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Dial Before You Dig

SmarterWX Sentinel Referral Specification

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Version 1.2

Document Details

File Name	2021-02-01 DBYD SmarterWX Sentinel Referral Spec v1.2.docx
Project	AADBYDS SOW1
Reference	

Document Status

Release Status	Final
Approval Date	15 March 2021

Document Change Control

Version	Release Date	Authors	Summary of Changes
1.0	1/02/2021	Gary Johnson	Initial Version
1.1	2/03/2021	Gary Johnson	Added registered email
1.2	13/3/2021	Gary Johnson	Added company name

Detailed Change Record

Version 1.1 (2/3/2021)

- Added new REGISTERED EMAIL field to legacy email referral body.
- Added new RegisteredEmail field to legacy email referral XML attachment.
- Added new RegisteredEmail field to referral:create web hook payload.

Version 1.2 (13/3/2021)

- Added COMPANY field to legacy email referral body.
- Added Company field to legacy email referral XML attachment.
- Added CompanyName field to referral:create web hook payload.

Contents

1 Overview

From July 2021, the Australian Dial Before You Dig service is changing technology provider for the Core Referral Service. The new service is being delivered by Esri Australia's SmarterWX Sentinel application. This document provides details of the technical specification for Dial Before You Dig enquiries being referred to asset owners.

Who should read this document?

This document is specifically targeted at personnel involved in the technical integration of response automation software with the Dial Before You Dig (DBYD) service. It is assumed that the reader is familiar with the DBYD service and the concept of enquiry referrals being forwarded to DBYD members.
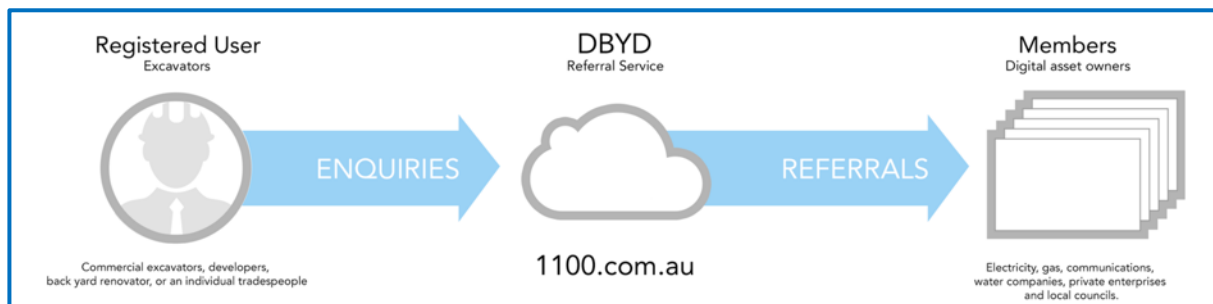
What is SmarterWX Sentinel?

SmarterWX Sentinel is the software product selected by AADBYDS to deliver the next generation referral service. SmarterWX Sentinel is developed and supported by Esri Australia. From July 2021, all Dial Before You Dig enquiries will be lodged through the SmarterWX Sentinel web application and smartphone apps.

2 Referral Options

When a user of SmarterWX Sentinel lodges a Dial Before You Dig enquiry, the job site is compared to each member's area of interest. If the job site intersects with a member's area of interest, an enquiry referral is issued so that the member can generated maps and other documents to return to the user.

A single enquiry typically results in between six and eight referrals but can result in twenty or more referrals in areas with a high concentration of utilities.

SmarterWX Sentinel provides three options for the referral of enquiries to a member: -

1. **Web Hook**
   The referral is sent to the member via an HTTP request containing a JSON payload describing the job site, job details, and the enquirer. (See section 3)

2. **Legacy Email**
   The referral is sent to the member via email. The email can be sent either as a human-readable or machine-readable format. (See section 6)

3. **SmarterWX Automate**
   For members using the SmarterWX Automate solution for referral handling and response generation, this option directly integrates with the referral service. (See section 7).

