightings", "dcterms_bibliographicCitation": "BioNet Atlas of NSW Wildlife 28/04/2015 12:00 AM",
      "dcterms_language": "en", "dcterms_modified": "1996-01-01T00:00:00 is Jan 1 1996 12:00AM UTC",
      "dcterms_rights": "Creative Commons by Attribution", "dcterms_rightsHolder": "Office of Environment and Heritage",
      "dcterms_type": "Event", "dynamicProperties": "BFMS=N/A; botanicalDivision=N/A; CMA=Southern Rivers;
      CMAsubRegion=Southern Rivers - East Gippsland Lowlands (Part C); floraReserve=N/A; geogExtent=N/A;
      IBRA=South East Corner (NSW); mechanicalHRDescription=N/A;
      potentialImpact=N/A; profileID=N/A; reserve=N/A; speciesFireDescription=N/A; stateForest=N/A; vulnerability=N/A",
      "informationWithheld": "The following fields have been withheld and are only available to
      licensed or OEH staff: locality, locationRemarks, occurrenceRemarks",
      "institutionCode": "NSW Office of Environment and Heritage", "ownerInstitutionCode": "Office of Environment and Heritage",
      "associatedReferences": null, "countryConservation": null, "catalogNumber": "75080-035", "consequence": null,
      "establishmentMeans": "Alive in NSW Native", "estimateTypeCode": null, "individualCount": null,
      "individualID": null, "observationType": "Observed", "occurrenceID": "urn:catalog:NSW Office of Environment and Heritage:BioNet Atlas of NSW
      Wildlife:75080-035", "occurrenceRemarks": "occurrenceRemarks withheld", "occurrenceStatus": "Present",
      "otherCatalogNumbers": null, "PNFFilter": "N", "recordedBy": "HUTKE", "recordNumber": null, "reproductiveCondition": null,
      "sex": null, "stateConservation": "Protected", "status": "Valid and accepted without modification", "eventDate": "1983-09-06", "eventID": null, "eventRemarks": null,
      "eventTime": null, "habitat": null, "samplingEffort": null, "samplingProtocol": null, "coordinatePrecision": "9",
      "coordinateUncertaintyInMeters": 1000.0000, "country": "Australia", "countryCode": "AU", "county": "BEGA
      VALLEY", "decimalLatitude": -37.246482589, "decimalLongitude": 149.921284892, "easting": 759113,
      "geodeticDatum": "GDA94", "georeferenceProtocol": null, "locality": "locality withheld", "locationRemarks": "locationRemarks
      withheld", "mapSheetNumber": "8823 - EDEN", "maximumElevationInMeters": null, "minimumElevationInMeters": null,
      "northing": 5873784, "stateProvince": "NSW", "zone": 55, "class": "Aves", "family": "Meliphagidae",
      "genus": "Caligavis", "infraspecificEpithet": null,
      "kingdom": "Fauna", "nomenclaturalCode": "ICZN", "order": "Passeriformes", "populationName": null,
      "scientificName": "Caligavis chrysops", "scientificNameAuthorship": "(Latham,
      1802)", "scientificNameID": "0614", "sortOrder": 2638, "locationID": "2620-035", "specificEpithet": "chrysops",
      "taxonRank": "Species", "vernacularName": "Yellow-faced Honeyeater"
    }
  ]
}

```

Figure 3 SpeciesSightings_CoreData record JSON format


```
{
  "@odata.context": "http://webdev.environment.nsw.gov.au
/BioSvcApp/odata/$metadata#MeasurementOrFact", "value": [
    {
      "DatasetID": 1, "OccuranceID": "urn:catalog:Office
of Environment and Heritage, Department of Planning
and Environment representing the State of New South
Wales:BioNet Atlas of NSW
Wildlife:065000001", "measurementID": "405", "measurementT
ype": "SurfaceGeology", "measurementValue": "BA", "measur
entUnit": "Basalt"
    }
  ]
}
```

Figure 4 SpeciesSightings_MeasurementsOrFacts record JSON format

5 Data we collect

The service logs request details for internal analytics usage. The following information is captured:

- Web Service Name
- Request parameters
- Date and Time of request
- Data Size of response
- Geographic Location of requestor
- User name
- Application name.