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National  
Broadband  
Network

# 3MLT-10 Deployment Trial Post Implementation Results and Recommendations - Industry Pack

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NBN Co Construction Services Group  
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## 3MLT-10 Deployment Trial Background

The Melton 10 (3MLT-10) Deployment Trial was initiated by NBN Co to create an internal baseline/benchmark for programme, productivity and cost performance utilising:

1. The Render deployment management system;
2. Innovative specified equipment;
3. Innovative build methods and work practices;
4. Project governance initiatives; and
5. Build Drop installation during LN/DN build.

Telstra remediation works commenced in January 2014. NBN Co engaged Australian Broadband Company, Celemetrix, Comms Connect and Linktech directly to carry out the works with a uniform Schedule of rates. Specified equipment was free issued by NBN Co to the Contractors.

3MLT-10 is a large residential FSAM with 2484 GNAF's (2459 SDU, 25 MDU). It contains a mixture of old and new infrastructure and is a rocky area. There is also a relatively large number of 5 and 1 acre lots and standard residential blocks within the FSAM.

The 3MLT-10 deployment was the first to utilise a Telstra FIR / NBN Co design. A separate Post Implementation analysis for Design is currently being completed by NBN Co's Design group.

## 3MLT-10 Scorecard for Comparison

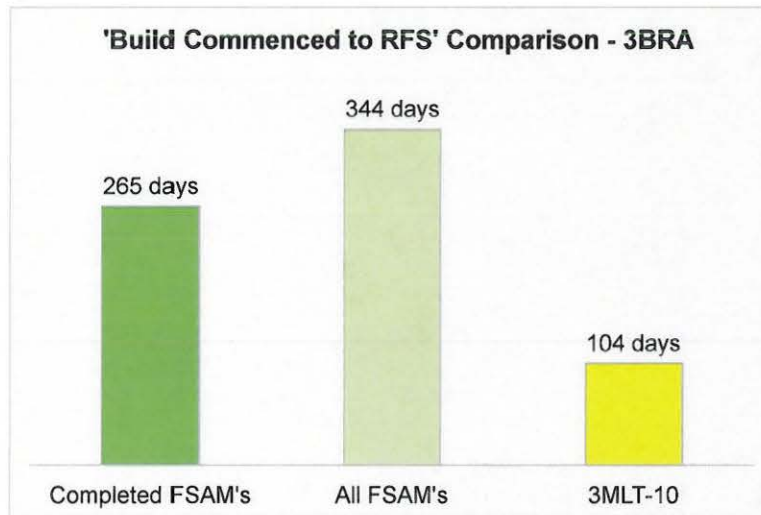
Deployment data for all FSAMs 'Ready for Service' or 'Build Commenced' in the Ballarat 2 CSA (3BRA) has been used as the basis for comparison. This results in a group of 20 FSAMs for comparison.

The scorecard items below was prepared and agreed by all of the NBN Co Stakeholders prior to commencement of the trial, and was to be the basis for comparison at the end of the trial period.

Subject	Metric	Method of Measurement
HSE	Audit Completion Rate	% of audits and inspections achieved
	Asset Strike Rate	Average strikes per 10km of duct
	Cost of Asset Strikes	Asset strikes per FSAM * \$10k/Strike
Cost	Per Premise Cost @ SC1	Average Per Premise Costs
	Average cost per drop	Average Per Premise Costs
	Per Premise Cost @ SC2	Average Per Premise Costs
Build	Build Duration to SC1 (RFS)	Business days post Telstra Handover
	Build Duration to SC2	Business days post Telstra Handover
Quality	Submit to Met FDA PC	Average calendar day duration
	Qty Major defects	Average quantity per FSAM
	Qty M1 defects	Average quantity per FSAM
Stakeholder Management	Customer Complaints	% of complaints per premises passed