3 Response Options

After receiving a Dial Before You Dig enquiry referral, the member is responsible for returning a response to SmarterWX Sentinel[1]. This response typically contains maps and other information regarding safe work around the member's assets. This response is then packaged up and returned to the original enquirer by SmarterWX Sentinel
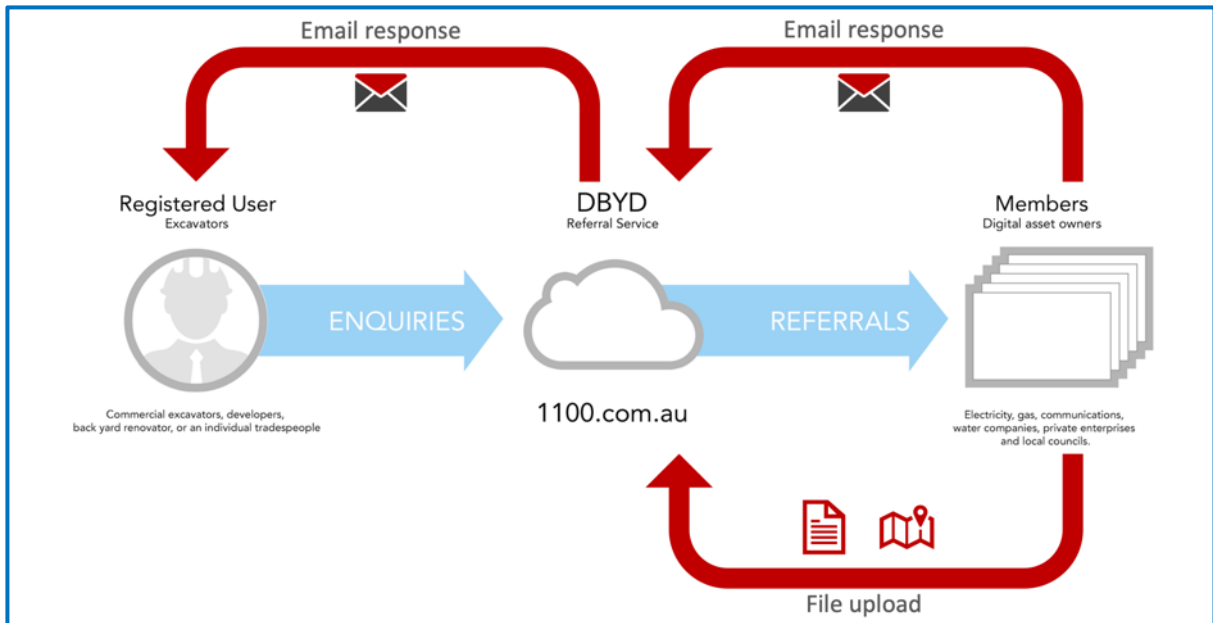
A member can return one or more responses to the same referral.

SmarterWX Sentinel provides two options for the return of responses: -

1. **Email**

   A response is formed as an email including attachments. The response is sent to the email address provided in the referral. Each referral includes a unique system-generated email address allowing the response to be matched to the enquiry.

2. **API**

   The response is uploaded via the SmarterWX Sentinel REST API. The member can upload any number of files as well as HTML content. The response is packaged up and sent to the enquirer. (See section 8)

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[1] This is an important difference from the existing service. All responses are returned to SmarterWX Sentinel and are then forwarded on to the original enquirer. The member no longer returns responses directly to the enquirer.

4 Data Changes

The new DBYD referral service includes some data changes that apply to all referral options. In this section, we describe those changes. Details on specific changes to the Legacy Email Referral are provided in section 6.1.

- **No post or fax responses**. All referrals will allow email or API response. There is no requirement for a member to return responses by fax or post.

- **Multiple activity types**. A user is encouraged to select all activities that will be performed in their job. Currently the user picks only one activity type.

