



|  |  |
| --- | --- |
| **Project clarity code:** |  |
| **Project name:** | Feature Extraction from Aerial Imagery Initiative |
| **Project manager:** | Maria Jansen |
| **Project Sponsor:** | Lars Hansen |
| **Project start date:** | March 26th, 2021 |
| **Project finish date:** | October 29th, 2021 |

*NOTES TO COMPLETE:*

1. *Guidance text in blue helps complete the relevant section*
2. *Guidance text to be deleted prior to final approval*
3. *Technical terminology / jargon should be kept to a minimum*

Document control sheet

**Document information**

|  |  |
| --- | --- |
| **Document filename** |  |
| **TRIM document number** |  |

**Document history**

|  |  |  |  |
| --- | --- | --- | --- |
| **Version** | **Issue date** | **Author** | **Reason for change** |
| 1.0 | 6/10/21 | Group 5 - CSU | Initial Version from CSU Students. |

**Distribution List**

|  |  |  |
| --- | --- | --- |
| **Title** | **Name** | **Date** |
|  |  |  |

**Endorsement**

|  |  |
| --- | --- |
| **Title** | **Name** |
| Program manager |  |
| Project steering committee chair |  |

**Approval**

|  |  |  |
| --- | --- | --- |
| **Name & title** | **Signature** | **Date** |
| Project sponsor |  |  |

**References**

|  |  |  |  |
| --- | --- | --- | --- |
| **Document name** | **Version** | **Issue date** | **Author** |
|  |  |  |  |

**Table of Contents**

[**Document control sheet 2**](#_heading=h.30j0zll)

[**Table of Contents 3**](#_heading=h.1fob9te)

[**1.**](#_heading=h.2et92p0) **Summary 4**

[1.1](#_heading=h.tyjcwt) High level information 4

[1.2](#_heading=h.3dy6vkm) Project manager report 4

[1.3](#_heading=h.1t3h5sf) Program manager report 4

[1.4](#_heading=h.4d34og8) Sponsor summary 4

[**2.**](#_heading=h.2s8eyo1) **Post implementation review 4**

[2.1](#_heading=h.17dp8vu) Objectives 4

[2.2](#_heading=h.3rdcrjn) Strategic alignment 4

[2.3](#_heading=h.26in1rg) Project team performance 4

[2.4](#_heading=h.lnxbz9) Deliverables 4

[2.5](#_heading=h.35nkun2) Outstanding risks 4

[2.6](#_heading=h.1ksv4uv) Outstanding issues 4

[2.7](#_heading=h.19c6y18) Change requests 4

[2.8](#_heading=h.44sinio) Business case 4

[2.9](#_heading=h.2jxsxqh) Project plan & schedule 4

[2.10](#_heading=h.z337ya) Communications management strategy 4

[2.11](#_heading=h.3j2qqm3) Risk management strategy 4

[2.12](#_heading=h.1y810tw) Procurement strategy 4

[2.13](#_heading=h.4i7ojhp) Quality management strategy 4

[2.14](#_heading=h.2xcytpi) Implementation plan 4

[2.15](#_heading=h.1ci93xb) Artefact conformance 4

[**3.**](#_heading=h.3whwml4) **Benefit Realisation 4**

[3.1](#_heading=h.2bn6wsx) Fully realised 4

[3.2](#_heading=h.qsh70q) Yet to be fully realised 4

[**4.**](#_heading=h.3as4poj) **Lessons learnt 4**

[4.1](#_heading=h.1pxezwc) Scope 4

[4.2](#_heading=h.49x2ik5) Cost 4

[4.3](#_heading=h.2p2csry) Scheduling 4

[4.4](#_heading=h.147n2zr) Resourcing 4

[4.5](#_heading=h.3o7alnk) Communications 4

[4.6](#_heading=h.23ckvvd) Risks & issues 4

[4.7](#_heading=h.ihv636) Benefit realisation 4

[4.8](#_heading=h.32hioqz) Procurement 4

[4.9](#_heading=h.1hmsyys) Governance & assurance 4

[4.10](#_heading=h.41mghml) Project methodology 4

[**A.**](#_heading=h.2grqrue) **Appendices 4**

[A.1 Final status report 4](#_heading=h.vx1227)

[A.2 Risk register 4](#_heading=h.3fwokq0)

[A.3 Issues register 4](#_heading=h.1v1yuxt)

[A.4 Change register 4](#_heading=h.4f1mdlm)

[A.5 Final benefit realisation tracker 4](#_heading=h.2u6wntf)

# Summary

## High level information

|  |  |  |
| --- | --- | --- |
| **Details** | Clarity code |  |
| Name | Feature Extraction from Aerial Imagery Initiative |
| Project manager | Maria Jansen |
| Sponsor | Lars Hansen |
| Overseeing PMO | Marian Jansen |
| **Dates** | Planned start |  |
| Planned close |  |
| Actual start | CSU Students - March 2021 |
| Actual close | CSU Students - 18th October 2021 |
| **Duration** | Forecasted |  |
| Actual |  |
| **Costs** | Forecasted |  |
| Actual |  |

## Project manager report

*Provide an overall summary of the project’s performance.*

*The project is performing well based on the criteria of :1) delivery of expected/correct outputs; 2) satisfactory implementation progress; 3) successful management of risks; 4) minimum/no disruption to business operations; 5) meeting the agreed business requirements ; 6) executive/business buy-in; 7) comprehensive training/onboarding program.*

## Program manager report

*Have the program manager provide a summary of the project. This summary should be no more than half a page in total.*

This project is associated with an ICT program and therefore no program management. The project is directly reporting to the Director of Information Management directly.

## Sponsor summary

*Have the sponsor provide a summary of the project. This summary should be no more than half a page in total.*

# Post implementation review

## Objectives

*Review of how the project has performed against its planned targets and tolerances.*

The project has delivered on the following objectives:

*The project had achieved its objectives by successfully converted 9,000 folders & 3,500 documents from the Objective environment to the Core TRIM environment with 100% accuracy.*

*The delivery of successful outcome by conducting detailed data analysis and provided a new revised data structure which fits for BDM’s current business purpose;*

*Refined BDM’s Business classification to suit BDM’s current/future business processes*

*Successfully converted/migrated BDM Objective data to Production Core TRIM environment with no downtime to BDM/CORE TRIM’s operation*

1. Demonstrate the successful application of computer vision (CV) to generate flood extent maps.

The project successfully demonstrated the use of computer vision in conjunction with other imaging techniques to generate flood extent maps.

1. Measure the accuracy of flood extent maps generated by computer vision vs existing manual methods.

The produced files have been reviewed by Spatial Services Staff and feedback has been favourable for the outputs produced.

1. Document a repeatable process which can be utilised in future for the next flood occurrence.

The process is repeatable with minimal configuration changes between each run. During testing Spatial Services staff were able to repeatedly run the process successfully.

## Strategic alignment

*Describe how the project deliverables aligned to the divisional, ICT & DCS strategic goals and the level of success?*

## Project team performance

*Describe how all roles associated with the project performed. Recognise good performances.*

From the perspective of CSU students, the team operated well together over the two semesters they worked on the project. They initially completed the AWS Certified Cloud Practitioner certification with only 2-3 weeks study where 2 months is the recommended study time for this exam. Guided by Nikzad Babaii from Intellify, the students largely explored their own approaches to the problem with approaches by Adam Blewitt and Andrew Smith from the student team showing the most promise leading them to do the bulk of the coding work throughout the project. The other team members assisted with research, documentation, project management and completing assignment tasks required by the subject they were studying.

The manual annotation of map features into flood, buildings, trees and land was undertaken by the whole group over a number of weeks resulting in a large dataset which can be used for future mapping projects by DCS.

Simon Reynolds was a great assistance to the group, facilitating any needs the group had, and representing DCS at group meetings.

## Project Deliverables and handover

*List all deliverables (not artefacts) with reference to the written acceptance from the service owner(s). Information sourced from the business case deliverables and further detail will be found in the Business Handover Plan artefact.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Deliverable** | **Quality  reference** | **Configuration item reference** | **Service  owner** | **Service owner signoff** |
| *name / identifier* | *reference ID* | *identifier in CMDB* | *name of person* | *TRIM reference to email or signature* |
| Map to Shapefile Solution(s) including code. |  |  |  |  |
| Manual for solutions |  |  |  |  |
| Data from project including lessons learnt |  |  |  |  |

## Outstanding risks

*Full details are available in Clarity and full risk register should be attached as an appendix to this document.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Identification** | **Brief description** | **Residual rating likelihood** | **Owner** | **Target resolution date** |
| *clarity ID* | *as per clarity* | *as per clarity* | *name of person* | *as per clarity* |
|  | Potential issues if source data changes from what is currently used. | Only applicable if equipment or techniques change for image acquisition. |  |  |
|  | AWS Instances will cost more if left running. | Low provided staff are aware of this risk, plus cost of leaving it on is under $20 per hour and can be limited by budget alerts within AWS. |  |  |

## Outstanding issues

*Full details are available in Clarity and full issues register should be attached as an appendix to this document.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Identification** | **Brief description** | **Priority** | **Owner** | **Target resolution date** |
| *clarity ID* | *as per clarity* | *as per clarity* | *name of person* | *as per clarity* |
|  |  |  |  |  |

* Note issue was identified by Suri testing which was resolved 15/10 as an old python package being used. Code was updated to update the python package if required automatically. No other known issues at this stage.

## Handover to the Business

*Append acceptance formal acknowledgement form the business, that the assets and other project deliverables have been successfully handed over to the operational business.*

In addition to the code in the Spatial Services Bitbucket repository the following items have been prepared by the students for handover to the Business.

|  |  |  |  |
| --- | --- | --- | --- |
| **Source** | **Folder** | **Document Name** | **Description** |
| DCS | DCS Related Documentation | High\_Level\_Business\_Requirements\_Document\_Intellify\_POC\_Final | Business Requirements v 2 08 June 2021 |
| CSU | Presentation Material | Feature Extraction Aerial Imagery Initiative | Presentation Slideshow |
| CSU | Presentation Material | Feature Extraction PoC\_group 5 | Presentation Runsheet |
| CSU | Presentation Material | Imagery Feature Extraction PoC (Demo from CSU students)-20210903\_143246-Meeting Recording-Demo | Presentation Video |
| CSU | Other Development Documents | Image Preprocessing Report | Evaluation of different methods of Image Preprocessing. |
| CSU | Initial Documentation Set | Project Plan v4 | Details of Group 5’s approach to the project. |
| CSU | Initial Documentation Set | Requirements Model V4 | Details of the Group 5 approach to the project requirements. |
| CSU | Initial Documentation Set | G5 Executable Architecture | Early solution demonstration video |
| CSU | Initial Documentation Set | Architecture Notebook | Architecture details for the project. |
| CSU | Initial Documentation Set | Master Test Plan v2 | Test Plan for project |
| CSU | Initial Documentation Set | Project Vision | Project Vision Document |
| CSU | Manuals | Flood Extent Extraction Manual (GMM Method) | Project Manual for GMM Method |
| CSU | Manuals | Flood Extent Extraction Manual (SS Method) | Project Manual for SS Method |
| CSU | Manuals | Flood Extent Extraction Manual (Unet CNN Method) | Project Manual for Unet Method |
| CSU | PSRs | PSR (April 2021) | Project Status Report - April |
| CSU | PSRs | PSR (May 2021) | Project Status Report - May |
| CSU | PSRs | PSR (June/July2021) | Project Status Report - June / July |
| CSU | PSRs | PSR (August/September 2021) | Project Status Report - August / September |
| CSU | Repository Backup Sets | csu-spatialservices-flood-extent-extraction | Backup of bitbucket repository as at 16/10/21 |
| CSU | SHP Files | Brewarrina\_GMM\_01 | Brewarrina shape files as at 29/07/21 |
| CSU | SHP Files | Brewarrina\_GMM\_05 | Brewarrina shape files as at 24/8/21 |
| CSU | SHP Files | Hawkesbury\_Napean\_GMM\_07 | Hawkesbury Nepean shape files as at 7/8/21 |
| CSU | SHP Files | Hawkesbury\_Napean\_GMM\_08 | Hawkesbury Nepean shape files as at 26/8/21 |
| CSU | SHP Files | Lower\_Clarence\_GMM\_01 | Lower Clarence shape files as at 19/8/21 |
| CSU | Testing | UAT Alpha Testing | Team 5 internal testing of solutions. |
| CSU | Testing | Test Result Report E4 | Testing of solution against Test Plan 17/6/21 |
| CSU | Testing | GMM Colour Space Tests | Early testing against various colour channels using a Jaccard score. |
| CSU | Testing | Clustering Technique - Feedback (Beta UAT) | Feedback questionnaire for Clustering technique |
| CSU | Testing | AWS Semantic Segmentation - Feedback (Beta UAT) | Feedback questionnaire for Semantic Segmentation |
| CSU | Confluence Research & Development Documentation | Jira Timeline.png | Project timeline for second semester. |
| CSU | Confluence Research & Development Documentation | Research & Development (Confluence).pdf | Exported research and development documentation from confluence documentation platform. |

## Business case

*Explain how the project performed against the cost benefit plans that were approved in the initiation stage.*

The results of the project provide large benefits to the organisation through enabling the ability to provide shapefiles of a given flood extent within hours of the imagery arriving. The use of Amazon Web Services and computer vision techniques to identify and map the flood extent increases the ability of the department to innovate into the future through making use of the extensive research completed thus far in addition to acquiring useful data created in the annotation process which can be used for other future projects.

## Change requests

*Full details are available in Clarity, provide basic information below for each change request and full register should be attached as an appendix to this document.*

|  |  |  |  |
| --- | --- | --- | --- |
| **Identification** | **Brief description** | **Category** | **Reason** |
| *clarity ID* | *as per clarity* | *as per clarity* | *as per change request form* |
|  |  |  |  |

## Project Management Plan

*Explain how the project performed against the following plans:*

While the students had no visibility of the below plans, we will provide commentary around the subjects.

### Project plan & schedule

The project schedule was largely dictated by the two semesters the university subject ran for, and the time given was appropriate for the task given. For the students the project requirements became clear 6 weeks into the first semester, meaning the students lost some time which was gained through extra time committed to the project by the students in the first semester.

### Communications management strategy

Communication through the project was good. Weekly meetings with DCS provided regular clarity of any questions the students had and ensured the project remained focused.

### Risk management strategy

Risks during the project:

* Security was managed through good security practices such as multi factor authentication implemented on the cloud infrastructure.
* Cost managed through budget alerts set in the AWS infrastructure and the student team being aware of the need to stop resources not in use.

Ongoing Risks:

* Change to source images may cause unpredictable results - The system is capable of interpreting imagery containing Near Infrared / Red / Green components and is based on inputs from 3 different flood situations. Imagery processed differently to the imagery provided during the project may cause unpredictable results.

### Procurement strategy

Having Intellify staff to guide the students through the project was a great positive.

### Quality management strategy

Please see section 1.15.

### Implementation plan

Students were given some freedoms here with the constraint of being on AWS. These freedoms to explore different approaches resulted in the best outcome. AWS is very appropriate for this project because of the flexibility of the infrastructure and the wide range of services it can provide.

## Project Assurance and Recommendations

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date** | **Identification** | **Brief description** | **Report** | **Target resolution date** |
|  | *Assurance activity* | *List type of assurance review* | *Provide link to Assurance report* |  |
|  |  |  |  |  |

Quality Assurance for the project was provided in the following forms:

* Weekly meetings with DCS to ensure progress was being made in the right direction.
* Bi-Weekly meetings with Intellify to help with technical issues and suggestions of other directions / techniques to try.
* Bi-Weekly meetings with CSU lecturer to ensure the project remained within educational scope.
* Testing and feedback from DCS staff which was subsequently reviewed and implemented where necessary.

# Benefit Realisation

*Provide details for all benefits as outlined in the Benefits Realisation Plan and updated in the centralised Benefit Realisation Register.*

## Fully realised

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Benefit ID** | **Benefit owner** | **Benefit classification** | **Baseline value** | **Realised value** | **Start  date** | **Date fully realised** |
|  |  |  |  |  |  |  |

As a result of the project, Spatial Services now has a functioning repeatable Machine Learning platform that is producing results for emergency services with the students already providing the SES data for recent flood events.

The process of producing vector images has been accelerated with the new process taking approximately an hour, effectively speeding up the existing process of providing these to external agencies.

## Yet to be fully realised

*To be handed over to benefit owners*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Benefit ID** | **Benefit owner** | **Benefit classification** | **Baseline value** | **Realised value** | **Start  date** | **Handover date** |
|  |  |  |  |  |  |  |

The platform can be expanded further to identify other items from aerial imagery such as buildings, swimming pools and further adapted for other emergency situations such as fire extents.

The expansion of using AWS, image processing and machine learning techniques to improve other existing processes which are time consuming and further improve customer services.

# Lessons learnt

*The following reviews of what went well, where improvements can be made and make a brief comment for consideration for further similar projects and programs. Refer to the project/program lessons learned log that may have been setup at the start of the project/program. Make sure you record lessons learned into the centralised lessons learned register in Clarity.*

## Scope

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **What went well** | **Improvements** | **Comments** |
| Understanding of need | * Business requirements document |  | The Business Requirements Documents provided clear requirements to be met for the project to be successful. Occasionally the document conflicted with itself however given the nature of this proof of concept and the inherit unknowns which come with this the conflicting points were easily resolved. |
| Alignment to strategic goals | * Freedom to arrive at a solution. |  | The group was given relative freedom to provide a solution provided it was within AWS which enabled multiple avenues of research to come up with a great result which was aligned to the overall goals. |
| Defining outcomes | * Clearly defined in Business Requirements |  | The group was able to focus on the project outcomes described in the requirements. |
| Defining scope | * Clearly defined in Business Requirements |  | This provided direction for the group up front. |
| Benefit realisation | * Solution exceeded the needs of the business. |  | At a demonstration of the solution to leaders within DCS and SES there was overwhelming support for the results. |

