UAT Alpha Testing

Conducted by Patrick Funnell & Darren Sheehan

[The Test Case ID should be unique. In addition, the name of each Test Case should reflect the intent of the test case, ideally expressed as a Boolean condition.]

KEY

<Test Case ID> - <Test Case Name>:

Description: [Describe the logical condition that the Test Case evaluates. Include the expected result.]
Pre-conditions: [List conditions that must be true before this Test Case can start.]
Post-conditions: [List conditions that should be true when this Test Case ends.]
Data required: [Identify the type of data required for this Test Case.]

Functional

Test Case FEAII-56 (JIRA) - Data Input (DCS Requirements - HLR)

Sub case 1. Accept input of aerial images in ecw or JP2 (JPEG2000) format.

Description	The system should accept JP2s with support for ecw as a backup, in which will be used to generate the flood extents and export to a shape file.
Pre conditions	Working ecw or JP2 files (can be tested by opening and manually confirming content is loading in a local file viewer, windows 10, MacOS, Linux. JP2s open fine but ecw may not be native to these systems)
Post conditions	Image data is loaded in the notebook and processed accordingly.
Data required	Image dataset

Test Case FEAII-57 (JIRA) - Data Input (DCS Requirements - HLR)

Sub case 1. The data will be already orthorectified as GDA2020 MGA56 (Hawkesbury) and MGA55 (Brewarrina)

Description	The data will be already orthorectified as GDA2020 MGA56 (Hawkesbury) and MGA55 (Brewarrina). **What is orthorectified imagery? (esri.com)**

Pre conditions	The data will be already orthorectified as GDA2020 MGA56 (Hawkesbury) and MGA55 (Brewarrina). Meaning positional data can be extracted from imagery.
Post conditions	Positional data can be extracted from the image leading to the shapefile being positioned correctly within the GIS software.
Data required	Image dataset with positional data included.

Test Case FEAII-58 (JIRA) - Data Input (DCS Requirements - HLR)

Sub case 1. The solution will accept 1 or more aerial images in strip mosaic format. Tiled input for testing only.

Description	The solution will accept 1 or more aerial images in strip mosaic format. Tiled input for testing only.
Pre conditions	Image tiles concatenated or full sized images ready to be pulled into the system to be processed.
Post conditions	Shape files are generated.
Data required	Full sized images or concatenated image tiles for image set.

Test Case FEAII-59 (JIRA) - Data Input (DCS Requirements - HLR)

Sub case 1. Aerial images to be read from Amazon s3.

Description	Aerial images stored in an s3 bucket can be pulled into the system with bucket path configuration for dynamic image locations (different flood image sets)
Pre conditions	An s3 bucket created / or already existing with an image set present in the bucket. FEAII-56 must also be met for the image set.
Post conditions	Shape files are generated.
Data required	Input image set.

Test Case FEAII-60 (JIRA) - Configuration (DCS Requirements - HLR)

Sub case 1. Settings required to operate the system (ie. S3 image location) shall be configurable via a configuration file.

Description	The system needs an easy to configure configuration file (in the case of Jupyter Notebooks this is done in a code block and can be configured in line with operation, meaning configuration and operation happen in the same object manipulation space)
Pre conditions	Configuration file (.txt file or otherwise) or configuration code block present (Jupyter Notebook, Sagemaker)
Post conditions	System executed with set configurations / conditions, failed operations can occur as there is no requirement for setting fault checking. (Defaults should be mapped in documentation so users can set the configuration back)
Data required	Default settings or otherwise (user mapped)

Test Case FEAII-62 (JIRA) - Polygon Outputs (DCS Requirements - HLR)

Sub case 1. Output flood extents as a polygon in ESRI shapefile format, or GDB (GeoDatabase).

Description	Shape file(s) is produced from the runtime of a system.
Pre conditions	System is operational
Post conditions	Shape files are generated from the system into a zip file for download from s3.
Data required	Input image set.

Test Case FEAII-63 (JIRA) - Polygon Outputs (DCS Requirements - HLR)

Sub case 1. Output polygons to be geo-referenced to the same level of alignment accuracy as the input images.

Description	Output polygons to be geo-referenced to the same level of alignment accuracy as the input images.
Pre conditions	Images with flood data available with location data included for processing.
Post conditions	Generated Shape Files are geo-referenced to the same alignment accuracy as the input images.
Data required	Input image set & the locational data stored within that image set.

