OPERATING THE
NEWCASTLE TO FASSIFERN RAILWAY

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Figure 1: Operating Session on the Newcastle-Fassifern Railway, 2016

1   INTRODUCTION

It is now four years since I began building my new, larger version of the Newcastle to Fassifern Railway in late 2013, and three years since operating sessions commenced. Some 90% of baseboards and track work and a few structures are completed, but alas no scenery as yet. However, I now host up to 17 people at regular operating sessions.

Previous articles in LDSIG and OPSIG journals covered the planning of the current layout, as well as details of the steelworks (See references). Now that I have some operating experience on the layout, I thought it might be of interest to OPSIG readers to see how the layout has come to life. This article covers:

- A Railfan's Heaven
- Staging Construction for Early Operations
- Designing for Operation
- Preparing for an Operating Session
- Catering for all Tastes
- Operating Manual and Rulebook
- Conclusions

2   A RAILFAN'S HEAVEN

Newcastle, Australia, like its counterpart in England, is synonymous with coal. The city was established in 1801, just 13 years after Australia's first European settlement, and the first coal was sent 100 miles south to

Sydney by sea that year. Soon dozens of mines were operating, and the first railway in the area was built in the 1860's to link the mines to the growing port. Coal and railways remain vital to Newcastle, now the world's largest coal export port. In 2016, some 160 million metric tons of coal were exported from the terminals at Port Waratah and Kooragang Island, with well over 50 coal trains of up to 12,000 gross tons arriving at the port every day from the surrounding Hunter Region. (see references for videos of current rail operations).
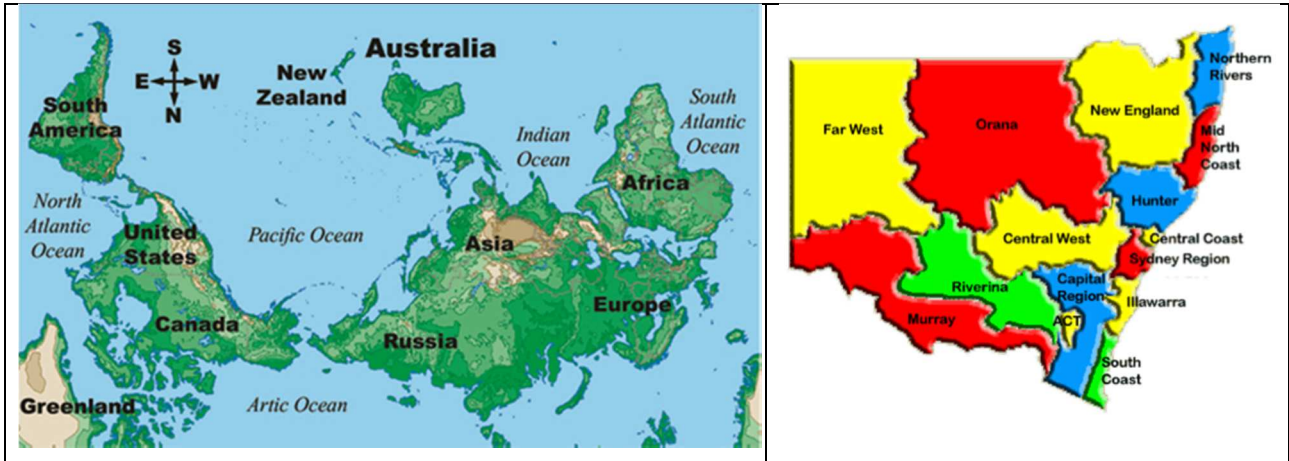
Figure 2: (Left): The world viewed from "downunder". (Right): Map of New South Wales showing the Hunter Region in relation to Sydney

However, I was fascinated with the area from the mid 1960's, when I first saw AD60 class Beyer Garretts on coal and freight trains and streamlined C38 class Pacifics hauling air conditioned passenger trains.
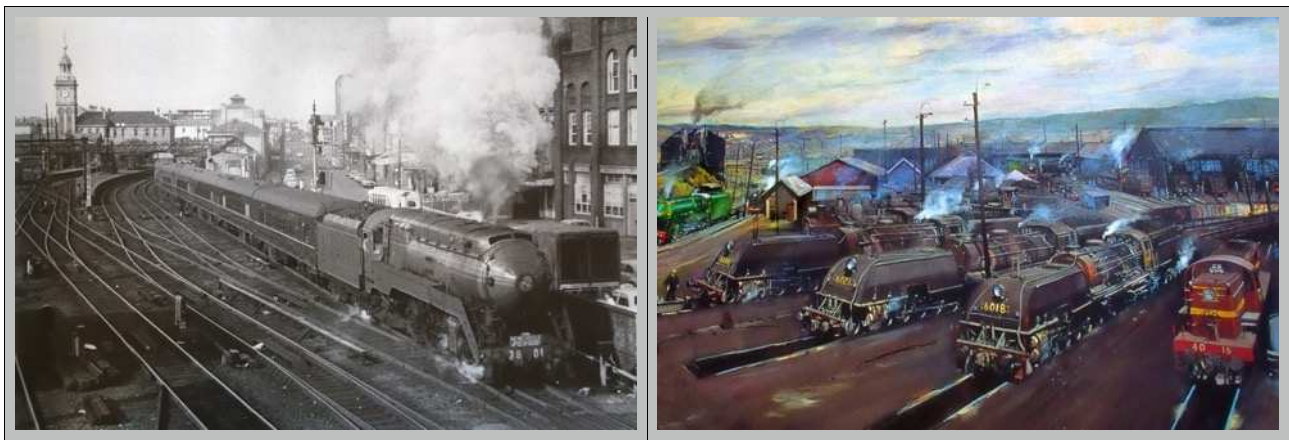

Figure 3 (Left): 3801 departing Newcastle with the "Flyer" in the 1960's. (Right): Painting of Broadmeadow Loco Depot showing the double roundhouses and Beyer-Garretts.

This area was the last in Australia to succumb to the diesel. As late as 1970 there were still 100 or more government-owned steam locomotives based at the twin roundhouses at Broadmeadow and the picturesque full-circle roundhouse at nearby Port Waratah. In addition, there were privately owned steam locomotives on some of the coal mine branches.

Newcastle was also the home of the Broken Hill Proprietary (BHP) steelworks, the largest in Australia in the 1960's, along with Sulphide smelters and other heavy industry. BHP had its own private rail network operated by a fleet of GE centre-cab and end-cab BO-BO diesel shunters. While the BHP Steelworks closed in 1999, BHP remains the world's largest mining company.