- **Job start date is today**. Users can specify a job start date of today.

- **No emergency enquiries**. All enquiries are created equal. There is no longer a concept of an emergency enquiry.

- **Removal of fax and mobile numbers**. Users will only have one phone number associated with their account.

- **System generated return email.** The return email address for email responses is a SmarterWX Sentinel relay address. Responses are sent via SmarterWX Sentinel. (See section 8).

- **Registered email.** The enquirer's registered email is also sent in the referral as a new field.

- **Additional spatial projections**. The GML and GeoJSON polygons can now be issued using GDA2020 projections.

5 Web Hook Referral Specification

When you select the Web Hook referral option, you provide an HTTP endpoint to which SmarterWX Sentinel will send a JSON representation of the enquiry. The following values are configured: -

- **URL**
  This is the URL which SmarterWX Sentinel will call for each referral. The URL must accept a POST request. The URL must support HTTPS and must be reachable from the SmarterWX cloud.

- **Signing Key**
  A secret string that allows the receiver to verify that the referral was sent from SmarterWX Sentinel and that the body of the message has been unchanged.

- **Custom HTTP Headers (optional)**
  Some firewalls require custom HTTP headers to be included on requests to allow them to be proxied through the firewall. SmarterWX Sentinel allows you to include any number of custom HTTP headers to be included with each referral request.

5.1 Payload

The payload description can be [found online as an Open API Specification file](#).

The geometry is sent as a GeoJSON Polygon using your default spatial projection.

5.2 Signature Verification

The signing key entered when setting up the web hook referral allows the receiver to confirm that the request came from SmarterWX Sentinel and that the body of the message has not been changed since SmarterWX Sentinel issued the request.

The signing key is used to create a SHA-256 hash signature with each payload. Each request includes an HTTP header: -

```
X-SWX-Signature: sha256=f6e2a86f4c76873817545c57823d4fb5c57823d
```

The code sample below (NodeJS) shows how the signature is calculated.

```javascript
const body = JSON.stringify(message);
const hash = crypto
  .createHmac("sha256", subscription.clientKey)
  .update(body)
  .digest('hex');
const headers = {
  "X-SWX-Signature": "sha256=${hash}"
};
```

5.3   HTTP Response

The receiver is expected to return an HTTP response code of **2XX** within 3 seconds of the request being sent.

If the HTTP response code is not **2XX** or if the response is not received within 3 seconds, SmarterWX Sentinel will mark the request for retry. SmarterWX Sentinel will keep retrying the request until a successful response is received or it has failed 12 times. Retries are issued using a randomised Fibonacci back-off algorithm – 12 attempts would typically correspond to around 6-8 hours of retrying.

If the request fails 12 times, it must be manually reissued through the SmarterWX Sentinel web application.

Each request includes a **uuid** attribute which can be used for deduplication. The request will carry the same **uuid** for each subsequent retry.

6 Legacy Email Referral Specification

The legacy email referral continues the referral method used in the existing Dial Before You Dig service. A referral is sent to your specified email address including a collection of attachments.

6.1   Summary of Changes from Current Service

- **ACTIVITY DESCRIPTION** will include a comma-separated list of activities. The user can select more than one activity when lodging the enquiry. **ACTIVITY CODE** is removed.

- New **ACTIVITY DESCRIPTION** for Non-Destructive Digging.

- **ENQUIRY DATE** will be in UTC.

- **MAP TYPE** and **MAP REF** are removed. The street atlas grid references are no longer provided.

- **JOB NUMBER** and **SEQUENCE NO** values will be restarted at a value higher than the current numbers. There will be no overlap.

- **AUTHORITY NAME** is populated with a user-entered value when the Other Authority Type is selected.

- **MOBILE** and **FAX NUMBER** are removed from the enquirer's details.

- **CUSTOMER ID** will be different. All enquirers will have a new customer ID.

- GML attachments can be sent in GDA2020 projections.

- **EMAIL ADDRESS** will be a return address to SmarterWX Sentinel.