# 3MLT-10 Programme and Cost per GNAF Results

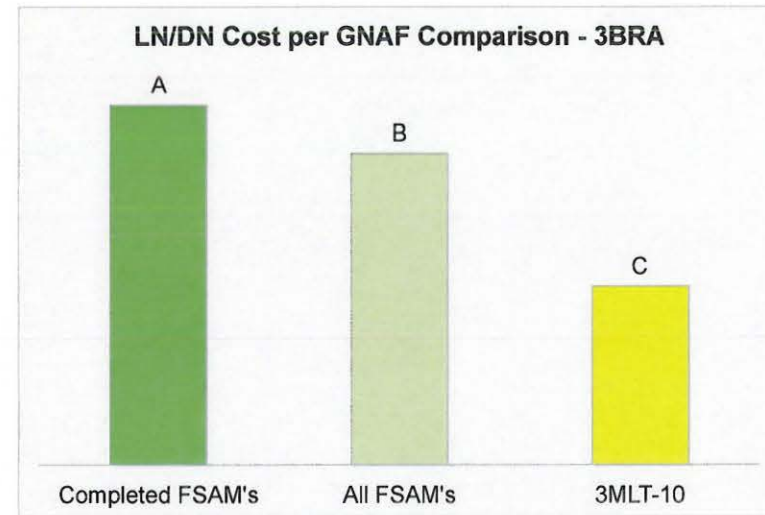
## Programme



3MLT-10 was completed:

- 61% faster than FSAMs completed in 3BRA to date (161 business days faster)
- 70% faster than all FSAMs commenced in 3BRA to date (240 business days faster)

## Cost per GNAF



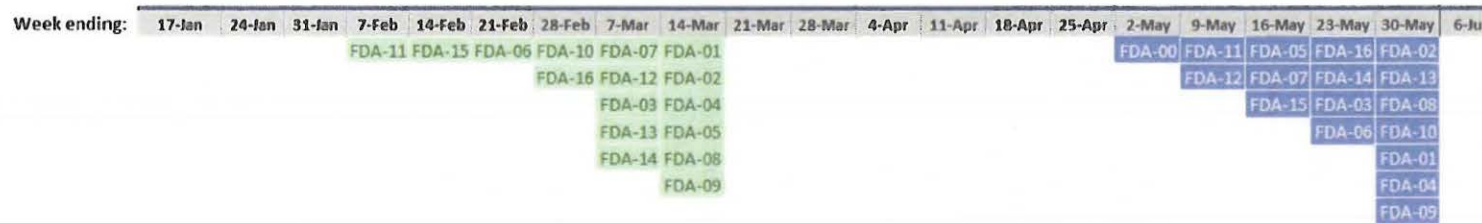
3MLT-10 was completed:

- 50% cheaper than FSAMs completed in 3BRA to date
- 43% cheaper than all FSAMs commenced in 3BRA to date

# 3MLT-10 Build Timeline

## LN/DN:

### Key Milestones and Timeframes



Build drops: 90% SC2 threshold is forecast to be achieved 29 August (131 business days)

### 3MLT-10 Build Timeline compared to 3BRA FSAMs to date

This chart includes the 'Build Commenced to RFS' programme for all FSAMs commenced to date in Ballarat 2 CSA (3BRA). Dark green are RFS FSAMs and light green are Build Commenced FSAMs. 3MLT-10 is RFS and is yellow. FSAMs are sorted by Build Commenced date.

FSA	FSAM	GNAP's	Build Status	CACI Issued	RFS	Business Days	Cost Status	2013								2014				20			
								Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2				
Bacchus Marsh	3BAC-02	2,093	RFS	31/07/12	05/04/13	179	Actual																
Bacchus Marsh	3BAC-01	2,443	RFS	20/09/12	24/07/13	220	Actual																
Bacchus Marsh	3BAC-03	2,021	RFS	30/09/12	17/07/13	209	Actual																
Ballarat	3BRA-01	2,688	RFS	30/09/12	14/02/14	361	Actual																
Melton	3MLT-06	2,576	Build Commenced	31/12/12	14/11/14	490	EAC																
Melton	3MLT-07	2,458	Build Commenced	31/12/12	14/11/14	490	EAC																
Ballarat	3BRA-02	2,793	RFS	31/12/12	15/11/13	230	Actual																
Ballarat	3BRA-03*	2,214	RFS	31/12/12	05/03/14	308	Actual																
Melton	3MLT-09	2,147	Build Commenced	31/03/13	15/12/14	447	EAC																
Ballarat	3BRA-04	2,143	Build Commenced	31/03/13	22/08/14	366	EAC																
Melton	3MLT-08	2,602	Build Commenced	31/03/13	14/11/14	426	EAC																
Creswick	3CRW-01	1,341	RFS	31/03/13	01/08/14	351	Actual																
Melton	3MLT-02	2,111	Build Commenced	30/06/13	08/10/14	334	EAC																
Bacchus Marsh	3BAC-05	822	Build Commenced	30/06/13	15/05/15	491	EAC																
Ballarat	3BRA-05	2,427	Build Commenced	31/08/13	15/12/14	337	EAC																
Ballarat	3BRA-06	2,572	Build Commenced	31/08/13	13/02/15	381	EAC																
Ballarat	3BRA-07	2,205	Build Commenced	31/12/13	13/03/15	314	EAC																
Ballarat	3BRA-08	2,228	Build Commenced	31/12/13	15/12/14	250	EAC																
Melton	3MLT-10	2,484	RFS	28/02/14	23/07/14	104	Actual																

## 3MLT-10 Productivity Results compared to Vic Averages

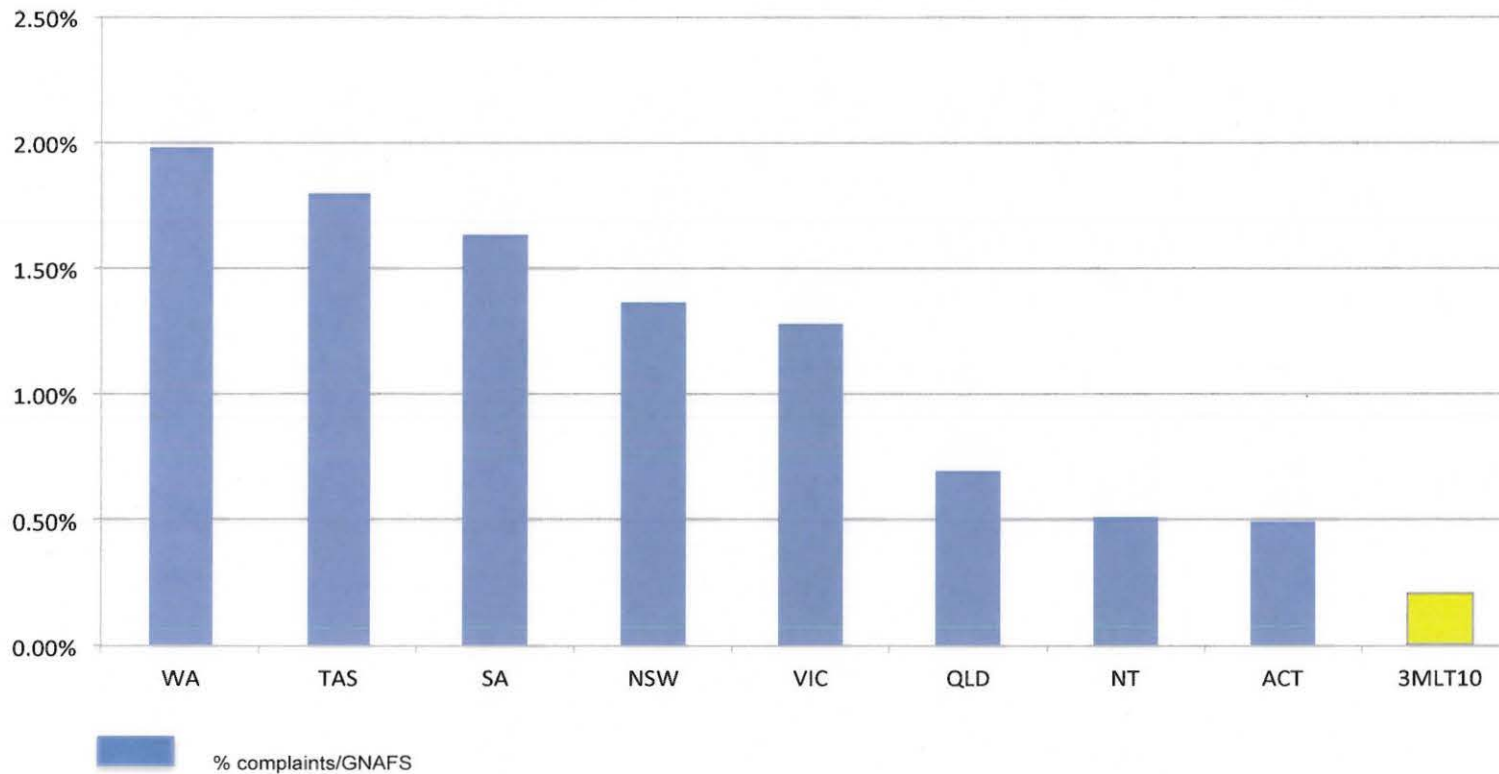
P6 Activity ID	Metric	Vic Average	3MLT-10	3MLT-10 vs Vic Average	Units
ULN-1000	Boring - Underground Local	40	102	+ 154%	metres/day
ULN-1005	Trenching - Underground Local	20	68	+ 250%	metres/day
ULN-1010	Pit Installation - Underground Local	0.6	2.0	+ 233%	qty/day
ULN-1030	Cable Hauling - Underground Local	692	1195	+ 73%	metres/day
ULN-1040	Install Multiports - Underground Local	4.1	12.0	+ 193%	qty/day
ULN-1050	Cable Splicing - Underground Local	25	31	+ 22%	ribbons/day
DN-1020	Cable Hauling - Distribution	185	251	+ 36%	metres/day
DN-1030	Cable Splicing - Distribution	18	46	+ 160%	ribbons/day
DN-1000	Boring - Distribution	38	66	+ 74%	metres/day
DN-1005	Trenching - Distribution	14	63	+ 337%	metres/day
DN-1010	Pit Installation - Distribution	0.4	2.0	+ 400%	qty/day
DN-1050	FDH Cabinet Installation - Distribution	0.8	3.0	+ 275%	qty/day

Source: P6

## 3MLT-10 Customer Complaints Results

Despite having a lower level of overheads and carrying out Build Drops in parallel with the LN/DN deployment, the 3MLT-10 team received a very low level of complaints from the Public.

Jan 14 – May 14 average complaints per premises passed





## 3MLT-10 Scorecard at Completion

This 3MLT-10 Deployment Trial scorecard is included below.

Subject	Metric	Method of Measurement	3BRA Average	3MLT-10
HSE	Audit Completion Rate	% of audits and inspections achieved	Variable	100%
	Asset Strike Rate	Average strikes per 10km of duct	2	0
	Cost of Asset Strikes	Asset strikes per FSAM * \$10k/Strike	\$20,000	\$0
Cost	Per Premise Cost @ SC1	Average Per Premise Costs	\$ X	\$ X - 43%
	Average cost per drop	Average Per Premise Costs	\$ Y	\$ Y - 23%
	Per Premise Cost @ SC2	Average Per Premise Costs	\$ Z	\$ Z - 40%
Build	Build Duration to SC1 (RFS)	Business days post Telstra Handover	344 days	104 days
	Build Duration to SC2	Business days post Telstra Handover	501 days	131 days
Quality	Submit to Met FDA PC	Average calendar day duration	95 Days	51 days
	Qty Major defects	Average quantity per FSAM	16	71
	Qty M1 defects	Average quantity per FSAM	7.5	31
Stakeholder Management	Customer Complaints	% of complaints per premises passed	1.12%	0.20%

Note: HSE, Cost, Quality, Stakeholder Management data is updated to 30 June, excluding average cost per drop which is February data. Build data is updated to 30 July.

## 3MLT-10 Render Deployment Management Results

Following a technical Proof of Concept, the Render deployment management methodology was trialled in 3MLT-10. Render was used to:

1. Automatically create the work scope, material BOQ directly from the DDD, including the asset data and construction sequence.
2. Allocate work to Contractors in advance using the work scope information created.
3. Automatically create the work schedule based on committed allocated resources.
4. Release 4 days worth of work to crews each day(top up) to ensure continuity & visibility of work.
5. Only release jobs that were ready to be done, i.e. all preceding tasks had been completed.
6. Status completed work daily then optimally reschedule the remaining work.
7. Capture as-built information at the task level on the day it was completed wherever possible, taking advantage of the detail extracted from the DDD in the task data.
8. Automatically update progress status and view scope/resource/asset/location/cost/programme data centrally, visible on Google maps.
9. Build the network as it was designed, eliminating “air gaps” and red-line mark ups.
10. Sequence and manage build drops concurrently with the LN/DN build.

The task based approach created by the Render tools took some time to become familiar to the teams after which time it was used to deploy and manage the work. There is still some work to be done on the functionality of the system however it performed well.

## 3MLT-10 Deployment Management Results

### Reduced administration and simplify the following for NBN Co and Contractors:

- Work Scope – defining scope at the task/asset/address level
- Work Visibility - viewing all elements of the deployment on Google maps, from high level to task level to address level
- Variation Management – measure design and in-field variations at the task/asset/resource level
- Work Allocation – commit work volumes at the task level to Contractors
- Progress reporting – automated, accurate and updated on a daily basis (Report 004)
- Jeopardy management – manage issues at the task/asset/address/resource level
- HSE & Quality management – integrated at the task/resource/asset level

### Improve productivity, resource utilisation and forecast accuracy:

- Schedule optimisation – automated daily schedule optimisation, accurate forecasts
- Contractor productivity – ability to monitor productivity at the task/crew level
- Crew utilisation – maximised productivity of resources each day
- As-built management – updated as-built data accurately at the task/asset level daily



## 3MLT-10 Innovative Specified Equipment Results

### SMALL DIAMETER CABLE



**Overall indications are that SDC is 10-20% faster to deploy**

- Lighter and more flexible making the cable easier to handle and transport
- Easy to coil (smaller layout area required) for cable directional changes during haul, greater utilisation of Telstra infrastructure
- Less physical strain on crew – HSE benefit + reduction in crew number required for hauling

### SMALL FOOTPRINT MULTIPOINT



**Significantly increased installation efficiency – 5 mins install vs. 15 minute install for traditional multipoint**

- No requirement to mount the multipoint
- Can be used in smaller pits, reducing the need for Telstra pit remediation which significantly reduces HSE risk associated with Asbestos Containing Material (ACM)
- Quality issue with connection waterproofing is under investigation by the CTO group.

## 3MLT-10 Innovative Build Methods and Work Practices Results

### Intelligent Optical Loss Measurement (IOLM) Testing

- Provided a 66% reduction in testing time
- Automated test result capture and upload
- Enabled real time defect rectification and smoother handover when FSAM complete/less defects
- Removed subjectivity regarding test results

### HSE initiatives:

- Safety barricading in lieu of bunting
- Waste water harvesting and re-use
- Distribution pipe straightener removed memory of the 100mm pipes minimising HS&E incidents

### In Line Jointing:

- Significantly reduces the number of splices required.

### 100% Asset Locating

- Investment in asset locating resulted in zero asset strikes.
- Non destructive potholing/Hydro Vacuum:
- Ground Penetrating Radar was trialled and had mixed results impacted by the soil conditions
- Use of the Sub Surface Instruments All Material Locator (AML) was an effective method of identifying buried assets

### Design walkout/Constructability Review:

- Joint NBN Co/Contractor constructability walkout prior to completion of the design would have eliminated many of the design variations encountered.

### Purpose stocked Trailer for drops:

- Engaged Kennards to trial.
- Proven initial success.