## Cost

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **What went well** | **Improvements** | **Comments** |
| Cost estimation |  |  |  |
| Obtaining final budget |  |  |  |
| Ongoing forecasting |  |  |  |
| Managing budget | * Relative cost of server resource on AWS |  | The server cost of under $20 per hour was seen as more than acceptable for the project given its intermittent use when flood events happen and training. |

## Scheduling

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **What went well** | **Improvements** | **Comments** |
| Defining deliverables, activities, and tasks | * A working version of the project was available early. |  | A presentation of a working version of the project happened September 3rd, over a month before the students were finished with the project. Other information such as project updates were provided by the students in a timely fashion. |
| Estimating task effort and durations | * Unified process methodology |  | Because this was largely a research project, task effort and durations were hard to define. Students ran the project internally to the Unified process methodology which was a good fit for this type of project. |
| Controlling schedule |  |  |  |
| Project timeframes | * Achievable within the given time frame. |  | The project was limited by the University semester times; however all required deliverables were achievable given this constraint. |

## Resourcing

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **What went well** | **Improvements** | **Comments** |
| Acquiring / sourcing | * Intellify |  | The students found the partnership with Intellify helpful during the project. |
| Managing project team | * Project manager direction. |  | Maria provided direction for the group where needed from a project management perspective and the weekly meetings with Simon provided further clarity. |
| Key stakeholder buy-in | * Request fulfilment |  | From the student perspective, key stakeholders appeared to be engaged in the project and able to assist - especially with requests such as additional images. |
| Sponsor involvement | * Presentation involvement |  | It was great to have various levels of management at the presentation of the solution. |

## Communications

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **What went well** | **Improvements** | **Comments** |
| Planning |  |  |  |
| Executing | * Key contacts |  | Maria and Simon provided regular communication to the student group while making themselves available for any needs. |
| Reporting project performance | * Monthly status reports |  | The monthly status reports were a great way for the students to assess progress while providing an update to DCS at the same time. |
| Managing stakeholder expectations | * Initial requirements gathering. |  | Initial sessions with James Triggs from Intellify proved valuable for DCS to think further about the requirements and the students to understand the requirements. |

## Risks & issues

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **What went well** | **Improvements** | **Comments** |
| Planning |  |  |  |
| Identification | * Testing |  | Testing was conducted through the project both by the students and DCS minimising any risks and resolving any issues. |
| Monitoring & control |  |  |  |

## Benefit realisation

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **What went well** | **Improvements** | **Comments** |
| Analysis |  |  |  |
| Stakeholder buy-in |  |  |  |
| Benefit owner buy-in |  |  |  |
| Measuring & reporting | * DCS review |  | The key improvement of the project is the time taken from image acquisition to generation of flood extent polygons which is now just over an hour. |

## Procurement

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **What went well** | **Improvements** | **Comments** |
| Obtaining supplier agreements |  |  |  |
| Planning & estimating procurement needs |  |  |  |
| Administration |  |  |  |

## Governance & assurance

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **What went well** | **Improvements** | **Comments** |
| Steering committee participation |  |  |  |
| Input from Program manager on project | * Feedback from Maria |  | Maria provided timely feedback to the students as required. |
| Sponsor involvement through lifecycle |  |  |  |
| Stage gate reviews |  |  |  |
| Follow up action plans |  |  |  |

## Project methodology

For the project the students used the Unified Process Methodology.

|  |  |  |  |
| --- | --- | --- | --- |
| **Stage** | **What went well** | **Improvements** | **Comments** |
| Concept | * Suitable for a student project. |  | From the student perspective the project was an interesting one which had great educational value. |
| Start-up |  | * Project ready to start at the beginning of the semester. | The students had very little detail about the project until the middle (six weeks in) of the first semester meaning that time was lost in development. Timing the start of the project at the beginning of the semester would have provided extra time for them to work on the project. |
| Initiation | * Business Requirements. |  | The business requirements document provided a clear idea of what was needed. Requirements meetings with James provided further insight into the requirements and assisted the students in getting up to speed. |
| Delivery | * Clear delivery expectations. |  | The students are clear about expectations of delivery items thanks to good communication. |
| Closure |  |  | N/A at this stage it is expected the project will continue with Intellify. |

# Appendices

## A.1 Final status report

## A.2 Risk register

## A.3 Issues register

## A.4 Change register

## A.5 Final benefit realisation tracker