- **REGISTERED EMAIL** is a new field containing the enquirer's own email address.

6.2   Email Contents

There are four parts to the Legacy Email Referral: -

- Text Email Body
- XML Attachment
- GML Attachment
- GIF Attachment

Each of these is described in Appendix A.

6.3 Legacy Status

There is no timeline for the removal of the Legacy Email Referral option. It will remain as long as it is required to meet the needs of DBYD members.

New functionality that might be added to the DBYD referral service in the future may not be retrofitted to the Legacy Email Referrals with advanced functionality being targeted to the web hook and SmarterWX Automate options.

6.4 PDF Email Format

Members have an option to receive a PDF Format Email (the human-readable format). This is not included here as this document is focused on machine-to-machine integration.

7 SmarterWX Automate Referral Option

For members using [SmarterWX Automate](#), the integration is automatic. All referrals and responses are automatically passed between SmarterWX Sentinel and SmarterWX Automate.

8 Returning Responses

Regardless of referral option, members have two options available to return responses to the enquirer.

1. **Email**

   A response is formed as an email including attachments. The response is sent to the email address provided in the referral. Each referral includes a unique system-generated email address allowing the response to be matched to the enquiry.

2. **API**

   The response is uploaded via the SmarterWX Sentinel REST API. The member can upload any number of files as well as HTML content. The response is packaged up and sent to the enquirer.

All responses sent back to the enquirer will carry a standard format for subject header and email address. For email responses, the subject header returned by the member will be moved into the body.

8.1 Using the API

The full SmarterWX Sentinel REST API will be published in mid-2021. In this section a portion of the API is described specifically for uploading responses by the API.

There are four steps required to return responses by the API.

1. **Authenticate**.
   An API Key pair can be created through the SmarterWX Sentinel web application. This key pair is used to start an authenticated session.

2. **Request a file upload location**.
   Zero or more files can be included as part of the response. These files might include maps, safe work practices, permit forms etc. A file upload location is requested which returns a URL to which the file can be uploaded. Each file requires a separate file upload location.

3. **Upload file to upload location**.
   Using the upload location returned in the previous step, upload the file.

4. **Submit response**.
   Call the response API including a list of all files that were previously uploaded.

8.1.1 Authentication

Request:

POST https://smarterwx-api.1100.com.au/community/auth/tokens

```
{
  "clientId": "<YOUR CLIENT ID>",
  "clientSecret": "<YOUR CLIENT SECRET>"
}
```

Response:

```
{
  "access_token": "<THE ACCESS TOKEN>",
  "expires_in": 1800
}
```

The **access_token** returned by the authentication request will be used as the **Authorization** header on all other API requests.

8.1.2   Request a file upload location

Request:

POST https://smarterwx-api.1100.com.au/system/uploads

Header: Authorization=<access_token>

Response:

```
{
    "id": 10430,
    "key": "2021/02/01/a76383e1-6d88-4419-a0a1-160e98fd6dd1",
    "method": "PUT",
    "url": "https://<UPLOAD LOCATION>"
}
```

The **url** is a signed URL (using query parameters) that allows you to upload a file using a **PUT** request. The **id** will be used to link this file to the response in step 4.

If returning more than one file, request multiple distinct upload locations. An upload location can only be used once.

8.1.3   Upload file to upload location

Request:

PUT <URL FROM PREVIOUS STEP>

Binary Data: The file content

Example:

```
curl –request PUT '<UPLOAD URL>' --data-binary '@myfile.pdf'
```

Request:

POST https://smarterwx-api.1100.com.au/enquiries/{{id}}/referrals/{{id}}/responses

Header: Authorization=<access_token>

```
{
  "body": "<EMAIL BODY CONTENT>",
  "Files": [
    { "id": 213 },
    { "id": 214 }
  ]
}
```

The **{{id}}** placeholders in the URL should be replaced with the enquiry ID and referral ID respectively.