Test Case FEAII-65 (JIRA) - Polygon Outputs (DCS Requirements - HLR)

Sub case 1. Output polygons to be clean and minimally smoothed only to eliminate noise. E.g. with a main predominant floodline, rather than many small polygons of a few pixels each. Minimum polygon size for a patch of land to be 25 square meters.

Description	Output polygons to be clean and minimally smoothed only to eliminate noise. E.g. with a main predominant floodline, rather than many small polygons of a few pixels each. Minimum polygon size for a patch of land to be 25 square meters.
Pre conditions	Images with flood data available for processing.
Post conditions	Polygons minimally smoothed and any less than 25 square meters not present in output.
Data required	Input image set.

Test Case FEAII-66 (JIRA) - Raster Outputs (DCS Requirements - HLR)

Sub case 1. Output flood extent rasters in the same file format as the input images.

Description	NA - Not considered essential. Checked with Simon who asked the business unit and SES representative
Pre conditions	NA
Post conditions	NA

Data required	NA

Test Case FEAII-67 (JIRA) - Polygon Outputs (DCS Requirements - HLR)

Sub case 1. It is preferable for the polygon output to be a single file with a continuous floodline, even where the flood line spans across input mosaics.

Description	It is preferable for the polygon output to be a single file with a continuous floodline, even where the flood line spans across input mosaics.
Pre conditions	Concatenated image made up of tiles or one full image tile.
Post conditions	Single shape file generated with continuous flood content.
Data required	Input image set.

Test Case FEAII-68 (JIRA) - Outputs (DCS Requirements - HLR)

Sub case 1. Generated flood extent files are to be saved in Amazon s3

Description	Generated flood extents are saved in an s3 bucket of the users choice configurable in the configuration code block.
Pre conditions	Authenticated AWS IAM access for the user in s3 and
Post conditions	Generated shape extent files successfully saved in configured Amazon s3 location.
Data required	Input image set.

Test Case FEAII-69 (JIRA) - Polygon outputs (DCS Requirements - HLR)

Sub case 1. Polygon outputs to be closed polygons (i.e. the end of each polygon must join back to the start) Note: open polygon is a line not a polygon.

Description	Polygon outputs to be closed polygons (i.e. the end of each polygon must join back to the start) Note: open polygon is a line not a polygon.
Pre conditions	Images available to be processed contain flood areas.
Post conditions	Generated shape files are generated as closed polygons.
Data required	Input image set.

Test Case FEAII-70 (JIRA) - Outputs (DCS Requirements - HLR)

Sub case 1. The solution will report its level of confidence in the produced flood extent map.

Description	The solution will report its level of confidence in the produced flood extent map. As to how this is completed will be a per pipeline decision. High probability this will be based on IOU (intersection over union) scoring.
Pre conditions	System is operational and performing as per the other functional requirements.
Post conditions	The system produces some form of confidence reporting for comparison, improvement or adjustments.
Data required	Input image set.

Test Case FEAII-71 (JIRA) - Polygon outputs (DCS Requirements - HLR)

Sub case 1. Polygon outputs to contain only the flood extent, so that other software using the output can overlay the flood extent on top of other imagery and maps.

Description	Polygon outputs contain only the flood extent, so that other software using the output can overlay the flood extent on top of other imagery and maps.
Pre conditions	System is operational.
Post conditions	Generated shape files containing only the flood extents
Data required	Input image set

Non Functional

Test Case FEAII-72 (JIRA) - Data Storage (DCS Requirements - HLR)

Sub case 1. Temporary Files removed each run

Description	Temporary files generated during running of the solution should be removed at the end of each run.
Pre conditions	Ensure no temporary files from the previous run are present.
Post conditions	No temporary files are present after the code is run successfully.
Data required	Input image set.

Test Case FEAII-73 (JIRA) - Manual Data and Validation of Images (DCS Requirements - HLR)

Sub case 1. Data Validation, manual output review.

Description	Does the output of the process appear accurate with relation to format, projection, spatial accuracy and congruence?
Pre conditions	Nil.
Post conditions	The shape file output can be opened in GIS software and appears to cover the flood extent which was presented in the source imagery.
Data required	Input image set.

Test Case FEAII-74 (JIRA) - Data and User Access (DCS Requirements - HLR)

Sub case 1. Data and User Access, Single User

Description	Can the system be operated by a single user?
Pre conditions	Users are authenticated into AWS and can access the SageMaker notebook environments. Users will need Sagemaker and s3 access as a minimum to access the systems.

Post conditions	Shape files are generated.
Data required	Input Image Set.

Test Case FEAII-75 (JIRA) - Usability (DCS Requirements - HLR)

Sub case 1. Minimal user effort required to use the system

Description	Users are able to configure and run the system by configuring a single configuration area and running.
Pre conditions	Users are authenticated into AWS and can access the SageMaker notebook environments. System import requirements already set up.
Post conditions	Image files are generated.
Data required	Input Image Set.

Test Case FEAII-76 (JIRA) - Auditing (DCS Requirements - HLR)

Not required.

Test Case FEAII-77 (JIRA) - Performance (DCS Requirements - HLR)

Sub case 1. Solution completes output within hours, not days

Description	Solution should produce an acceptable output within hours of start time. An acceptable output is one that is determined by the tester (flood region is clearly defined).
Pre conditions	The system is operational, images are in tiles (may be required - hardware environment specific, incurs higher cost in AWS if run on full size images)
Post conditions	Shape files are generated.
Data required	Input image set.

Test Case FEAII-78 (JIRA) - Supportability (DCS Requirements - HLR)

Sub case 1. Documentation supports general use

Description	Documentation contains start and stop instructions and how data needs to be passed into the system.
Pre conditions	Solution working, AWS account.
Post conditions	NA.
Data required	Documentation material - Manual

Test Case FEAII-79 (JIRA) - System Availability (DCS Requirements - HLR)

Sub case 1. System can be taken offline and started again

Description	System is able to be taken offline and stored without having any running components, to be brought out again once flood happens. Setup should remain the same (files and python dependencies)
Pre conditions	Is runnable.
Post conditions	Once taken offline, the system can be started again.
Data required	NA

Sub case 2. System runs on Windows

Description	NA - Not considered essential. Checked with Simon and Nik 20-Aug-21
Pre conditions	All imports are accounted for, special software conditions are also accounted for.
Post conditions	Smooth operation, no import errors or runtime errors.
Data required	Input image set, requirements.txt (contains pip libraries)

Test Case FEAII-80 (JIRA) - Cost (DCS Requirements - HLR)

Sub case 1. Runtime is reasonable in length and therefore does not cost an enormous amount (is directly related to FEAII-77).

Description	Runtime is reasonable in length and therefore does not cost an enormous amount (is directly related to FEAII-77). Exact metrics are hard to place with this test case (if the runtime test case (FEAII-77) passes then as far as G5 is concerned, cost passes)
Pre conditions	System is in a runnable state.
Post conditions	NA
Data required	NA

Test Results

Information Stakeholders

Person	Role	Comment
Patrick Funnell (Group 5)	**REVIEWER**	Primary group 5 UAT reviewer
Darren Sheehan (Group 5)	**REVIEWER**	Secondary group 5 UAT reviewer
Maria Jensen (DCS Project Manager)	**INFORMANT**	DCS Project Manager, requests and circulates information. Also ensures standards.
Simon Reynolds (Spatial Services)	**INFORMANT**	Manager Business Technology Services.
Adam Blewitt (Group 5)	**DEVELOPER**	Clustering Technique Pipeline - (Primary)
Andrew Smith (Group 5)	**DEVELOPER**	AWS semantic Segmentation Pipeline - (Primary)
Cameron Nyberg (Group 5)	**DEVELOPER**	AWS semantic Segmentation Pipeline - (Secondary)

Key

ID	Status	Description
FEAII-XX	**PASS**	Overall pass
FEAII-XX	**PASS**	Pass with some concerns to be checked and confirmed after UAT feedback
FEAII-XX	**FAIL**	Fail
FEAII-XX	**TBC**	To be confirmed

Statement
Overall this pipeline is ready for a beta implementation and testing period. This will need to be organised with Simon as Maria is on leave.