As Australia's sixth largest city and major industrial centre, Newcastle was the terminus for around 30 daily suburban and local rail services operated by 4-6-4 tank locomotives, C35 and C36 class 4-6-0's and diesel railcars, as well as the thrice daily "Newcastle Flyer" expresses from Sydney hauled by C38 class Pacifics. Most of the early NSW diesel electric locomotives could also be found in the Newcastle area on express freights and passenger services as well as some coal trains. Altogether there were some 20 distinct classes of steam and diesel locomotives in the area. (see references for videos of the area in the 1960's.)
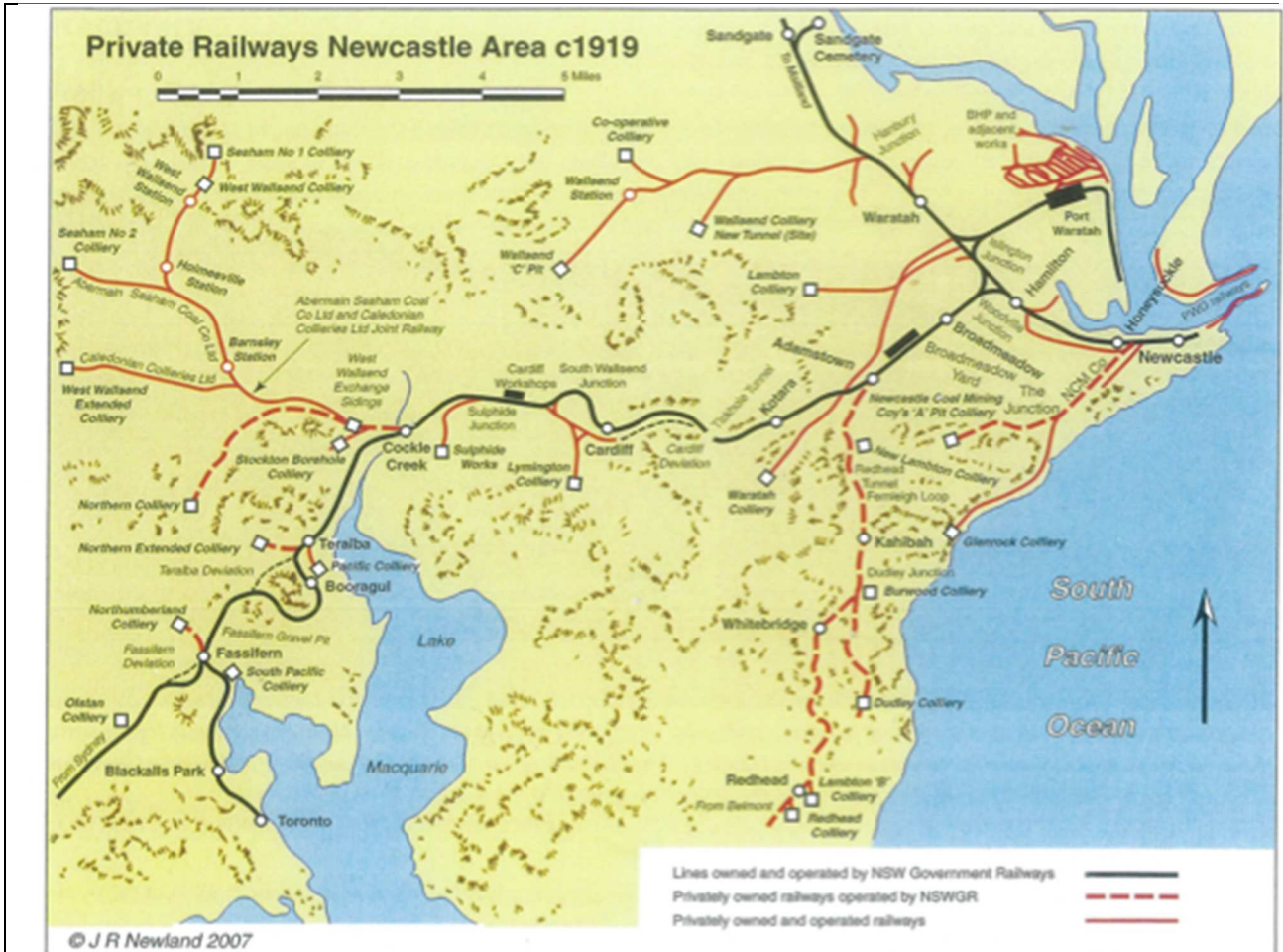
Figure 4: Newcastle – Fassifern Area, showing Government and Private Rail lines in 1919

Figure 4 shows the area I decided to model – a twelve mile stretch of the NSW Government Railways main line from Newcastle to Fassifern, plus the branch to Port Waratah and some private coal mine branches. The Newcastle area in those days was a railfan's heaven, with over 200 coal, freight and passenger trains per day, plus light engines, moving through the complex of junctions between Newcastle and its port. The volume of coal trains, which ran about every fifteen minutes in each direction, necessitated a four-track main line from the Port west through Waratah and Sandgate to Maitland.

In those days, the density of traffic meant train movements were directed by multiple signal boxes ("towers" in US parlance) under the general direction of "train control". CTC came later and today all operations are controlled from a single location. A mixture of upper and lower quadrant semaphore signals as well as color-light signals were in operation. All trains as well as light engine movements were included in the working timetable, although many trains such as wheat trains or fruit expresses were "conditional" and only ran as required by seasonal traffic.

As discussed later, I wanted to operate my layout in a similar fashion to the prototype in the 1960's. This meant some operators operating trains using walk-around radio throttles, while others such as signalmen, yard shunters and locomotive foremen worked from "fixed locations".

3   STAGING CONSTRUCTION FOR EARLY OPERATIONS

From the outset, I envisaged up to twelve operators would be required to run my railway when completed. However, I didn't want to wait for years until the layout was finished before I could start operations. Accordingly, I designed it to be built in stages, with operations to be progressively enhanced after each stage was completed.

The first stage included the key facilities of Broadmeadow marshalling yard and loco depot, incorporating the first roundhouse which I salvaged from an earlier layout. Stage 1 was built on a total of 7 permanent modules and connected into a simple loop by temporary modules (Figure 4).

Figure 5 – The first two stages were built in my original shed.
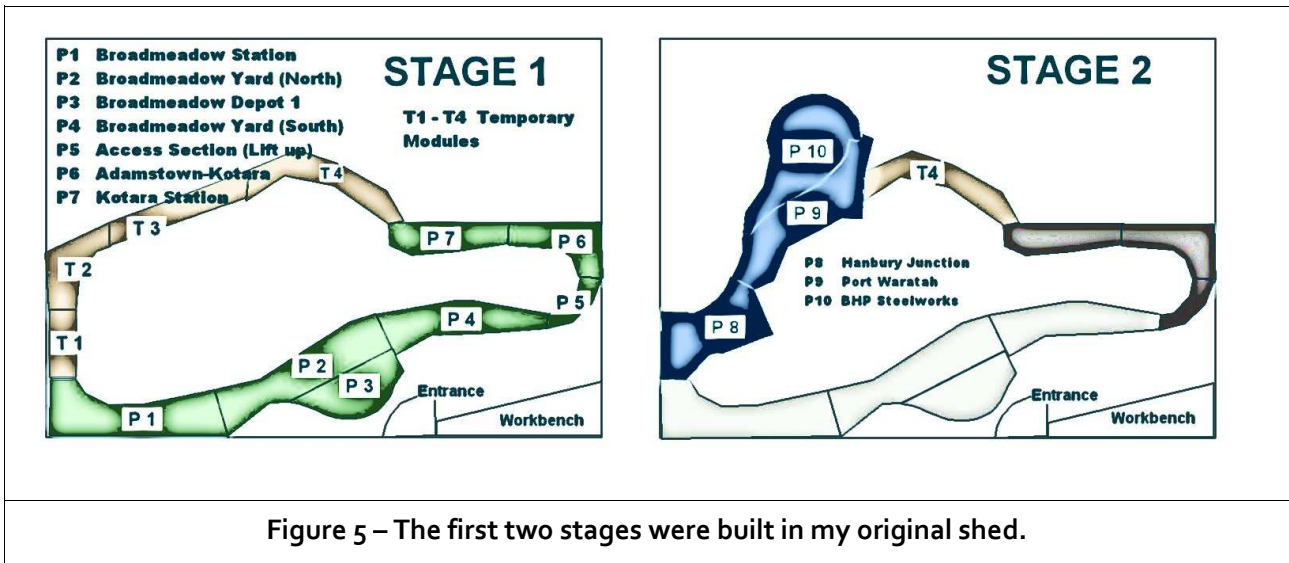
First operations began after just twelve months. This had the major benefit of widening my circle of friends, and soon there were half a dozen people offering help with various aspects of the layout as they bought into the "vision". Stage 2 quickly followed, with three more modules.

Figure 6 - Left: First Operations commenced after a year. A 44 class Diesel emerges from Tickhole tunnel (on Module 7). Note basic foam scenery Right: Stage 2 added three more modules covering the Port Waratah-Steelworks area.

Railroad Heaven from Potential Disaster

Two years into layout construction, my wife and I decided to move house. This meant abandoning my fabulous 10m*7m fully lined and insulated train "shed". This was a potential disaster!

However, by building in stages with easily separated light-weight modules, I avoided what could have been a (minor) catastrophe. Furthermore, by removing some internal walls and eliminating two bedrooms in the new house, I managed to get an even better layout room, totaling about 100 sq.m. (1,200 sq.ft.), of fully carpeted and heated internal space. This was railroad heaven! (Did I mention my wife is a saint?)