In the request body, **Files** is an array where each element is an object **{ "id": nnn }** using the ID(s) returned from step 2. The **body** attribute is either plain text or HTML that is placed in the body of the email response sent to the enquirer.

9 Enquiry Splitting

As a DBYD member, you can choose to specify a maximum size in square metres for any referrals sent to you. If the user lodges an enquirer larger than this specified maximum size, you will receive multiple referrals each representing a portion of the overall enquiry.

There are some changes to the way this works in SmarterWX Sentinel.

The algorithm used in the old service will sometimes split enquiries into multiple referrals even when the area of the enquiry site is less than the maximum size. This is because the calculations are all based on placing a bounding box around the job site and calculating based on the area of the bounding box rather than the actual area of the job site.

SmarterWX Sentinel will strictly follow the maximum size where specified. If the area of an enquiry job site is less than the maximum size it will not be broken into smaller pieces.

The old service places a grid over the job site to split it into multiple referrals. This can lead to cases where far more referrals are created than required to ensure all referrals are under the maximum size. In the example below, you can see how this grid approach has created a wide variety of different sized referrals.
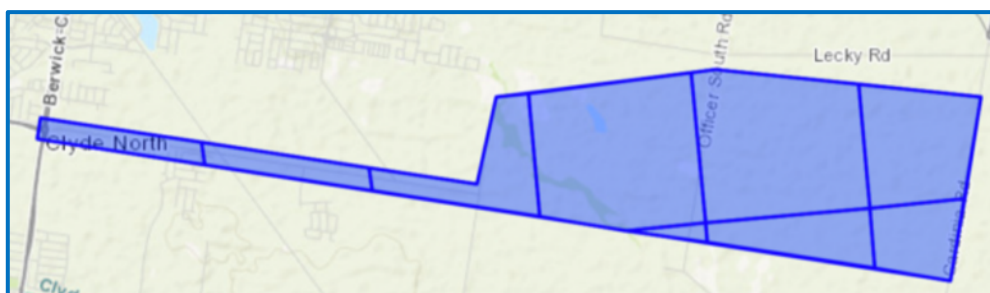

Figure 1 - Enquiry splitting in old service

SmarterWX Sentinel will attempt to create equal sized referrals. When SmarterWX Sentinel splits up an enquiry to meet your maximum size rules, it will attempt to create approximately equal sized referrals. It will also only create the minimum number of referrals required to meet your maximum size rule. The example below shows the same enquiry split into four parts (compared to the nine parts from the old service).
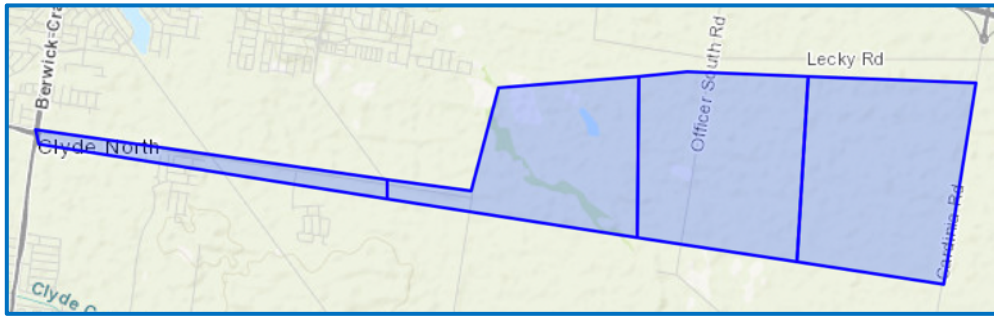
Figure 2 - Enquiry splitting in SmarterWX Sentinel

If you rely on receiving referrals below a maximum size, you may need to reduce the value used in SmarterWX Sentinel to keep receiving the smaller-than-specified job sites produced under the old service.

Appendix A – Legacy Email Attachment Formats

A.1   Text Email Body

The text email body contains multiple sections each containing key-value pairs separated by an equals (=) sign.