Clustering Pipeline

Reviewer: Patrick, Darren
Notebook: TBC
Conducted in git branch: review_pat
https://bitbucket.org/csu-spatialservices/flood-extent-extraction/src/review-pat/
Primary developer: Adam
Status: 80-90% Complete, some further follow up internally required.
Date completed: In progress

ID	Status	Description
FEAII-56	**PASS**	**Sub case 1. Accept input of aerial images in ecw or JP2 (JPEG2000) format.** The clustering pipeline accepts JP2 images, ecw and JP2 are very similar in format. Ecw is a proprietary file type and has a similar file composition to JP2 although they have not been tested through this system. The clustering pipeline makes use of the NRG (near infrared) colour spectrum images in JP2 and as such it is recommended to use the JP2 file format with accompanying location and image data (infrared). (5-Sep-21) Raster file formats—ArcGIS Pro | Documentation
FEAII-57	**PASS**	**Sub case 1. The data will be already orthorectified as GDA2020 MGA56 (Hawkesbury) and MGA55 (Brewarrina)** Based on information contained within the image file and from discussion surrounding the MGA zones this appears to be correct. What is orthorectified imagery? (esri.com)
FEAII-58	**PASS**	**Sub case 1. The solution will accept 1 or more aerial images in strip mosaic format. Tiled input for testing only.** The clustering pipeline solution accepts both singular tiles, large and small depending on the instance size. It has been found that running a full sized image (ie Hawksbury took 700+ GB ram in a sagemaker instance to process the entire full sized tile). Tiles can also be inputted for testing but some issues have been found spacing between the tiles, investigation to follow. (5-Sep-21)

FEAII-59	**PASS**	**Sub case 1. Aerial images to be read from Amazon s3.** This pipeline is able to pull data from an s3 bucket which is directly configurable in one of the early code blocks in its Jupyter notebook. Shape files are then generated accordingly from the imported image set. (5-Sep-21)

FEAII-60	**PASS**	**Sub case 1. Settings required to operate the system (ie. S3 image location) shall be configurable via a configuration file.**
		
		Simple configuration is available from within this pipeline's Jupyter notebook. Present in one of the earlier blocks at the top of the file. Settings in the image below are subject to change or improvement. Additional settings can be configured in other sections but should be done in non master versions of the code to test if the configurations work. (5-Sep-21)
		
		 
		`#Image constants`
		`nrg_image_storage_directory = "../../Images/"`
		`image_scale = 0.1`
		`#GMM constants`
		`gmm_storage_directory = "../../Models/GMM/gmm_1_3_4_5_v2_master_image_nrg_0.1.gmm"`
		`gmm_flood_clusters = (1,3,4,5)`
		`#Contour constants`
		`minimum_contour_size = 100 # pixels`
		`#Log file constants`
		`log_file_prefix = "NOTEBOOK_LOG"`
		`log_storage_directory = "../../Logs/"`
		`#Inspection image options`
		`write_inspection_images = False`
		`#Output settings`
		`zip_output = True`
		`output_directory = "../../Out"`

FEAII-62	**PASS**	**Sub case 1. Output flood extents as a polygon in ESRI shapefile format, or GDB (GeoDatabase).** The clustering pipeline successfully produces ESRI shapefiles, which are very accurate (some human constructed water structures detected). There is still some room for improvement but the location information provided in the JP2s has helped create shape files which can accurately be placed over a map in a GIS program (ArcGIS, QGIS). Maria Jensen asked for some of these shape files a number of weeks ago to have them reviewed by some of their image processing specialists who declared that the shapefiles were good with the only major downfall being that they included some human constructed water structures in them (ie dams, etc) more in the report. (1-Sep-21)
FEAII-63	**PASS**	**Sub case 1. Output polygons to be geo-referenced to the same level of alignment accuracy as the input images.** The shape file review report provided by DCS August 12th, 2021 reported that the shape files imported into ArcMap 10.5 and maintained correct spatial references indicating that the output polygons do have the same level of alignment accuracy as the input images. (5-Sep-21)
FEAII-65	**PASS**	**Sub case 1. Output polygons to be clean and minimally smoothed only to eliminate noise. E.g. with a main predominant floodline, rather than many small polygons of a few pixels each. Minimum polygon size for a patch of land to be 25 square meters.** Using contouring detection from the OpenCV library, the output polygons are generated and the code eliminates any detected small polygons less than 25 square meters in size leaving the main floodline. No smoothing is applied to the contouring as no major noise was present in the contour outputs. (5-Sep-21)
FEAII-66	**PASS**	**Sub case 1. Output flood extent rasters in the same file format as the input Images.**

		Determined as not necessary, stated solidified by response from the SES representative at the project presentation held on 3-Sep-21. Shape files are the most valuable output and the system is able to produce these. Also confirmed by Simon and the related business units that this is not a major requirement. (5-Sep-21)
FEAII-67	**PASS**	**Sub case 1. It is preferable for the polygon output to be a single file with a continuous floodline, even where the flood line spans across input Mosaics.** The system can work with large image tiles (sagemaker instance hardware dependent) and singular or joined tiles. (5-Sep-21)
FEAII-68	**FAIL**	**Sub case 1. Generated flood extent files are to be saved in Amazon s3** This pipeline generates the required shape files and exports them to a zip folder but currently it does not move the zip folder to s3. Although this is still easily accessible from the sagemaker file system with a simple right click and download on the zip folder. This is a fairly simplefeature to implement, conducted similarly to pulling the images down from s3 with the one line pre authenticated script.. Implementation TBC. (5-Sep-21)
FEAII-69	**PASS**	**Sub case 1. Polygon outputs to be closed polygons (i.e. the end of each polygon must join back to the start) Note: open polygon is a line not a polygon.** For each Mosaic the polygon output shape file is a single file containing closed polygons. The contouring methods used to identify the flood area via the OpenCV library close the polygons before their coordinates are converted into shape files. Visual inspection of the shape files in GIS software further supports this. (5-Sep-21)
FEAII-70	**TBC**	**Sub case 1. The solution will report its level of confidence in the produced flood extent map.** Unsure at this stage of how the system will report its confidence of the flood extent result as results are calculated on a per pixel level. Using the IOU (intersection over union) as a whole, an average of the results may be able to give a good result but there is still potentially some issues with this regarding outliers with certain types of flood images and the data represented within. More investigation required. (5-Sep-21)
FEAII-71	**PASS**	**Sub case 1. Polygon outputs to contain only the flood extent, so that other software using the output can overlay the flood extent on top of other imagery and maps.** The outputs are primarily flood extent, there are small amounts of human made structures such as dams as well as unrelated bodies of water but overall the shape files contain the flood extents to a high level accuracy, there is some work still needed surrounding removing these and declaring where known water structures are but this has been perceived internally as an out of scope activity, not specifically aligning to any of the requirement outcomes. For now this is being set aside to focus on overall refinement and cleanup for the PRM (product release milestone). (5-Sep-21)
FEAII-72	**FAIL**	**Sub case 1. Temporary Files removed each run** Not implemented, temporary files remain after each run. Adam is working on implementing a method for clearing the temporary files. (21-Aug-21)

FEAII-73	**PASS**	**Sub case 1. Data Validation, manual output review** Data exported from the clustering notebook pipeline appears correct at first glance. This data is exported in the form of shapefiles (shp) which has been passed on for review with Spatial Services and other related parties at DCS, the feedback received was positive and few corrections are needed. There is some noise in the clustering pipeline which will be noticed with human constructed or non flood water bodies being detected as part of the flood clusters but is within safe levels at this time. There will need to be some level of post processing manual data validation from the staff at DCS / Spatial Services as this pipeline does have some noise but the overall result will limit the amount of time needed to complete this. Further refinement of the model may even reduce the need for someone to validate during the pipeline and make corrections, making it a final product check instead. (23-Aug-21)
FEAII-74	**PASS**	**Sub case 1. Data and User Access, Single User** Provided an AWS administrator from Spatial Services or DCS has provided appropriate access for a user's account regarding s3 and Sagemaker, then s3 can be used to input and output data for the notebook and Sagemaker can be used to start the notebook instance. (23-Aug-21)
FEAII-75	**PASS**	**Sub case 1. Minimal user effort required to use the system** The system will not require much user interaction once setup, some AWS competence and basic git cloning skills will be required to complete setup. Basic AWS skills will be required for adding imagery data and downloading it from S3 once done, the pipeline is automated so provided the basic preconditions are met no user activity is required once the system is started. Documentation will provide further information and usage parameters. (23-Aug-21)
FEAII-76	**PASS**	Auditing is not required, so automatic pass for this test case. (23-Aug-21)
FEAII-77	**PASS**	**Sub case 1. Solution completes output within hours, not days** The clustering pipeline normally completes Brewarrina and Hawkesbury fairly quickly. Further decrease in time may be possible through conda configurations (meta data on available packages and environment solving complexity). Larger full image single tiled throughputs take upwards of an hour with a significant amount of system resources but overall does not cost much. See figures below from the presentation (22-Aug-21) **GMM Technique** **Image: Hawkesbury-Nepean NRG image (179590px, 72510px) - 13 GP (Giga Pixel)** **Run time: 1hr approx.** **Instance: ml.r5.24xlarge @ $8.698 p/h** **Total Cost: $8.698**
FEAII-78	**PASS**	**Sub case 1. Documentation supports general use** Manual has been created and supports general use and setup. Now ready for user testing and review. (12-Sep-21)

FEAII-79	**PASS**	**Sub case 1. System can be taken offline and started again** Provided pre conditions are met, the system can be taken offline and started again. Sagemaker notebook instances can be shutdown and setup stays as it was left and started again without change in conditions. Instructions on setup, start and shutdown will be present in the user manual (in the works) (20-Aug-21) **Sub case 2. System runs on Windows** No longer relevant. Determined as such by Simon (DCS) and Nik (Intellify), the G5 team agrees. In terms of this clustering pipeline there are no issues with running it on windows but the setup can be difficult (installing GDAL and ensuring paths under environment variables are correct). Docker or vagrant environments (containerisation) would be key instruments to dynamic movement between AWS and Windows in future if/when a proper solution is pieced together from this notebook. (20-Aug-21)
FEAII-80	**PASS**	**Sub case 1. Runtime is reasonable in length and therefore does not cost an enormous amount (is directly related to FEAII-77).** Runtime is less than an hour so cost will be low. See FEAII-77 for a costing example. (5-Sep-21) Amazon SageMaker Pricing – Amazon Web Services (AWS)
FEAII-103	**TBC**	**Sub case 1. Code complies with language syntax and operation standards set out either by the language provider or a highly experience company / organisation (ie. Google code standards)** Some basic code compliance to clean up, otherwise functional and logical. This will be focused on towards the end of the project to ensure maximum productivity towards the results of the project (5-Sep-21)

AWS Semantic Segmentation Pipeline

Reviewer: Patrick, Darren
Notebook: TBC,
Conducted in git branch: NA
Primary developer: Andrew
Status: IN PROGRESS
Date completed: TBA

ID	Status	Description
FEAII-56	**PASS**	**Sub case 1. Accept input of aerial images in ecw or JP2 (JPEG2000) format.** Trained on JP2 images, ecw may not be a good file type to use as this pipeline has been trained in the NRG colour space whereas the ecw represents the RGBA colour space (ecw). May be incompatible, further investigation required. The system does work with JP2 as per its design so a designated pass for that space with potentially more research in the ecw space. (5-Sep-21)
FEAII-57	**PASS**	**Sub case 1. The data will be already orthorectified as GDA2020 MGA56 (Hawkesbury) and MGA55 (Brewarrina)** Based on information contained within the image file and from discussion surrounding the MGA zones this appears to be correct. What is orthorectified imagery? (esri.com)
FEAII-58	**PASS**	**Sub case 1. The solution will accept 1 or more aerial images in strip mosaic format. Tiled input for testing only.** Same as FEAII-58 in the Clustering Pipeline. (5-Sep-21)
FEAII-59	**PASS**	**Sub case 1. Aerial images to be read from Amazon s3.** Same as FEAII-59 in the Clustering Pipeline. (5-Sep-21)
FEAII-60	**PASS**	**Sub case 1. Settings required to operate the system (ie. S3 image location) shall be configurable via a configuration file.** Very similar to FEAII-59 in the Clustering Pipeline, although given the greater complexity of this pipeline there are several configuration points. Like the clustering it does have a central configuration code block. (5-Sep-21)
FEAII-62	**PASS**	**Sub case 1. Output flood extents as a polygon in ESRI shapefile format, or GDB (GeoDatabase).** Same as FEAII-62 in the Clustering Pipeline. (5-Sep-21)
FEAII-63	**PASS**	**Sub case 1. Output polygons to be geo-referenced to the same level of alignment accuracy as the input images.** Same as FEAII-63 in the Clustering Pipeline. Note Semantic Segmentation Pipeline output not verified by DCS however the same methods are used for contouring and generation of shape files. (11-Sep-21)
FEAII-65	**PASS**	**Sub case 1. Output polygons to be clean and minimally smoothed only to eliminate noise. E.g. with a main predominant floodline, rather than many small polygons of a few pixels each. Minimum polygon size for a patch of land to be 25 square meters.** This has been accounted for in the AWS Semantic segmentation pipeline. As it follows the contouring and shape file generation that is used in the clustering pipeline. (11-Sep-21)

FEAII-66	**PASS**	**Sub case 1. Output flood extent rasters in the same file format as the input Images.** Same as FEAII-66 in the Clustering Pipeline. (5-Sep-21)
FEAII-67	**TBC**	**Sub case 1. It is preferable for the polygon output to be a single file with a continuous floodline, even where the flood line spans across input Mosaics.** TBC - Polygon output is generated as a continuous floodline across input Mosaics. (5-Sep-21)
FEAII-68	**FAIL**	**Sub case 1. Generated flood extent files are to be saved in Amazon s3** Same as FEAII-68 in the Clustering Pipeline. (11-Sep-21).
FEAII-69	**PASS**	**Sub case 1. Polygon outputs to be closed polygons (i.e. the end of each polygon must join back to the start) Note: open polygon is a line not a polygon.** Same as FEAII-69 in the Clustering Pipeline. The same methods are used for contouring and generation of shape files. (5-Sep-21)
FEAII-70	**TBC**	**Sub case 1. The solution will report its level of confidence in the produced flood extent map.** Unsure at this stage of how the system will report its confidence of the flood extent result as results are calculated on a per pixel level. Using the IOU (intersection over union) as a whole, an average of the results may be able to give a good result but there are still potentially some issues with this regarding outliers with certain types of flood images and the data represented within. More investigation required. (5-Sep-21)
FEAII-71	**PASS**	**Sub case 1. Polygon outputs to contain only the flood extent, so that other software using the output can overlay the flood extent on top of other imagery and maps.** Same as FEAII-71 in the Clustering Pipeline. (11-Sep-21)
FEAII-72	**PASS**	**Sub case 1. Temporary Files removed each run** This pipeline removes unnecessary files after runtime leaving the environment clean for additional runs. (12-Sep-21)
FEAII-73	**PASS**	**Sub case 1. Data Validation, manual output review** The data produced from the AWS Semantic Segmentation appears accurate but not as accurate as the clustering pipeline outputs, there are rougher edges and some of the edge zones are missing but it works better for cloud regions. Andrew and Nik are working on XGBOOST which may be a better alternative to this. (12-Sep-21)
FEAII-74	**PASS**	**Sub case 1. Data and User Access, Single User**
FEAII-75	**PASS**	**Sub case 1. Minimal user effort required to use the system** The Semantic Segmentation pipeline is not as easy to set up due to the endpoint training but in terms of endpoint deployment (the ML computation point) this is straight forward and does not require interaction once initiated, settings can be adjusted as needed for testing or improvement. (11-Sep-21)
FEAII-76	**PASS**	**Auditing is not required, so automatic pass for this test case.**

FEAII-77	**PASS**	**Sub case 1. Solution completes output within hours, not days** **Semantic Segmentation Technique** **Images: Hawkesbury-Nepean NRG image (144 * approx 400px, 400px) - 230.4 MP (Mega Pixel)** **Run time: approx 30 mins** **Instances:** • **Sagemaker - ml.r5.24xlarge @ $8.698 p/h** • **Endpoint - ml.c5.xlarge @ $0.133 p/h** **Total Cost: $4.415**
FEAII-78	**PASS**	**Sub case 1. Documentation supports general use** Manual has been created and supports general use and setup. Now ready for user testing and review. (22-Aug-21)
FEAII-79	**PASS**	**Sub case 1. System can be taken offline and started again** Provided pre conditions are met, the system can be taken offline and started again. Sagemaker notebook instances can be shutdown and setup stays as it was left and started again without change in conditions. Instructions on setup, start and shutdown will be present in the user manual (in the works) (20-Aug-21) **Sub case 2. System runs on Windows** No longer relevant. Determined as such by Simon (DCS) and Nik (Intellify), the G5 team agrees. (5-Sep-21)
FEAII-80	**PASS**	**Sub case 1. Runtime is reasonable in length and therefore does not cost an enormous amount (is directly related to FEAII-77).** Runtime is less than an hour so cost will be low. See FEAII-77 for a costing example. (5-Sep-21) Amazon SageMaker Pricing – Amazon Web Services (AWS)
FEAII-103	**TBC**	**Sub case 1. Code complies with language syntax and operation standards set out either by the language provider or a highly experience company / organisation (ie. Google code standards)** Some basic code compliance to clean up, otherwise functional and logical. This will be focused on towards the end of the project to ensure maximum productivity towards the results of the project (5-Sep-21)