## 3MLT-10 Project Governance Initiatives Results

### HS&E

- “Zero strike zone” approach for asset strikes
- Safety in design and pro active hazard identification and mitigation

### Work Allocation at the task level

- Allocate work as far in advance as appropriate at the Contractor level
- Allocate additional work based on performance

### Program Scheduling

- With Contractors, scheduled and issue the work, crew by crew with a 4 day look ahead, and then updated progress
- Provided accurate forecasts to all Stakeholders

### Jeopardy Management

- Proactively managed the jeopardy issues at the task/resource/address level

### Project Governance Meetings (twice a week)

- Provided a forum to jointly address schedule, resourcing and jeopardy issues
- Progress and earned value analysis by Contractor, CPA Report 004.

### Focus on Culture and Work Environment

- Established site office and warehouse and ran daily site (toolbox) meetings
- Less administration and simpler processes
- Focus on completing tasks and moving on the next without looking back

### Reduction in PC to RFS timeframe

- Captured as built data as the work progressed daily

### Quality

- Automated Quality inspection management process based on newly created business rules

## 3MLT-10 Build Drop Installation during LN/DN Build Results

Build drop installation was carried out concurrently with the LN/DN deployment. The following were the key lessons learned from the trial:

1. Efficiencies are achieved through crews specialising in particular elements of build drops.
2. Mobilising once to carry out build drops as well as LN/DN was well received by the Public as it minimised disruptions in the area.
3. The commercial engagement model needs to take into consideration the broad range of different circumstances regarding drop construction.
4. Rates for drops were not considered attractive by Contractors and two contractors walked away from the work. Contractors who carried out LN/DN at the same time as Build Drop works were able to manage this better, in effect “subsidising” the drop work with the LN/DN at times.
5. Scoping/proving of drops is recommended as a schedule of rate item. Reward for success as an incentive for utilising a LIC is also recommended.
6. Build drop installation concurrent with LN/DN eliminates the occurrence of “air gaps”. The 3MLT-10 team insisted works be constructed as designed.
7. HSE needs to be maintained with the drop crews as diligently as it is with the LN/DN crews.
8. Drops need to be viewed as potentially a series of tasks not a single task to further enhance efficiency – scoping, dig down, pcd installation, install drop, splice. (Per the Render approach)
9. Direct burying of drops needs to be further investigated.

## 3MLT-10 Deployment Trial RECOMMENDATIONS

Based on the results and experience gathered during the Melton 10 Deployment Trial, the following actions are recommended:

### 1. The Render deployment management methodology and system

- Broad adoption of a deployment methodology and system by NBN Co and Contractors within appropriate commercial frameworks.

### 2. Innovative specified equipment

- Broad use of small diameter cable and small footprint multiports, pending resolution of the seal quality issue.

### 3. Innovative build methods and work practices

- Broad adoption of Intelligent Optical Line Measurement testing system and procedures as the evolving Industry Standard,
  - Implement the Phase 2 IOLM initiatives – Automation of integration to NBN Co Workbooks
- Broad adoption of the Rapidmap to support the design walkout & constructability reviews (ideally) prior to completion of design and prior to the commencement of construction



## 3MLT-10 Deployment Trial RECOMMENDATIONS

- **Innovative build methods and work practices (Cont)**
  - Broad adoption of 100% asset location prior to commencing civil works,
  - Utilize rigid site barricading in lieu of bunting and star pickets, use of Pit covers to avoid trip hazards *(A nation wide arrangement has been put in place to make these items available to our delivery partners )*
  - Industry should develop and invest the bore pipe straightening methods.
  - In-line jointing technique should be widely adopted across the Fibre program
  - Utilize the Trenchless Advisory Board to assist NBN Co Field teams and Delivery Partners in a Civil skills assessment and uplift, safety and Hazard identification / mitigation techniques.
- 4. **Project governance initiatives**
  - Broad adoption of the “Zero Strike Zone” approach
  - Broad adoption of the work allocation, program scheduling, jeopardy management, project governance meetings, focus on culture and work environment, PC to RFS and quality initiatives across all programs.
- 5. **Build Drops installation during LN/DN deployment**
  - Broad adoption of build drop installation in parallel with LN/DN works.