DIAL BEFORE YOU DIG Call 1100 35 Railway Rd, Blackburn VIC 3130 Please be advised the person below has requested information about underground assets in your jurisdiction. You are required to respond within 2 working days and reference the Job Number, Sequence Number and the User Reference (where supplied).	**Header** This text is for information only and may change. It does not contain valuable information.
[REFFERAL DETAILS] MESSAGE VERSION NO= 2.0.0.0 FROM= Dial Before You Dig ENQUIRY MEDIUM= *<Describes the source – e.g. Web, Android>* TO= *<Your organisation primary contact>* UTILITY ID= *<Your utility id>* COMPANY= <Your organisation name> ENQUIRY DATE= <Format: "dd/mm/yyyy hh.mm" – UTC Time Zone> COMMENCEMENT DATE= *<Format: "dd/mm/yyyy">* COMPLETION DATE= *<Format: "dd/mm/yyyy">* SEQUENCE NO= *<Numeric reference ID for this referral>* JOB NUMBER= *<Numeric reference ID for this enquiry>* PLANNING= *<Design/Planning = "Yes" / Excavation = "No" >* LARGE SCALE= No USER REF= *<Free text string entered by user>* WORKING FOR AUTHORITY= *<One of Utility, Local Government, Private, Other>* AUTHORITY NAME= *<Name of authority working for – blank if Private>*	**Referral Details**
[CALLER DETAILS] CUSTOMER ID= *<Unique id representing this user>* CONTACT NAME= *<Full name of the user>* COMPANY= *<Optional name of the caller's company>* ADDRESS= *<First line of user's postal address>* SUBURB= *<Suburb of user's postal address>* STATE= *<State using two/three character short form>* POSTCODE= *<Postcode of user's postal address>* TELEPHONE= *<Telephone number in e.164 format>* EMAIL ADDRESS= *<Email address to send response>* REGISTERED EMAIL= *<Direct email address for enquirer>*	**Caller Details** Note the email address is a relay address generated by SmarterWX Sentinel for this referral.
[LOCATION DETAILS] ADDRESS= *<First line of job street address>* SUBURB= *<Suburb of job street address>* STATE= *<State using two/three character short form>* POSTCODE= *<Postcode of job street address>* ACTIVITY DESCRIPTION= *<Comma-separated list of activities>* PRIVATE/ROAD/BOTH= *<General location of job site>* LOCATION IN ROAD= *<Specific location in road reserve>* MESSAGE= *<Free text notes entered by user>* DBYDMESSAGE= SmarterWX Sentinel generated referral	**Location Details** Address is approximate based on the centre of the job site.
Notice: Please DO NOT REPLY TO THIS EMAIL as it has been automatically generated and replies are not monitored.	**Footer**

A.2   XML Attachment

The values in the XML Attachment correspond to the values in the Text Email Body above. The sections in the text email body are represented by elements containing the key-value pairs as child elements.

