THE HIGHLAND AND ISLANDS FIRE BOARD
IRMP WORKING GROUP

IRMP RISK REVIEW

Agenda Item	
Report No	

Summary

The purpose of this report is to present to members the outcome of the validation of the IRMP Risk Review Phase I Capital Build Programme methodology completed at the request of the Board.

1. OVERVIEW

1.1 To facilitate the progression of the Board's IRMP Risk Review in considering the Capital Build Programme, the service has applied a methodology which utilises an approach by which individual data sets can be quantified, analysed and brought together to present information which will provide an evidenced based priority for future builds

1.2 The methodology used to formulate this proposal will in the future assist the Board in deciding the appropriate allocation of resources within the fields of Prevention, Protection and Intervention.

1.3 These data sets that have been considered include amongst others;

- Data gathered from the Sustainability Review
- Demographic information on communities including the distribution of vulnerable persons
- The potential for future life critical incidents
- Critical elements of the current intervention resources provision

1.4.1 At the meeting of the IRMP Working Group on the 20.03.09 the importance of the developed methodology to the Service was recognised and as such, to ensure the approach taken was appropriate, it was requested that the methodology be subjected to validation by a suitable third party.

Recommendation

Members are requested to note the contents of the Report – Validation of IRMP Methodology, prepared by Risktec Solutions, dated June 2009.

BRIAN A MURRAY
CHIEF FIRE OFFICER
Date: 11th August 2009

Document No: HIFRS-01-R-01	
Issue: 1.0	
Date: June 2009	

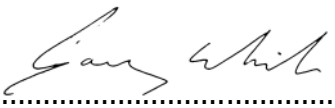
Report

Validation of IRMP Methodology

Prepared for

Highlands and Islands Fire and Rescue Service

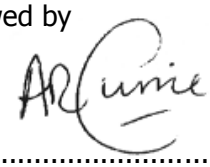
Prepared by



.....

G D White, Principal Consultant

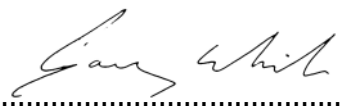
Reviewed by



.....

A R Currie, Group Fire Advisor

Approved by



.....

G D White, Principal Consultant

Wilderspool Park
Greenall's Avenue
Warrington
WA4 6HL
United Kingdom
www.risktec.co.uk

ISSUE RECORD

Issue	Date	Revision History
0.1	22-May-2009	Initial issue to Client
1.0	09-Jun-2009	Formal issue incorporating client comments and internal review

DISTRIBUTION

Mr T Johnson	Highlands and Islands Fire and Rescue Service, Inverness
File	Risktec Solutions Limited, Warrington

CONTENTS

Tables

Figures

Appendices

1 INTRODUCTION

Highlands and Islands FRS (HIFRS) currently has 95 stations providing emergency response to the service area, mainly crewed by Retained Duty personnel, which are supported by 14 Community Response Units. Whilst good progress has been made in building stations of an appropriate standard there remain a significant number of stations which still require to be provided/upgraded.

Historically the building of stations has not been prioritised in a robust manner, with the sequence of builds being influenced by many local factors. It is recognised that the provision of a fire station located in an appropriate position is a complex task requiring the acquisition of land, planning approval, building warrant etc.

It is clear there should be a priority order for station builds, which is directly linked to the worth of a station based upon risk and sustainability information.

As part of the Sustainability Review process HIFRS has been able to analyse information relevant to individual stations and their associated communities, extending over a 36 month period. This has produced a large amount of valuable data across a number of different datasets.

To facilitate development of the Capital Build Programme, HIFRS has applied a methodology which utilises an approach by which these individual data sets can be quantified, analysed and brought together to present information which will provide an evidenced based priority for future builds. It is likely that the work undertaken will underpin future Integrated Risk Management Planning strategies.

This report presents a review and validation of the methodology applied by HIFRS (Reference 1). The methodology developed by HIFRS was reviewed to cover the following items:

- development of the methodology and the reasons for selection of the various criteria,
- development of the weightings applied to each area of the methodology, and
- overall fitness for purpose.

This was achieved by reviewing documentation provided by HIFRS followed up by a session with the team involved in developing the methodology at HIFRS Headquarters.

2 REVIEW OF METHODOLOGY AND DATASETS

In general, our review showed that significant effort had been expended by HIFRS to ensure that all the datasets were robust and that the methodology applied produced results that matched with the expert views of the FRS. We believe that the methodology used and datasets are fully transparent and robust enough to support the current findings of HIFRS, however we have a number of detailed areas where we believe additional benefit may be found. These are detailed in the following sub-sections.

2.1 Use of FSEC Data

The use of FSEC is central to the methodology employed in generating the data on potential lives saved by each Fire Station. We reviewed the HIFRS approach to building FSEC model, and explored how the model dealt with the sparsity of 'real' incident data in some geographic areas.

The FSEC model within HIFRS is completely developed with all modules fully populated. The model is also benchmarked along with all other Scottish FRSs as part of an annual audit completed by representatives from the national FSEC team. HIFRS were instrumental in supporting the development of the FSEC model to allow RTC risk to be calculated per road length rather than spread over a geographic area (which for HIFRS would have resulted in a great 'dilution' of the risk data).

HIFRS also regularly demonstrate the robustness of the datasets contained within the FSEC model. This includes allowing back fitting of data to match actual fires. These data are shown to overlay well against the predicted risk profiles.

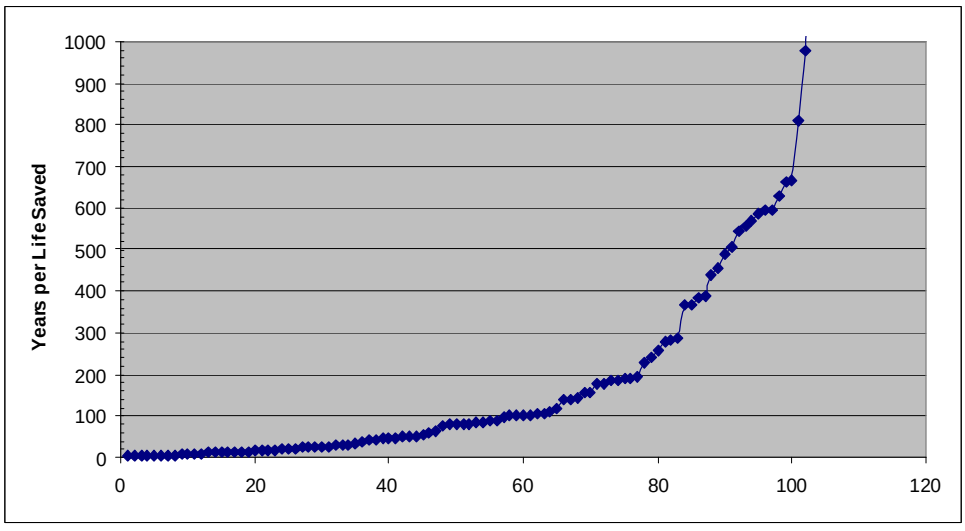
2.2 FSEC years per Additional Lives Saved

Table A1 shows how scores are allocated against the additional lives saved value for each station. HIFRS have effectively split the range of scores into twenty groups and set the width of these groups to allow roughly an equal number of stations in each. This has the consequence, however, of there not being a consistent approach to the size of each group.

While we do not believe this to be of any concern for the current use of the methodology; a different approach may ultimately be more supportable.

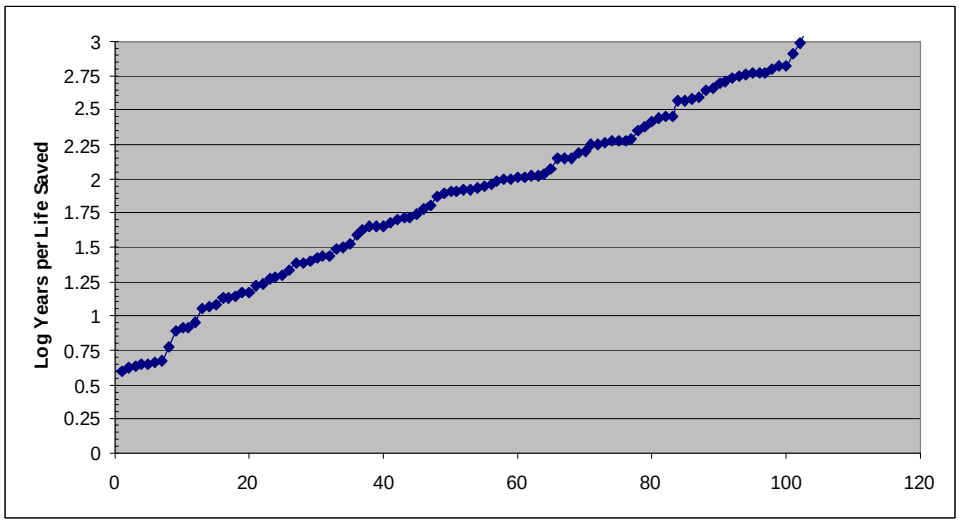
It is difficult to visualise how to group the station data as it covers such a wide range (from around 4 years to 15,000 years per life saved). Figure 1 below shows these data (cut off at 1000 years to prevent the scale being compressed too much).

FIGURE 1: FSEC YEARS PER LIVES SAVED



This demonstrates the difficulty in choosing a bin size to sensibly reflect the large range in data. When plotted on a log scale, however, a linear trend can now be seen as shown on Figure 2 below.

FIGURE 2: FSEC YEARS PER LIVES SAVED (LOG SCALE)



This suggests to us that it is would make sense to set the bins on an equal logarithmic size. Doing this would result in the following scoring sheet:

TABLE 1: FSEC YEARS PER ADDITIONAL LIVES SAVED SCORING SHEET

Years per additional Lives Saved	Score	Number of stations with that score
0 to <5	20	7
5 to <7	19	1
7 to <9	18	3
9 to <12	17	3
12 to <16	16	6
16 to <21	15	5
21 to <28	14	7
28 to <38	13	3
38 to <50	12	6
50 to <67	11	6
67 to <90	10	9
90 to <120	9	9
120 to <160	8	5
160 to <210	7	7
210 to <280	6	4
280 to <375	5	4
375 to <500	4	5
500 to <670	3	10
670 to <900	2	1
900 to <1250	1	3
>= 1250	0	4

The results of this proposal have been studied and are shown in Appendix 1. There are no significant differences, however any differences tend to show a reduction in the score based on FSEC.

2.3 Potential Population for Day Cover Recruitment

There are two key elements to this section; the determination of the potential number of persons available to recruit for day cover and the conversion of this into a score for use in the final calculation. We have looked at these separately.

2.3.1 Determination of the potential number of persons

The potential Day Cover recruits figure is drawn from the 2001 Census figures and predicts the potential number of persons who could be available to provide emergency 'day cover', during the period 08.00 – 18.00hrs. The figure is derived by subtracting the total number of residents who it would appear are unable/unsuitable to become firefighters, from the total resident population.

Those defined as being unable/unsuitable include:

- Persons under the age of 18 or over the age of 65
- Persons working in agriculture or fishing
- Persons working in Transport or Communications
- Persons living / working more than 5km from the station.

The measure of Day Cover potential is critical to the HIFRS as the majority of the stations are crewed by personnel working the Retained Duty System. This involves Retained personnel being able to respond to the Station and answer emergency calls from their place of employment, if continuous emergency response is to be maintained.

We feel this is a good technique for estimating the potential recruits, however, this may require specific investigation where the apparent numbers are low to ensure robustness of the process (e.g. an example is given in Reference 1 where the island of Foula is shown as having a resident population of 66. It is believed from local intelligence that the current island population is less than 30).

2.3.2 Derivation of the scoring technique

The potential number of persons are allocated into ten bands, generating scores of between 1 and 10 for use in the final calculation. The lower and upper bands appear to be set based on the confidence of either there being little chance of being able to recruit sufficient 'day cover' or a 100% guarantee of recruiting sufficient 'day cover'.

We believe that the split of bands in between is sensible, showing that the confidence decreases more quickly below 500 potential recruits, and that above 500 there is only a slow increase in confidence (as it is already high). We investigated if there were any other structures that would produce more robust results (e.g. using a log scale as earlier), however none showed any benefit over that currently in use by HIFRS.

We would suggest, however, that if possible HIFRS look at the actual recruitment data for each station against the available population. This would allow underpinning of the allocation of scores against each band of potential numbers of recruits.

2.4 Establishment

The scoring for the establishment is based around the level of establishment that is required to ensure the availability of cover from the station. The establishment figure must cater to ensure that, sufficient numbers of personnel are available during periods of annual leave (and other associated leave as required by current Employment legislation e.g. special leave, maternity/paternity leave etc), sickness and potential fluctuations in periods of unavailability through primary work commitments.

Thus Table C1 in Reference 1 implies that for an establishment below 6, there is a very low chance of having the station available, however for an establishment of greater than 10 there will be a very high availability for the station.

We believe the scoring and the bands selected are sensible and will produce appropriate results. We would suggest, however, that the use of the positive trends to increase the score by a single point (i.e. increasing trend shown over 3 years) could be seen as optimistic as this is effectively projecting a positive tend into the future. This is only likely to affect the analysis in terms of detail however, and therefore we do not believe that removing this is warranted.

2.5 Crew Confidence

This dataset is a measure of the number of firefighters who respond to an incident. It is used in the final results as a negative measure (i.e. is used to effectively reduce the scores coming from the Potential recruits and establishment datasets).

As such, the range of the score from 0 to 10 is a sensible distribution, as is the selection of the bands and the allocation to the individual scores.

However, it is noted that the actual data presented in Table D2 of Reference 1 shows a number of stations receiving No Calls, and a larger number receiving only a very small number of calls. Where these data are low, the statistics based on this could be deceiving; e.g. a station may be available all the time, except for the one call they received in three years. Conversely it could be argued that the station could have been unavailable for more of the time but that this was not discovered as no calls were received.

We believe that it may be a worthwhile exercise to correlate these data against the amount of time each pump was booked off the run. This can have two effects:

1) If the pump is regularly booked off the run, then the station will not receive the calls and therefore appear to have a better percentage
2) Conversely, there are periods when, although there may a known unavailability of sufficient crew to man the pump, the pump may not be booked off the run. Calls will therefore still be received and thus the station will not be able to attend, thus causing a lower percentage.

Clearly, the effect of 'stations booking off the run', together with low call data has an effect on the use of these data. It may be worth investigating carrying out test calls to stations to ensure that all stations receive a minimum of five (say) calls per year. This would, at least test the response of the crews.

2.6 Relative Weightings of Scoring Systems

In the previous sections the scoring systems of each element of the overall methodology has been discussed. In this section we look at how they relate to each other to produce the final Sustainability Result Score.

It is clear that additional weight is provided for the effect of the additional lives saved. This gives a score at the maximum level which is twice that of any of the other scores. We regard this as sensible as it allows the major factor in the methodology to be based on the potential loss of life.

The remaining scoring schemes are effectively all related to the potential of a crew to respond to an emergency call. They are all scored with the same maximum score of 10, however the last of these is used in a negative manner, thus potentially reducing the previous scores.

We therefore believe the relationships between the sores and relative weightings for each dataset are appropriate for this methodology.

3 CONCLUSIONS

The work carried out by HIFRS in developing the methodology and datasets for the risk based methodology which allows the prioritisation of the Capital Build Programme is a robust and comprehensive piece of work, presenting data in a manner which is both transparent and easy to understand.

Several recommendations have been made to the methodology, however it is not envisaged that any of these will alter the conclusions of the existing work.

The key findings / recommendations are as follows:

1) Alter the scoring scheme for the FSEC additional Lives Saved dataset to reflect allocation of the scores based on the logarithmic value the FSEC data. This will make it simpler to continue using the method in the future.

2) Where the potential number of day cover recruits is low, carry out specific investigations to check the data.

3) Review the results from recruitment campaigns and compare against the scoring scheme and scores, for potential day recruits and establishment.

4) We believe that using a past positive trend in establishment numbers may be optimistic (in that it effectively projects this improvement into the future).

5) Carry out a series of 'test calls' for stations that currently receive a low number of calls. This will help establish a more accurate set of statistics for low or no call stations.

6) Review data for pumps 'booked off the run' against call statistics to determine if this has any effect on the data used for this methodology (i.e. can this show a potential change in the Crew Confidence score).

4 REFERENCES

1 Highland and Islands Fire Board. *IRMP Risk Review Future Capital Build Programme Proposal.*
20 March 2009

APPENDIX 1

COMBINED SUSTAINABILTY SCORE

Retained Station Name	FSEC Years Per Additional Lives Saved Score	FSEC New Calculation	Potential Day Cover Recruits Score	Current Establishment Score	Crew Confidence Score (-VE)	Total Sustainability Result Score (Original)	Total Sustainability Result Score	Change in Score
Fort William - Pump 1	20	20	10	10	0	40	40	0
Stornoway - Pump 1	20	20	10	10	0	40	40	0
Wick - Pump 1	20	20	10	10	0	40	40	0
Invergordon - Pump 1	20	20	10	10	1	39	39	0
Inverness Retained	20	20	10	10	1	39	39	0
Nairn - Pump 1	20	20	10	10	1	39	39	0
Thurso - Pump 1	20	20	10	10	1	39	39	0
Grantown - Pump 1	19	18	10	10	0	39	38	-1
Aviemore	19	17	10	10	1	38	36	-2
Dingwall - Pump 1	19	18	10	10	1	38	37	-1
Kirkwall - Pump 1	19	19	10	10	1	38	38	0
Lerwick - Pump 1	19	18	10	10	1	38	37	-1
Tain	18	17	10	10	1	37	36	-1
Fort William - Pump 2	18	16	10	9	1	36	34	-2
Kingussie	18	16	8	10	0	36	34	-2
Wick - Pump 2	18	16	10	8	1	35	33	-2
Nairn - Pump 2	18	16	10	5	2	31	29	-2
Stornoway - Pump 2	18	17	9	5	1	31	30	-1
Golspie	17	15	10	10	1	36	34	-2
Stromness - Pump 1	17	15	8	10	0	35	33	-2
Kirkwall - Pump 2	17	15	10	8	1	34	32	-2
Thurso - Pump 2	17	16	10	8	1	34	33	-1
Invergordon - Pump 2	17	16	10	2	2	27	26	-1
Portree	16	15	9	10	0	35	34	-1
Dornoch	16	14	8	10	0	34	32	-2
Kyle of Lochalsh	16	14	8	10	0	34	32	-2
Grantown - Pump 2	16	15	8	7	2	29	28	-1
Beauly	16	14	4	9	1	28	26	-2
Dingwall - Pump 2	15	13	10	9	1	33	31	-2
Fortrose	15	14	9	10	1	33	32	-1
Lerwick - Pump 2	15	14	10	9	1	33	32	-1
Kinlochleven - Pump 1	15	14	6	10	1	30	29	-1
Drumnadrochit	15	14	8	7	1	29	28	-1
Ullapool	14	13	8	10	0	32	31	-1
Benbecula	14	12	6	10	0	30	28	-2
Broadford	14	12	6	10	1	29	27	-2
Brae - Pump 1	14	12	4	10	0	28	26	-2
Helmsdale	14	13	5	8	1	26	25	-1
Stromness - Pump 2	14	12	6	5	2	23	21	-2
Castlebay	13	11	6	10	1	28	26	-2
Fort Augustus	13	11	6	10	1	28	26	-2
Shawbost	13	11	6	10	1	28	26	-2
Strontian	13	12	4	10	0	27	26	-1

Retained Station Name	FSEC Years Per Additional Lives Saved Score	FSEC New Calculation	Potential Day Cover Recruits Score	Current Establishment Score	Crew Confidence Score (-VE)	Total Sustainability Result Score (Original)	Total Sustainability Result Score	Change in Score
Port of Ness	13	12	5	7	0	25	24	-1
Bonar Bridge	13	11	6	4	1	22	20	-2
Mallaig	12	10	8	10	0	30	28	-2
Tarbert	12	10	5	10	0	27	25	-2
Lairg	12	11	5	9	1	25	24	-1
Sandwick	12	11	4	10	2	24	23	-1
Kinlochleven - Pump 2	12	10	4	2	1	17	15	-2
Scalloway	11	10	5	10	0	26	25	-1
Lochboisdale	11	10	5	10	1	25	24	-1
Dunvegan	11	10	4	10	1	24	23	-1
Dunbeath	11	10	4	10	2	23	22	-1
Staffin	11	10	4	9	2	22	21	-1
Uig	11	10	4	7	2	20	19	-1
Whalsay	10	9	6	10	0	26	25	-1
Lochinver	10	9	5	10	0	25	24	-1
Lochcarron	10	9	5	9	1	23	22	-1
Baltasound	10	9	4	10	2	22	21	-1
Lochmaddy	10	9	2	5	5	12	11	-1
Gairloch	9	9	7	9	1	24	24	0
Sumburgh	9	8	4	10	2	21	20	-1
Aultbea	9	9	5	7	4	17	17	0
Brae - Pump 2	9	9	3	5	2	15	15	0
St Margaret's Hope	9	9	5	2	3	13	13	0
John O'Groats	8	8	4	10	1	21	21	0
Kinlochbervie	8	8	4	8	1	19	19	0
Leverburgh	8	8	1	9	1	17	17	0
Walls	8	7	3	10	4	17	16	-1
Bayhead	8	8	3	7	3	15	15	0
Acharacle	7	7	4	9	1	19	19	0
Bettyhill	7	7	5	9	3	18	18	0
Hillswick	7	7	1	10	3	15	15	0
Westray	7	7	4	7	3	15	15	0
Mid Yell	7	7	3	5	2	13	13	0
Foyers	7	7	4	5	5	11	11	0
Great Bernera	6	5	3	10	1	18	17	-1
Bressay	6	6	4	5	0	15	15	0
Longhope	6	6	2	9	2	15	15	0
Scalpay	6	6	3	7	1	15	15	0
Sanday	6	6	2	6	3	11	11	0
Stronsay	5	5	4	9	0	18	18	0
Lochaline	5	5	4	8	2	15	15	0
South Lochs	5	4	3	7	1	14	13	-1
Shapinsay	5	4	3	5	0	13	12	-1
Fair Isle	5	5	1	2	9	-1	-1	0

Retained Station Name	FSEC Years Per Additional Lives Saved Score	FSEC New Calculation	Potential Day Cover Recruits Score	Current Establishment Score	Crew Confidence Score (-VE)	Total Sustainability Result Score (Original)	Total Sustainability Result Score	Change in Score
Eday	4	3	2	7	0	13	12	-1
Bixter	4	4	3	10	5	12	12	0
Scourie	4	4	2	8	2	12	12	0
Cannich	4	3	3	5	6	6	5	-1
Papa Westray	4	4	1	1	0	6	6	0
Durness	3	3	3	10	1	15	15	0
Achiltibuie	3	3	3	9	2	13	13	0
Fetlar	3	3	1	7	0	11	11	0
Raasay	3	3	2	3	4	4	4	0
Flotta	3	3	1	1	7	-2	-2	0
Rousay	2	1	2	7	0	11	10	-1
Applecross	2	3	3	8	3	10	11	1
Tongue	2	3	4	5	2	9	10	1
Valtos	2	2	3	7	3	9	9	0
North Ronaldsay	2	3	1	5	No Calls	8	9	1
Skerries	1	0	2	10	No Calls	13	12	-1
Glenelg	1	1	3	8	3	9	9	0
Kilchoan	1	1	3	5	2	7	7	0
Torridon	1	0	3	2	3	3	2	-1
Kinlochewe	1	0	2	3	4	2	1	-1
Foula	1	0	2	1	10	-6	-7	-1