Fig 7: Moving the Layout. (Left): The Crew load a module in a truck. (Right): The transferred modules in the new layout room

A group of six friends moved the first ten modules of the layout with a small furniture van in four hours (Figure 7). It then took a couple of weeks to reinstall the specially designed aluminum legs and sub-frames, to reposition the modules, and connect up all the track, wiring etc.

The move also allowed the track plan to be further improved. Figure 8 shows how the layout has been built up in stages in the new space, with a total of 13 new modules and with operations restored at the end of each stage by using temporary connections. Some limited modifications to earlier modules were also necessary.
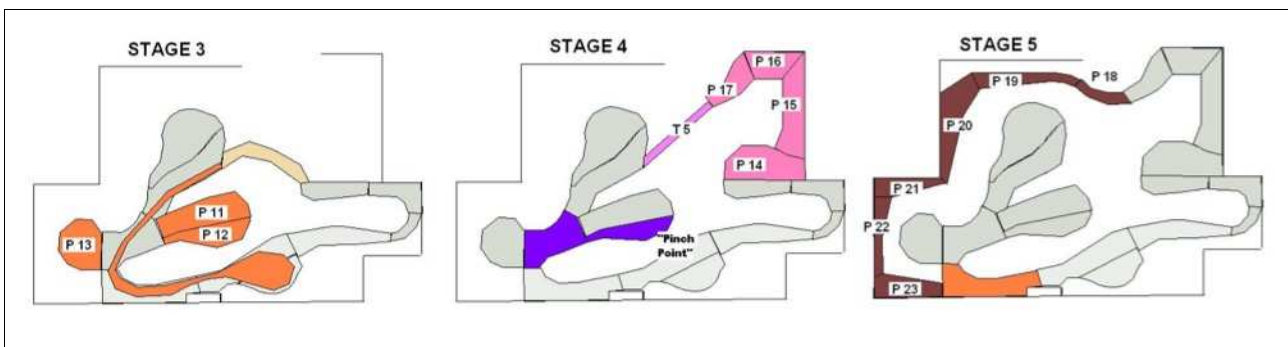
Figure 8: Stages 3, 4 and 5 have been built in the new Layout Room.

Figure 9 shows the layout as at June 2017, and includes some 23 modules. Not shown are the hidden Sydney staging area under Broadmeadow station, and the hidden North Staging area under Newcastle City, both of which feature return loops.
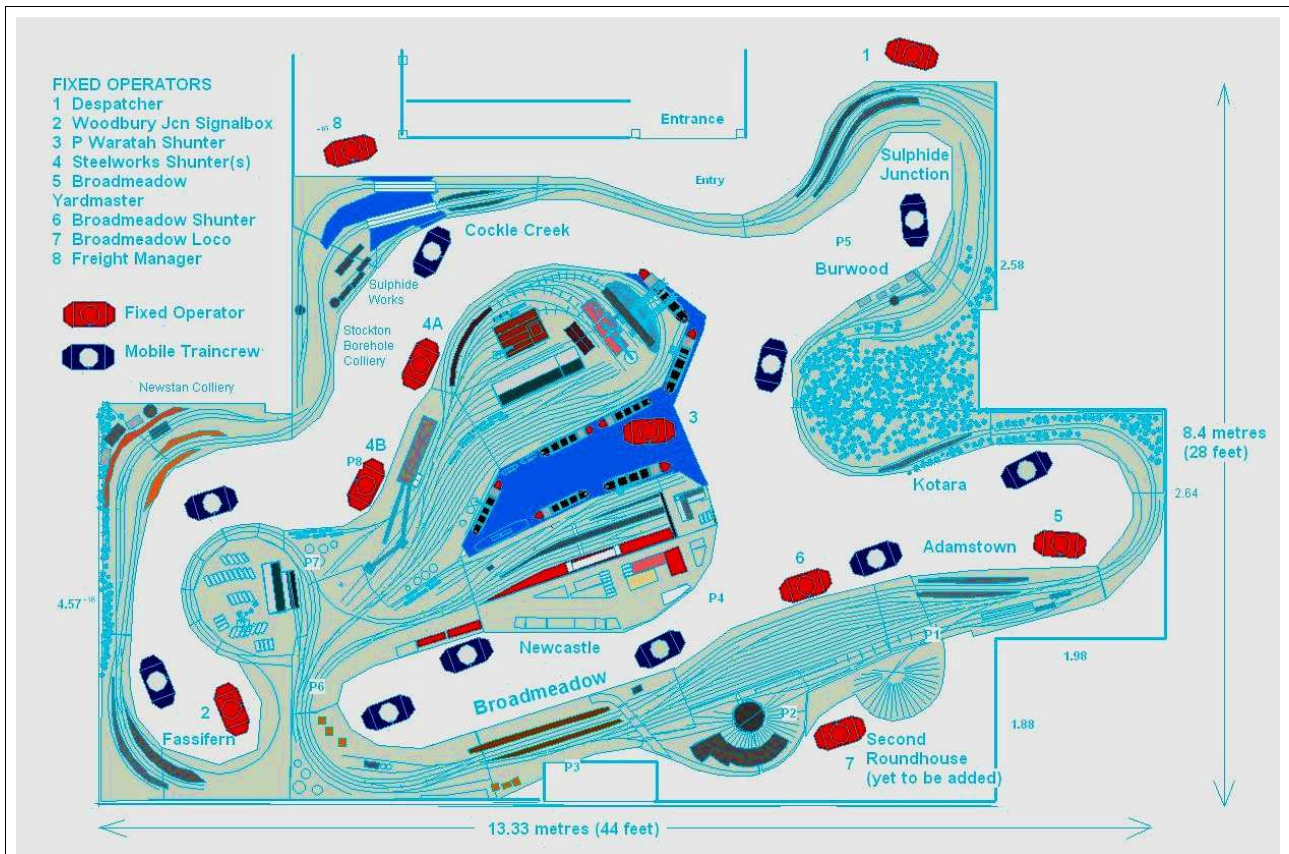
Figure 9: Layout Track Plan at June 2017. Dimensions in metres unless shown otherwise.

4   DESIGNING FOR OPERATIONS

The layout as now built is designed for up to 18 operators - 10 train crew who follow their trains (shown in blue in Figure 9) and 8 fixed operators (shown in red). Fixed operator positions are located as far as possible so as not to block the aisle-ways.

Several more additions are planned, including:
- the second roundhouse at Broadmeadow
- extension of the Burwood Branch in the alcove at the top right-hand corner of the room
- the Toronto Branch from Fassifern (at a lower level); and
- an additional staging yard under Port Waratah.

When complete there will be sufficient track capacity to hold over 35 trains and up to 50 locomotives.

The layout has been designed from the outset to be focused on operations, and I have incorporated many of the principles involved from books and articles by the likes of John Armstrong and Tony Koester as well as the OPSIG and LDSIG journals. OPSIG's wonderful new book on Operating Model Railways (OPSIG, 2017) is, in my view, an invaluable guide to building a layout designed for operations. In particular, Byron Henderson's chapter provides a very useful framework for considering these questions. He identified five "cornerstones" for layouts designed for operations, three "phases" of layout design, and a number of "tools" for achieving an effective operating layout. The table below sets out some of these, and how my layout matches up to his principles.

Table 1: Applying Byron Henderson's Design Principles

Cornerstones	
Prototype Inspiration	My layout is closely modelled on a specific prototype, and on a specific time period (roughly 1962-1970). This has worked well. Operators with experience of rail-fanning or driving trains in the Newcastle area in particular appreciate the attempt to recreate actual places and a real era.
Staging	Currently there are two staging yards - when finished there will be three with total capacity for 24 trains. All include return loops avoiding the necessity to turn trains. Some passenger consists in particular can return from staging within an operating session, as would be prototypically possible. Staging yards are 5 – 10 inches below the main layout, but hinged panels make access easy, for example to swap loads in open cars.
Major Industries	The layout features the BHP steelworks/ Port Waratah area, which generates around one-third of all coal and freight movement. There are also mid-sized industries with multiple sidings (Comsteel, Sulphide Works), four large coal mines and a range of smaller industries which together generate another third. The remainder is through traffic.
Interchanges	The layout includes the Morandoo exchange sidings at Port Waratah, where cars were interchanged with the private BHP steelworks railway.
Human Factors	These were critical to the design from the beginning, especially aisle width, locations for fixed operator positions and layout height. See comments in Table 2 below.
Design Phases	
Conceptual Phase	I designed the layout by utilizing both "Layout Design Elements" and an overall track plan which is closely based on the prototype main line and selected branch lines in the area modelled.
Structural Phase	A number of alternative plans which fit my original space (10m * 7.2m) were developed and evaluated –see earlier LDSIG article
Detailed Phase	The layout was designed in detail using 3rd Planit. But in practice there have been many minor changes made, based on track re-arrangements to achieve better operational or aesthetic results.
Tools	
Setting the Frame	I managed to include two large yards, a major passenger station and other key facilities. However, space limitations meant I had to eliminate some features I would have liked, such as Port Waratah locomotive depot, the four-track main line to Maitland, or Gosford station where trains changed from steam to electric traction. You can't have everything!
Selective Compression	Newcastle station is close to the real thing. Broadmeadow yard is somewhat reduced in length and width, but conveys the feel of the prototype especially when the second roundhouse is added. The most difficult was Port Waratah – steelworks. However, the model includes most of the key rail-related steelworks facilities, as well as a 12-track classification yard and numerous wharves and sidings.
Piecing it Together	The layout is not attached to the walls. It uses light-weight aluminium legs (with easy height adjustment by means of threaded screws inside hollow tubes), a light-weight timber supporting frame, and self-contained modules built from 3mm MDF – foam – MDF sandwiches with a 33cm high MDF "Spine". The modules were built in a separate workshop area. They simply bolt together and are largely electrically self-contained.

Some of the key parameters I adopted in my layout design, and how they have worked out in practice, are listed below:

Table 2: Design Parameters

Parameter	My Design	Experience to Date
Space for Operators	Minimum aisle width 24 inches (pinch point) and 30 - 36 inches elsewhere	Pinch point turned out to be too narrow. Layout redesigned to allow 27 inches. Aisles in front of yards generally 36 inches or more
Track Height	Main yards etc, 50 inches. (1.3 m). Hidden staging 40 – 45 inches (1-1.15m)	Designed to be relatively high so that people look "into" the steelworks, rather than down on it. Created the desired visual effect, but Broadmeadow yard should ideally be 2 inches (5cm) lower. Have built a series of low platforms for yard operators.
Minimum Radius Curves	30 inches (75cm) plus transition curves wherever possible	Satisfactory for NSW trains in the 1960's. Ideally would be larger if running modern day rolling stock.
Train and Siding Lengths	Max train length 12 feet (3.6 metres)	Based on prototype trains in the 1960's which were quite short. Yards and Staging areas have worked out well
Maximum gradient	2.5% (1 in 40) on the Fassifern "Bank", as in prototype	Maximum gradient has been eased slightly to allow for additional resistance on curves
Locomotive Control	NCE with radio throttles	Worked out well; many operators were already familiar with NCE. However, radio communication to the throttles is now becoming an issue with 17 operators blocking the signal; there are plans to upgrade and duplicate the radio base station and to add a booster.
Accessory Control	Roco Z21 system with separate auxiliary bus and radio link to IPAD touch screen control panel(s)	Having a totally separate bus has worked well to date. Touch screen control of points and semaphore signals (via PECO boards and servos) works well, with additional optional control from local control panels with toggle switches.
Fast Clock	Assumed a fast clock of 2:1	To date full timetable operations have not been successful. Experience suggests that this will require operators to be fully familiar with the prototype, the layout and operating practices. Will revert to sequence timetable and potentially introduce a 1.5: 1 fast clock in the future, to ensure yards do not become clogged.

5   PREPARING FOR AN OPERATING SESSION

"Build it and they will come"

Interest in the layout has grown rapidly over the last couple of years, and I now have nearly 50 people on my invitation list for operating sessions. These are now held approximately every six weeks. This gives me time for construction between sessions (scenery has only just begun!) and to prepare for each session, which usually takes a full week. This includes fixing electrical or other problems, cleaning track, developing the operating plan, updating the operating documents and staging trains and locos (in addition to organizing food!).

I can accommodate up to about 17 people in the train room at one time. Typically, six or seven people volunteer (or are volunteered!) for the "fixed" positions, with the remaining operators being train crew. Single man crews are used, which means the engineers have to also handle shunting at way stations, although they are assisted by yard shunters in the main yards. This means up to 10 trains can be operating at one time, some with double-headed power, with additional locos moving in the yards or loco depot. To date this has been possible with a single 5-amp NCE system, but experience suggests a booster will be needed.

Figure 10: Op Session February 2016. Fourteen operators are visible in this scene.

Inviting Operators

Operators vary from those fully familiar with both the layout and prototype operations (we have some current and past train engineers, signalmen etc.) through to novices not yet familiar with either the layout or even the NCE throttles. Some are regulars and come to nearly every session; others might come once a year. Many come from Sydney about 1 1/2 hours north; others from Canberra (2 hours south), Wollongong (1 hour east) or from the local area.

Usually I invite interest by email about three weeks before a session, and the first 17 or so to "sign up" are then invited. I try to ensure that those operators who have helped out on the layout get advance notice of a session so that they can respond quickly if able to come. Recently the level of interest has meant that it has been fully "booked" a week or two before the session.

Developing the Operating Plan

Prior to a session, I devise a timetable based on the actual NSW Railways working timetable in operation in the mid 1960's. This typically includes about 25 trains plus additional light engine movements, to be run in a two-hour operating session (See Table 3). It includes local and long-distance passenger trains, unit freights, fast freights, general freights and local "trip" or "pickup" freights, as well as loaded and empty coal trains. Most train crew would get to operate 3 or more trains in a two-hour session. Crew allocations (column 4) are updated on computer by the despatcher as trains are allocated. This way train crew can be given a variety of trains to operate.

Table 3: List of Trains Selected for an Operating Session

NO	DIRN	CLASS	CREW	TRAIN	SET	FROM	TO	LOC(S)
36X	UP	PASS	Laurie	UP Gosford Pass	31	Newcastle	Gosford (S Stag)	C35/C36/C32
403	DOWN	FAST GOODS	Alistair	Down Fruit Express	42	Flemington (S Staging)	Brisbane (N Staging)	2*DE
140	UP	PASS	Roger	UP Fassifern Pass	33	Newcastle	Fassifern	620+720 or CPH
730	UP	PASS	Dennis	UP Singleton Pass	25	Singleton (N Staging)	Newcastle	C35/36/D59/C32
964	UP	TRIP	Allan B	UP Newcastle Trip	52	Newcastle	Broadmeadow	D59/C30 tank
967	DOWN	TRIP	Ben	DOWN P Waratah Trip	53	Broadmeadow	P Waratah	D50/53
8	UP	FAST PASS	John Z	UP Armidale Mail	24	Armidale (N Staging)	Sydney (S Staging)	C36; C38
951	DOWN	COAL	Laurie	DOWN COAL (Loaded)	61	Newstan	P Waratah	2*AD60 / AD60
49X	DOWN	PASS	Alan G	DOWN Gosford Pass	31	Gosford (S Staging)	Newcastle	C35/C36/C32
645	DOWN	GOODS	Roger	Down Wheat (Empty)	44	P Waratah	Werris Ck (N Staging)	AD60/DE
31	DOWN	FAST PASS	Alistair	DOWN Newcastle Flyer	22	Sydney (S Staging)	Newcastle	C38
410	UP	GOODS	John Z	Up Main Nth Goods	56	Werris Ck (N Staging)	Enfield (S Staging)	36
637	DOWN	GOODS	Dennis	Down Steel (Empty)	46	S Staging	P Waratah	AD60
320	UP	FAST GOODS		Up Express Goods	41	Brisbane (N Staging)	Chullora (S Staging)	2*DE/AD60
325	DOWN	COAL		DOWN Coal (Loaded)	64	Burwood	Port Waratah	D50/53
455	DOWN	FAST GOODS		DOWN Livestock (Empty)	43	Homebush (S Staging)	Werris Ck (N Staging)	Diesel
920	UP	COAL		UP COAL (Empty)	62	P Waratah	Newstan	AD60
140	DOWN	PASS		DOWN Fassifern Pass	33	Fassifern	Newcastle	620+720 or CPH
715	DOWN	PASS		DOWN Singleton Pass	25	Newcastle	Singleton (N Staging)	C35/36/D59/C32
A1	UP	COAL		UP Coal (Loaded)	63	Newstan	Wangi (S Staging)	AD60+SG
231	UP	TRIP		UP Comsteel Trip	55	P Waratah	Comsteel	BHP Diesel
269	DOWN	TRIP		DOWN Pickup Goods	51	Enfield (S Staging)	Newcastle	D59
2	UP	FAST PASS		UP Brisbane Express	26	Brisbane (N Staging)	Sydney (S Staging)	2* DE
303	DOWN	PASS		DOWN Belmont Pass	34	Newcastle	Burwood	620+720 or CPH
730	UP	PASS		UP Singleton Pass	25	Singleton (N Staging)	Newcastle	C35/36/D59/C32

Figure 11: Action on the layout: Clockwise from top left: Locos preparing at Broadmeadow; A 45 Class diesel arrives at the Port with a Coal Train; Streamlined 38 departing Newcastle on a Passenger train; Garrett climbs towards Tickhole Tunnel with a steel train.

Updating the Operating Documents

Having selected which trains to run, I ensure appropriate <u>train cards</u> for each train are completed. These are developed on a large Excel File, with four train cards and four switch lists per worksheet. The worksheet is then printed on both sides of an A4 page, cut out and laminated, resulting in four single, robust train cards approximately 5 inches by 3.75 inches (13cm by 10cm), which can easily be placed in a shirt pocket. The front of the train card includes details of the train as well as its timetable and specific instructions. The back of the card includes the switch list for any cars to be added or set out at specific yards, sidings or stations (see Figure 12). Special instructions can be written in using a fine texta pen, and later removed using methylated spirits.

Currently I have developed train cards and detailed timetables for over 30 trains, covering about 5 hours of the prototype timetable. I aim to eventually have the potential to run some 120 different trains. Developing the timetable and train cards is extremely labour-intensive, but once done, the train cards can be re-used. Depending on the number of operators likely to be available for a session, it is relatively easy to select a busier or quieter time of day, or to delete some of the conditional trains (such as wheat trains, coal trains or fruit expresses) which only operated in certain seasons, or when ships were in port to load export cargoes.

SIGN ON	10:10		Min	Station	Time
NUMBER	436			NC Staging	
TRAIN	UP Wheat (L)			MN Staging	10:15
FROM	Werris Ck			Port War	11:30
TO	P Waratah			Newcastle	
LOCO(S)	AD60/DE			Woodbury J	10:19
SET	Wheat			Woodbury J	10:30
SCHEDULE	Slow Freight			Broadm Sn	
INSTRUCTIONS				Broadm Sn	
				Broadm L	11:45
				Broadm Yd	10:34
	Run from Main North Staging to Woodbury Junction. Shunt the Flour Mill (see details over) using crossoover near Broadmeadow station (subject to Woodbury Junction Signalbox). Run to Broadmeadow Yard. Re-marshall train (see details over), placing brake van on other end. Run to Port Waratah. Return loco to BML.			Broadm Yd	11:24
				Adamst'n	
				Burwood	
				Belmont	
				Kotara	
				Sulphide J	
				Sulphide J	
				Cockle Ck	
				S Borehole	
				Newstan	
				Fassifern	
				Toronto	
				S Staging	

TRAIN NO		436		
SHUNTING INSTRUCTIONS: Note - Cars to be picked up or set down represent the maximum number; actual pick-ups and set downs are limitied by availability				
AT	PU/SD	CARS		FOR
Flour Mill	SD	2* Loaded RU Hoppers		Flour Mill
	PU	4* Empty RU Hoppers		Werris Ck
Broadm Yd	SD	2* Loaded BWH Hoppers		Sydney
	SD	2*Loaded RU Hoppers		Sydney
	SD	4* Emty RU Hoppers		Werris Ck
Port War	SD	Remaining Hoppers to Export Grain Terminal		
SPECIAL INSTRUCTIONS				

Figure 12: Train Order Cards. (Left): Train Orders for a Wheat Train. (Right): Switch List.

In addition, <u>updated schedules</u> are prepared for the fixed operators, so they can tell in advance which trains are likely to appear. These are generated from a large Excel sheet recording the details of each train, including its timetable, by selecting the trains chosen for a particular operating session, and sorting them appropriately. For example, Figure13 (top) shows the first nine "DOWN" trains (i.e. those heading away from Sydney) in order of "sign on" time - when the train crew is called. This list is useful for the despatcher who allocates jobs to train crew. Figure 13 (bottom) shows the first nine "UP" trains in order of the time they pass through Woodbury Junction. This list is useful for the Woodbury Junction Signalman, who is mainly interested in trains when they pass his signal box.

DOWN TRAINS — SIGN-ON TIME

DOWN TRAINS										
SIGN ON	9:40	9:40	9:40	10:05	10:05	10:40	10:05	11:05	11:20	11:54
NUMBER	37X	27	327	965	407	50/59/30/48	637	21	949	303
TRAIN	DN Gosf Loc	Nth Cst Daylight	DN Burwd Coal	DN Newc Trip	DN Interstate	Kempsey Pass	DN Steel (E)	DN FLYER	DN CSteel Trip	DN Burw Loc
FROM	Gosford	Sydney	Burwood	Broadmeadow	Chullora	Sydney	Leightonfield	Sydney	Broadmeadow	Burwood
TO	Newcastle	Grafton	P Waratah	Newcastle	Brisbane	Kempsey	P Waratah	Newcastle	Comsteel	Newcastle
LOCO(S)	C35/C36	DE	D50/ 48	50/59/30/48	2*DE	C38; DE	AD60	C38	50/59/30/48	CPH
S Staging	9:38	9:46			10:10	10:45	10:04	11:12		
Toronto										
Fassifern	9:42	9:50			10:14	10:49	10:08	11:16		
Newstan										
S Borehole										
Cockle Ck	9:45	9:53			10:17	10:52	10:12	11:19		
Sulphide J							10:14			
Sulphide J	9:47	9:54			10:18	10:54	10:38	11:20		
Kotara	9:50	9:55			10:20	10:57	10:42	11:22		
Belmont										
Burwood			10:12							11:58
Adamst'n	9:53	9:58	10:17			10:58		11:23		12:01
Broadm Yd				10:08	10:23		10:46		11:23	
Broadm Yd				10:30	10:53		11:16		11:45	
Broadm L	10:15		9:45	10:05		11:05	11:40	11:42	11:20	
Broadm Sn	9:56	10:00				11:00		11:25		12:04
Broadm Sn	9:57	10:01	10:20			11:10		11:26		
Woodbury J	9:58	10:02	10:22	10:32	10:57	11:11	11:20	11:27	11:48	12:05
Woodbury J				10:42					11:58	
Newcastle	10:00			10:44				11:30		12:07
Port War			10:26				11:24			
MN Staging										
NC Staging		10:07			11:03	11:16				

UP TRAINS						WOODBURY JUNCTION					
SIGN ON	10:10	10:00	10:30	10:35	11:20	11:30	11:00	11:45	11:20	12:15	11:50
NUMBER	436	812	402	334	420	302	966	604	934	820	668
TRAIN	UP Wheat (L)	UP Fass Local	UP Fruit XP	P Coke (Empty)	UP Interstate	UP Burw Loc	UP Newc Trip	UP NC Goods	UP Nstan Coal	UP Fass Local	UP Steel (L)
FROM	Werris Ck	Newcastle	Coffs Harb	P Waratah	Brisbane	Newcastle	Newcastle	Grafton	P Waratah	Newcastle	P Waratah
TO	P Waratah	Fassifern	Darling Harb	alcliff (S Staging)	Chullora	Burwood	Broadmeadow	Enfield	Newstan Mine	Fassifern	Leightonfield
LOCO(S)	AD60/DE	30 tank	DE; 60+steam	AD60	2* DE	CPH	50/59/30/48	DE: 60/2*steam	AD60	620/720	AD60
NC Staging			10:35		11:24			11:50			
MN Staging	10:15										
Port War	11:30			10:46						12:10	12:30
Newcastle		10:25				11:40	11:44			12:20	
Woodbury J	10:19	10:27	10:39	10:50	11:28	11:42	11:46	11:56	12:14	12:22	12:34
Woodbury J	10:30						11:58				
Broadm Sn		10:28				11:43			12:16	12:23	
Broadm Sn				10:53							
Broadm L	11:45	10:05	11:21	10:05			12:40	12:38	11:24		11:50
Broadm Yd	10:34		10:43		11:32		12:00	12:00			
Broadm Yd	11:24		11:33		12:02			12:50			13:28
Adamst'n		10;31		10:56		11:46			12:18	12:25	
Burwood						11:49					
Belmont											
Kotara		10:34	11:37	10:59	12:06			12:54	12:21	12:27	13:32
Sulphide J		10:37		11:03				12:58	12:24	12:30	
Sulphide J			11:39	11:20	12:08			13:28	12:36		14:02
Cockle Ck		10:38	11:40	11:22	12:09			13:29	12:38	12:32	14:04
S Borehole											
Newstan								13:32	12:46		
Fassifern		10:41	11:42	11:26	12:11				12:42	12:35	14:07
Toronto											
S Staging			11:44	11:29	12:13			13:34			14:09

Figure 13: (Top): "Down" Train Timetable for Despatcher. (Bottom): "Up" Train Timetable for Woodbury Jcn.

In devising a timetable, I take into account availability of locomotives and rolling stock (including "foreign owned"), as well as factors such as avoiding too many freight trains entering Broadmeadow Yard at one time, which causes chaos.

Car Cards and Waybills

At this stage, I have avoided using individual car cards and waybills. Instead train crew are instructed to pick up or set down a given number of cars of particular types at particular locations via the switch list. These represent the maximum number to be exchanged - if fewer are available to be set down or picked up then only those available are exchanged.

Eventually I may attempt to go further and generate switch lists for individual cars. However, with over 400 freight cars on the roster, I suspect this may prove too much paperwork, unless the process can be generated by JMRI or another computer-based program. One of my operators has indeed begun developing a JMRI version of my layout so this may be a development for the future.

6   CATERING FOR ALL TASTES

Fig 14: Facilities for passengers at Newcastle station are somewhat basic, but the operators don't seem to mind.

Operators come in all shapes and sizes (literally as well as figuratively!). The layout offers a wide variety of jobs for operators with a variety of tastes, experience and skills:

- Many of the **passenger runs** are relatively straightforward, although some involve locomotive changes or swapping of cars at Newcastle or Broadmeadow.
- **Through freights** usually only stop at Broadmeadow, where they re-marshall their train and frequently change locomotive power from steam to diesel or vice versa - the North Coast Main Line from Newcastle to Brisbane was exclusively operated by diesels by the mid 1960's, but most other lines out of Newcastle were mainly steam-powered.
- **"Trip" trains or "pick up" goods trains** can need to make complex shunting manoeuvres to serve industry sidings.
- **Coal trains** in the future will be able to load real coal at the four coal mines planned for the layout. In addition, coal traffic is complex as it involved coking coal as well as dedicated coke trains to the steelworks; steaming and coking coal for export; low grade steam coal to power stations; and special deliveries of high quality steaming coal for use by the railways at various locomotive depots.

However, the really challenging jobs are the despatcher, signalmen, yardmasters and shunters.

Figure 15: Despatcher (the author) at his desk, with tools of trade.

The Despatcher (usually me) allocates jobs to fixed operators and to train crew, updates train locations (on a magnetic board), and distributes throttles and train cards (Figure 15). In theory, the despatcher knows where all the trains are (or should be) at any given time. In practice, this has proved more honoured in the breach than the observance! Keeping track of 25 or more trains on the layout, some moving quite quickly, and most running late it seems, is no easy task.

In future, a radio communications system will be installed linking the despatcher to the yardmasters and signalmen. This will allow trains to be despatched out of timetable order if required, for example in the event of failed motive power, derailments, inadequate time allowance for shunting or just operator inexperience.

Woodbury Junction is particularly complex, and the signalman routes all traffic to and from the Main North, Port Waratah, the Steelworks, Newcastle and Broadmeadow, as well as directing traffic into Sydney Staging and North Staging (see Figure 16). There are at least 25 different routes through the junction in common use, many of which conflict with other routes. In addition, trip trains can tie up the main lines when shunting local sidings.

Currently only some of the points at Woodbury Junction have been powered, but eventually the Signalman will control about 70 points and 30 signals, and handle one train or light engine movement every 3-4 (actual) minutes through the junction plus additional moves into and out of staging. This is not a job for the faint hearted!
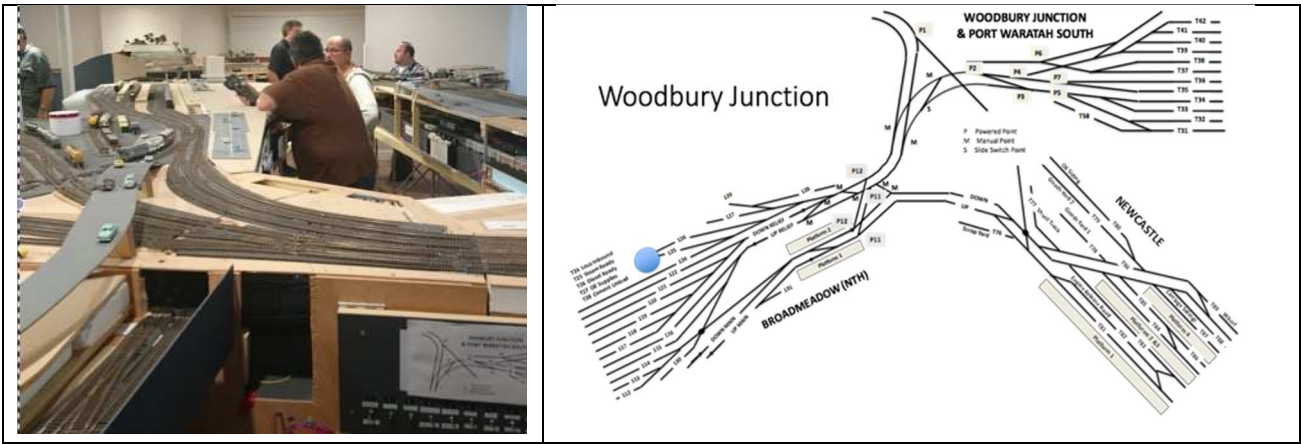
Figure 16: Woodbury Junction is the toughest operating challenge on the railway.

The yardmaster and shunter at **Broadmeadow** can also face real challenges, as they have to manage five arrival /departure tracks and six classification tracks; shunting moves to local industries; movements through Adamstown junction; and frequent moves of light engines into and out of the Locomotive Depot (Figure 17).

Fig 17: Broadmeadow yard can easily clog up.

For those operators who can't get enough shunting, there is always the **steelworks!** (Figure 18). The Steelworks / Port Waratah complex has around 70 yard tracks and sidings, and can keep two or even three operators busy (Fig 19):

- The Port Waratah Yardmaster/shunter is responsible for making up and breaking down coal, steel, wheat and trip trains, and moving cars to appropriate wharf sidings.
- The Steelworks shunter(s) handles moves within the BHP steelworks, movements into and out of the Morandoo exchange sidings, as well as movements from the steelworks to the slag dump area near the Comsteel plant (which involves venturing out onto the mainline at Woodbury Junction).

Fig 18: Steelworks showing Ore Bridge, Blast Furnace and Gas Holder in foreground, with Rolling Mill and BOF in background.
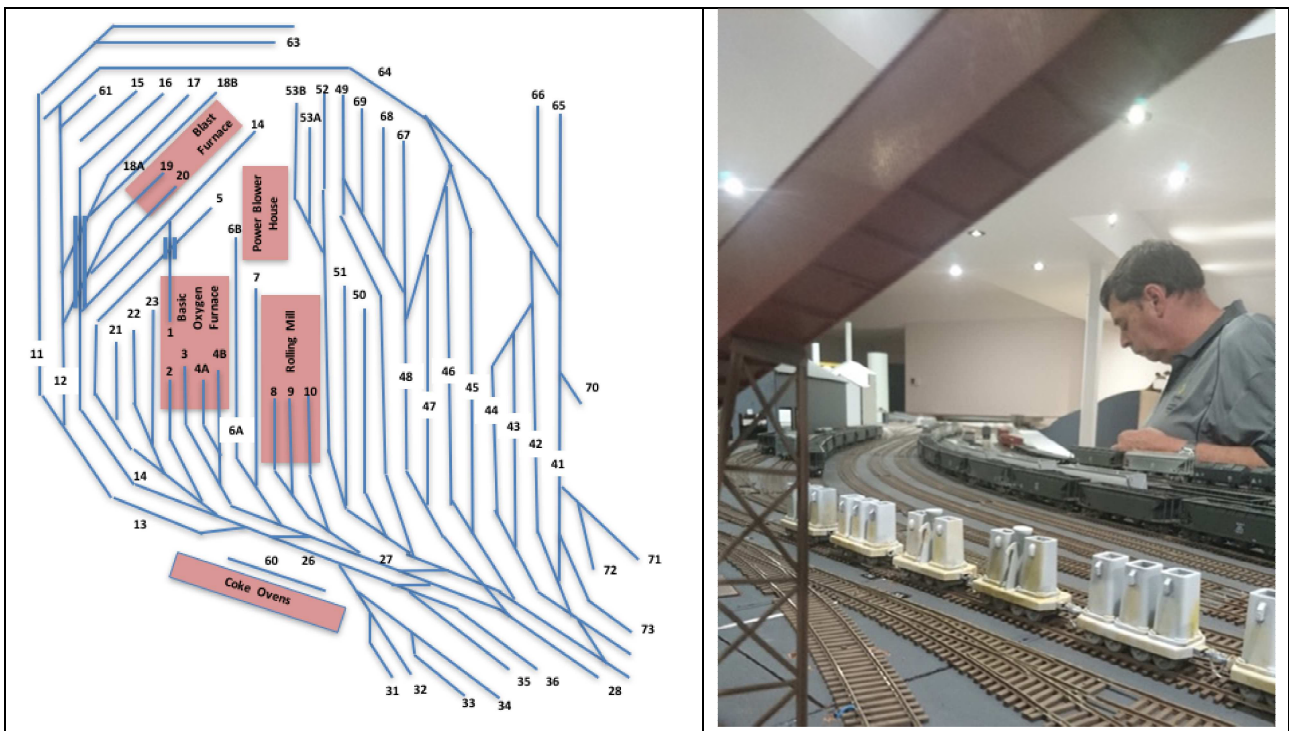

Fig 19: (Left) BHP Steelworks and Port Waratah track plan: (Right) Peter McGuire shunts Port Waratah

In a 2-hour operating session, around 40 shunting moves are required to handle movements of coal, coke, limestone, lime, hot metal, slag, ash, ingots, steel product (blooms, billets, plate steel coil steel) and refinery products between the various facilities. These include wharves, the high line, blast furnace, basic oxygen furnace, rolling mill, engine/blower house, coke ovens, refinery and slag dump. (Table 4). This would take two operators about two hours to perform completely. The moves are times to co-ordinate with arriving and departing steel, coal and trip trains.

Table 4: Steelworks Tasks

MOVE	COMMODITY		CARS	FROM ZONE	TRACK	TO ZONE	TRACK
CC1	Coking Coal		Private Coal Hoppers	Port Waratah	45,46,47	Coking Coal Unloader	35
SC1	Scrap Metal		Wagons	Morandoo	49,50,51	Scrapyard	21,22
HM4	Hot Metal		Torpedo Cars	BOS	2	Blast Furnace	19,20
LI1	Lime		Lime Hoppers	Industry – Lime Kiln	34	BOS	6A
LS2		Empty	Limestone Hoppers	Lime Kiln Unload	33	Ore Wharf	61
IN1	Ingots (Hot Steel)		Ingot Cars	BOS	4A,4B	Rolling Mill	8
BB1	Steel Products		Flat Cars, Wagons	Rolling Mill	9,10	Morandoo	47,48.49
SC2			Scrap Buggies	Scrapyard	23	BOS	1
CC2	Coke		Private Coal Hoppers	Coke Loadout	35	High Line	16
FS1	Slag		Slag Cars	Blast Furnace, BOS	18A, 3	West Yard	12
BS1	Ash		Side Dump Cars	BF, P House, BOS	18B,7	West Yard	12
IN2	Ingots (Empty)	Empty	Ingot Cars	Rolling Mill	8	BOS	4A,4B
HM1		Empty	Torpedo Cars	Blast furnace	19, 20	BOS	2
HM5	Hot Metal		Pollock Cars	Blast Furnace	19,20	West Yard	12
CS1	Slag, Ash, Hot Metal		Various	West Yard	12	COMSTEEL	80
LI2		Empty	Lime Hoppers	BOS	6A	Lime Kiln	34
CC3		Empty	Private Coal Hoppers	High Line	16	Port Waratah	45,46,47
IN1	Ingots (Hot Steel)		Ingot Cars	BOS	4A,4B	Rolling Mill	8
HM4		Empty	Torpedo Cars	BOS	2	Blast Furnace	19,20
CS1	Coil Steel		Wagons	Coil Steel Yard	53A,53B	Morandoo	47,48,49
SP1	Steel Products		Flat Cars, Wagons	Morandoo	47,48,49	Export Wharf	63
CO1	Coke		Coal Hoppers	Port Waratah	45,46,47	High Line	16
HM1	Hot Metal		Torpedo Cars	Blast furnace	19, 20	BOS	2
IN2	Ingots (Empty)	Empty	Ingot Cars	Rolling Mill	8	BOS	4A,4B
CS2		Empty	Various	COMSTEEL	80	West Yard	12
BS2		Empty	Side Dump Cars	West Yard	12	BF, P House, BOS	18B,7
FS2		Empty	Slag Cars	West Yard	12	B Furnace, BOS	18A,3
SC3		Empty	Wagons	BOS	1	Scrapyard	23
HM2		Empty	Torpedo Cars	BOS	2	De-kishing station	17
IN1	Ingots (Hot Steel)		Ingot Cars	BOS	4A,4B	Rolling Mill	8
RF1		Empty	Tank Cars	Morandoo	49,50,51	Refinery	31,32
SC4		Empty	Scrap Buggies	Scrapyard	21,22	Morandoo	50,51,52
SC1	Steaming Coal		4-wheel coal hoppers	Port Waratah	42,43,44	Power House	6B
CS2		Empty	Wagons	Morandoo	46,47,48	Coil Steel Yard	53A,53B
BB2		Empty	Flat Cars, Wagons	Morandoo	46,47,48	Rolling Mill	9,10
IN2	Ingots (Empty)	Empty	Ingot Cars	Rolling Mill	8	BOS	4A,4B
HM6		Empty	Pollock Cars	West Yard	12	Blast Furnace	19,20
CO2		Empty	Coal Hoppers	High Line	16	Port Waratah	45,46,47
HM3		Empty	Torpedo Cars	De-kishing station	17	Blast Furnace	19,20
LS1	Limestone		Limestone Hoppers	Ore Wharf	61	Kiln Unload Track	33
SC2		Empty	4-wheel coal hoppers	Power House	6B	Port Waratah	42,43,44
RF2	Benzol, Tar		Tank Cars	Refinery	31,32	Morandoo	50,51,52
SP2		Empty	Flat Cars, Wagons	Export Wharf	63	Morandoo	47,48,49

Figure 20: Clockwise from top left: 4104 shunts scrap steel to the BOS on the high line; BHP centre-cab loco with mixed rolling stock; Ore Bridge and Blast Furnace; BHP locos on torpedo and slag cars at a Blast Furnace. Prototype photos by Leon Oberg.

7   OPERATING MANUAL AND RULEBOOK

Operating Manual

A 28-page Operating Manual has been developed to help operators familiarize themselves with the layout and operating plan, and is available on the website (www.newcastle-modelrail.com). To my surprise, quite a few people have actually read it!

The manual is periodically updated, and includes information on:

- The Prototype Railway
- The Track Plan and how it was selectively compressed from the Prototype
- Control Systems and System Architecture
- Rules for Train Crew
- Specific Rules for Fixed Location Operators

One aspect yet to be developed is **a communications system** between the despatcher, signal boxes, yardmasters and locomotive foreman. This will be particularly useful since experience shows trains seem to show up unexpectedly all over the place despite the best intentions of the timetable staff! Seth Neumann's article in the OPSIG Compendium should prove invaluable in that respect.

The Rule Book

There is also a set of Rules, partly tongue in cheek, designed to smooth operations (figure 21):

THE RULEBOOK	
Rule 1	**"UP" trains are headed South, to Sydney. "DOWN" trains are headed North**, away from Sydney. South in this part of the world is always to your left as you face the layout. North is always to your right. **Those people having difficult distinguishing their left from their right or of other political persuasions should report to the Despatcher for training.**
Rule 2	**RULE 2:** Engine Crew will obtain their **instructions from the Despatcher** in the form of a Train Instructions Card. These list details of train location, locomotive(s) including any changes, origin and destination stations, and details of any cars to be picked up or set down. They will also receive a throttle at this time. Throttles and Train Cards should be returned to the despatcher on completion of that duty. The despatcher will allocate trains to crew on the basis of traffic requirements and seniority. **No correspondence will be entered into with the despatcher but appropriate bribes will be accepted.**
Rule 3	Train crew and others are instructed that new **Occupational Health and Safety** procedures at the layout entrance are in effect, involving a duck under. Use of this facility whilst a train is passing overhead is dangerous and potentially expensive, especially if a brass locomotive is involved, and should be avoided.
Rule 4	Train Crew should, if necessary, pick up their loco from the ready tracks at Broadmeadow Loco under the instructions of the **Roundhouse Foreman**. No swearing will be tolerated in the event of a defective locomotive being allocated. They should return their loco, if appropriate, to the servicing track at BML (Broadmeadow Loco) and report any defects in locomotive performance to the Roundhouse Foreman. Limited use of expletives is permitted at this time.
Rule 5	Train Crew must obey the instructions from the **Fat Controller** (Woodbury Junction Signalman) at all times, in particular when entering or leaving Port Waratah, Newcastle, Broadmeadow or staging. See Rule 4 with regard to the use of expletives.
Rule 6	All trains passing through Adamstown (whether from the main line, the Belmont Branch or the Yard) should hold at the appropriate signal for clearance by the Broadmeadow Yardmaster/Signalman prior to proceeding. Any **derailments** due to failure to follow this rule will result in demerit points and downgrading from Grange Hermitage to Chateau Nui San Wagga Wagga*, or for repeat offenders, to Coca Cola.
Rule 7	**Points** outside of Hanbury Junction and Adamstown areas are still manually operated, and should be returned to "main line" positions after departure. See Rule 6 regarding derailments.
Rule 8	**COMPLAINTS.** All complaints regarding electrical malfunctions should be referred to Lachlan McGuire, chief electrical engineer. All complaints regarding signals (or lack thereof) should be referred to Roger Tuck, chief signalling engineer. **All other complaints will be ignored**
*	For those not familiar with Australian wines, see Monty Python Skit at https://www.youtube.com/watch?v=RbOZccv9ym8. The reference to Chateau Nui San Wagga Wagga comes at the end of the skit.

Figure 21: The Rulebook

As is evident from the rulebook, my attitude to operating sessions is somewhat on the relaxed side - its lucky I'm not in charge of a real railway! Part of the fun for me is watching the chaos emerge and seeing how the operators cope with it.

Fortunately, most of the operators also take a reasonably relaxed approach, although some do seriously try to get things to run as smoothly and prototypically as possible. But with up to 30 trains in a two-hour session, and up to five freight trains in Broadmeadow yard all wanting to exchange cars, seamless operation has yet to be achieved!

Figure 22: Things aren't always handled prototypically, but the main idea is to have fun.

Op till you drop: Formal and Informal Sessions

Because many operators come from several hours away, and because operators vary in skills, experience and tastes, I generally run an "operating day" as follows:

Table 5: The Operating Day

Time	Activity
10:00am – 10:30am	Coffee, Orientation, Set-up
10:30am – 12:30pm	FORMAL Operating Session
12:30pm – 1:30 pm	Lunch
1:30 pm – 3:30 pm	INFORMAL Operating Session
3:30 pm – 4 pm	Coffee and General Chat

The **FORMAL** Sessions attempt to run a timetable based on the mid 1960's prototype, with only those locomotives and trains which are appropriate being used (fortunately, many operators bring not only appropriate locos and rolling stock but also their own NCE throttles). The timetable is a cut down version of the actual working timetable, adjusted to take account of the compression of distances, as discussed earlier.

To date this has been run both as a simple "sequence" timetable, and as a true timetable with a 2:1 fast clock. However, the latter has so far proved unworkable, and a 1.5: 1 fast clock will be trialed in future to give people more time for shunting and to reduce the intensity of train movements. As it is, there can be over 30 train and light engine movements through Woodbury Junction in 2 hours, or one every 4 minutes of actual time.

Figure 23: Scenes from around the layout. Photos by Richard Batterley

The **INFORMAL** sessions are for people to run their own trains and to just have fun without the stress of a timetable or schedule. Many operators don't have their own layouts, but value the opportunity to run their own rolling stock on a medium sized layout. And since many of them have made major contributions to the layout, including building structures, installing decoders, wiring, and building and installing signals, I enjoy being able to provide a venue for others to just run trains. In addition, I get to run trains myself! (instead of being the "fat controller / despatcher")

Past sessions sometimes run through till 6pm, so I assume people must be enjoying themselves. Much of the enjoyment I think comes from people just getting together and chatting about their latest triumphs or disasters. There is also a massive amount of experience shared, from decoder installations to scenery techniques.

CONCLUSIONS

Although there are as yet little by way of scenery and relatively few structures on the Newcastle - Fassifern Railway, this doesn't seem to bother people, and many seem to enjoy running trains on "medium density

fibre-board central". So, I would encourage people to get into operations as soon as they can, and not to worry about having a finished layout. In fact, operations can rapidly expand your network of friends and with it the range of skills and experience you can draw on. It can also help you debug your track work and wiring before scenery gets in the way.

While the main aim is to have fun, I feel there is real value in trying to operate a layout as closely to prototype practice as possible, whilst at the same time not getting too bogged down in paperwork. I think there is a lot of satisfaction from replicating the actual transportation system which railways provide. For me, much of the fun comes from trying to reproduce the wonderful variety provided by the real Newcastle railway in the mid 1960's and re-creating "rail fan" heaven.

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For a video of recent Coal Train action in the Hunter Valley, NSW, see for example https://www.youtube.com/watch?v=r5UIAT00Q80.

For videos of rail action in the Hunter in the 1960's, see for example https://www.youtube.com/watch?v=ePpG4tVHSMQ&t=273s

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