Note that the location of the XSD has changed from the old version as the XSD will be sourced from SmarterWX Sentinel.

```xml
<?xml version="1.0" encoding="utf-8"?>
  <sentinel:Referral
      xmlns:xlink="http://www.w3.org/1999/xlink"
      xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
      xmlns:sentinel="http://sentinel.smarterwx.com.au/sentinel"
      xsi:schemaLocation="http://sentinel.smarterwx.com.au/sentinel https://smarterwx-
api.1100.com.au/referrals/xsd/legacy.xsd">
    <sentinel:ReferralDetails>
      <sentinel:MessageVersionNumber>2.0.0.0</sentinel:MessageVersionNumber>
      <sentinel:From>Dial Before You Dig</sentinel:From>
      <sentinel:EnquiryMedium>Web</sentinel:EnquiryMedium>
      <sentinel:To>Alex Bell</sentinel:To>
      <sentinel:UtilityID>99999</sentinel:UtilityID>
      <sentinel:UtilityName>Super Speedy Telco</sentinel:UtilityName>
      <sentinel:EnquiryDateTime>01/02/2021 01:05</sentinel:EnquiryDateTime>  <!-- UTC -->
      <sentinel:CommencementDate>06/02/2021</sentinel:CommencementDate>
      <sentinel:CompletionDate>07/02/2021</sentinel:CompletionDate>
      <sentinel:WorkingForAuthority>Private</sentinel:WorkingForAuthority>
      <sentinel:NameOfAuthority></sentinel:NameOfAuthority>
      <sentinel:UserReference>My reference</sentinel:UserReference>
      <sentinel:SequenceNumber>12346632</sentinel:SequenceNumber>
      <sentinel:JobNumber>12346407</sentinel:JobNumber>
      <sentinel:Planning>1</sentinel:Planning> <!-- 1 = Yes -->
    </sentinel:ReferralDetails>
    <sentinel:CustomerDetails>
      <sentinel:ID>12885</sentinel:ID>
      <sentinel:MailingName>Gary Johnson</sentinel:MailingName>
      <sentinel:Company>Jimmy Diggers</sentinel:Company>
      <sentinel:Address>2 Hoppers Street</sentinel:Address>
      <sentinel:Suburb>Hoppers Crossing</sentinel:Suburb>
      <sentinel:Region>VIC</sentinel:Region>
      <sentinel:Postcode>3030</sentinel:Postcode>
      <sentinel:Phone>+61468xxxxxx</sentinel:Phone>
      <sentinel:EmailAddress>2jiiw6666.tm666678762hno@sentinel-
relay.1100.com.au</sentinel:EmailAddress>
      <sentinel:RegisteredEmail>gjohnson@smarterwx.com</sentinel:RegisteredEmail>
    </sentinel:CustomerDetails>
    <sentinel:LocationDetails>
      <sentinel:Address>26b Fawkner Street</sentinel:Address>
      <sentinel:Suburb>Aberfeldie</sentinel:Suburb>
      <sentinel:Region>VIC</sentinel:Region>
      <sentinel:Postcode>3040</sentinel:Postcode>
      <sentinel:ActivityDescription>Conveyancing,Subdivision<sentinel:ActivityDescription>
      <sentinel:PrivateRoadBoth>Road Reserve</sentinel:PrivateRoadBoth>
      <sentinel:LocationsInRoad>Footpath,Nature Strip,Road</sentinel:LocationsInRoad>
      <sentinel:CustomerMessage>Digging for my new pool</sentinel:CustomerMessage>
    </sentinel:LocationDetails>
  </sentinel:Referral>
```

A.3   GML Attachment

A [GML Version 3](#) format containing the enquiry job site definition. Schema makes specific references to SmarterWX Sentinel.

``xml
<?xml version="1.0" encoding="utf-8"?>
  <gml:FeatureCollection
xmlns:gml="http://www.opengis.net/gml"
    xmlns:xlink="http://www.w3.org/1999/xlink"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns:sentinelgml="http://smarterwx.1100.com.au/gml"
xsi:schemaLocation="http://smarterwx.1100.com.au/gml
https://smarterwx-api.1100.com.au/referrals/xsd/gml.xsd">
    <gml:featureMember>
      <sentinelgml:DBYDReferral gml:id="digsite">
        <sentinelgml:LocationDetails>
          <gml:surfaceProperty>
            <gml:Polygon srsName="EPSG:4283">
              <The polygon definition goes here>
            </gml:Polygon>
          </gml:surfaceProperty>
        </sentinelgml:LocationDetails>
      </sentinelgml:DBYDReferral>
    </gml:featureMember>
  </gml:FeatureCollection>
``
	Changes
	
	The only changes from the old solution are the schema references pointing to SmarterWX Sentinel.

A.4   GIF Attachment

A GIF image showing the job site overlaid on a topographic map of the area. The image is 256x256 at 150dpi.

Sample: