

# GeoCivil

# DATA PREPARATION AND EXPORT TO D-SPEC

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# SUPPLY OF DIGITAL DATA TO COUNCILS

**D-SPEC** is the acronym for the Consultant/Developer Specifications for the delivery of Digital Data to Local Government. A consortium of Councils/Utilities was formed to participate in the use of the D-SPEC standard; these being

**Bass Coast Baw Baw** Brimbank **Ballarat** Casey Colac-Otway Greater Dandenong Greater Geelong Hume Latrobe Melbourne Melton Mitchell Surf Coast Wellington Whittlesea Wyndham

The D-SPEC standard was developed to streamline the processes undertaken to display all new drainage assets and telecommunication conduits within each D-SPEC member's GIS.

A common specification for the supply of digital drainage data was identified as a major opportunity for the consortium members to achieve efficiency and cost savings in the process of maintaining their corporate geographic information systems (GIS) and asset management systems (AMS). Moreover, a common specification shared between Councils would also provide efficiencies to the Land Development Industry by removing the need to maintain separate processes, standards and software tools for numerous Councils.

The key objectives of the D-SPEC consortium are to streamline stakeholders' processes for receiving, handling and storing of underground infrastructure related to subdivision developments in their GIS. This process will increase the efficiency of information access and result in greater customer satisfaction when dealing with inquiries from consultants, developers and prospective residents.

Significant duplication of effort exists in the digitising of as constructed drainage information. This duplication exists between the private sector (who capture as constructed information), and council staff (who may digitise that information from paper plans).

# **Perceived Benefits**

In the process of accepting and processing lodgements, and in checking existing data against design criteria and/or design plans, the consortium members believe that D-SPEC will improve process efficiency, improve customer service, improve the quality of drainage information held by councils and ultimately enable them to manage drainage assets better.

The D-SPEC Version 5.0 specification document can be downloaded from <u>www.dpsec.com.au</u>. It contains details on the as-constructed attribute definitions.

The surveyed as-constructed digital data of the assets are:

- to be positioned relative to the State Digital Map Base, plus
- be positioned relative to the existing digital drainage data.

It is the responsibility of the consultant to ensure the as-constructed survey digital data of the assets are related to the current digital drainage data held in the council's GIS. The D-SPEC consortium members will make available an extract of any digital stormwater data in the specific project area held in their respective GIS environments.

If the position of the new assets clearly indicates a discrepancy when compared to the position of the existing assets the surveyor must record such discrepancies in the supplied graphics file. This is done through inserting a "P" surrounded by a 10m radius circle.

## **Responsibility of the Consultant**

The consultant shall be responsible for:

- ensuring that the as-constructed details of the works are recorded and certified by a Licensed Surveyor in accordance with the D-SPEC requirements and forwarded to the consortium member prior to works being accepted and receiving a Statement of Compliance;
- ensuring that the data supplied is correct, accurate and complete;
- ensuring the data is supplied within 3 weeks of work being completed;
- ensuring that the information provided is relative to SII's digital cadastral map base; and
- ensuring that any information provided by the consortia members is verified by the consultant prior to any works being processed.

## **Graphical Specifications**

The key principle of D-SPEC is to assign a unique ID to each individual asset (i.e Pit, Pipe and Property Connection) and for this to provide the link between the graphics and the associated attribute data tables. Where data is supplied in a proprietary GIS format it can be assumed that this is already the case, whereas if the data is to be supplied in a CAD format with associated ASCII files, a unique ID must be assigned to each asset.

All as-constructed data is to be supplied in a format specified by each individual D-SPEC consortium member. Currently specified formats are:

- Autodesk Map
- MapInfo Native
- MapInfo MID/MIF
- ESRI ArcInfo Native
- ESRI ArcView Shapefile
- DXF and CSV

## **Attribute File Specifications**

- All coordinates will be provided in the preferred datum of each individual D-SPEC consortium member (generally MGA).
- All Z coordinates (levels) will be provided in AHD metres.
- Maximum field widths are specified for alpha/numeric and alpha data.
- For floating point data the number of characters after the decimal point are specified.
- All fields are to be populated and the associated columns must adopt the specified column names.
- Attribute files are to be supplied for Pipes, Pits and Property Connections.

## **Drainage Attribute Data Conventions and Validation Checks**

Pits/Access points must be uniquely numbered with a maximum of 10 alpha/numeric characters. Where possible the numbers should increase as one progresses upstream.

Each pipe section must also be uniquely named with a maximum of 10 alpha/numeric characters. Generally the pipe name will be derived from the downstream and upstream pit numbers.

The easting and northing coordinates of the pipe ends must coincide with the corresponding pit centre coordinates. This means that the surveyed ends of all pipes entering a pit must be moved to the notional centre of the pit. This raises the issue of data integrity as in some instances it may mean that the pipe end is moved a significant distance laterally. The surveyed invert level of the moved pipe must also change to maintain the pipe grade.

## **Common Attributes**

For each Pit, Pipe and Property Connection the following must be provided:

- Subdivision Name
- Stage Number

- Street Name
- Design Company
- Construction Company
- Plan Number
- Construction Date
- Return Period

Basically all of this information comes from the design plan.

## **Pit Attributes**

Each Pit must also have:

- Type (e.g. SEP side entry pit, GP grated pit, EW end wall)
- Construction Type (e.g. PC pre-cast, CI cast insitu, BR brick)
- Lid Type (e.g. CA cast iron, CI concrete insert, GR grate)
- Side Length and Width
- Cover Level (generally finish surface level)
- Depth (from pit lid to pit bottom)
- Litter Traps (Yes or No)

## **Pipe Attributes**

Each Pipe must also have:

- Downstream and upstream invert levels
- Length
- Diameter (or width if a culvert)
- Height (if a culvert)
- Material (e.g CONC concrete, RC reinforced concrete)

## **Property Connection Attributes**

Each Property Connection must also have:

- Name of pipe into which it discharges
- Allotment number served by the Property Connection
- Material (e.g CONC concrete, RC reinforced concrete)
- Diameter
- Depth to invert below FSL at the property end

# DATA PREPARATION AND EXPORT IN D-SPEC FORMAT

As-constructed stormwater data needs to comprise the following:

- Lines representing pipes from centre of pit to centre of pit (joined from downstream to upstream)
- Points at the centre of each pit lid; the unique name of this Coord being the pit number
- Objects comprising Lines representing the shape of each pit (generally rectangles); the object name being the pit number
- Lines representing the property connection (joined from downstream to upstream).
- A finished surface level Point with the same X,Y as the end of the property connection. This is used to determine the depth of the property connection. (In the absence of this a depth attribute may be assigned to the property connection)
- Lines joining the invert of the pit (generally the invert of the outlet pipe) to the point on the pit lid. This is used to determine the depth of the pit.
- A Parcel, of class 199, encompassing the project data.

## **Data Preparation**

#### Pit Number

Each Pit must have a unique number. Where possible, these numbers should increase as you progress upstream through the pipe network. These numbers are allocated to each Pit Lid point using *Option 1171 – Assign Coord Name* and can be a maximum of 10 characters.

## Pit Extents

Once the Pit Lid points have been numbered, a rectangle can be created about each defining the inner extents of the Pit using *Option 1382 - Create Rectangle by Length and Width*. These rectangles comprise a GeoCivil object, the name of which is the Pit number. These Pit objects become blocks when the drawing is created.

Typically, at each pit there will be a point at the centre of the lid plus a point at the invert of each pipe and property connection entering or exiting the pit.

#### Pipes

Pipes may either be "strung" in the field to create Line elements automatically in GeoCivil or they may be picked up as Points and be joined to create Line elements in the office. When "stringing" in the field, you should endeavour to start at the downstream end of the pipe and where possible adopt the upstream pit number as the string number.

To create the pipes in the office, adopt the D-SPEC feature then use *Option 1714 – Create Pipe – Join & Retain Points*, as this will retain the invert points in their surveyed positions when the Pipe ends are moved to coincide with the plan position of the Pit Lid centre point as is required in D-SPEC.

#### Property Connections

For each property connection an invert point is required in a pit or near a pipe plus a point within the property and, in order to compute a depth, a finished surface level taken nearby.

#### Pit Depth

For each pit you should join the point on the lid to the lowest pit invert point, which is generally the invert of the exit pipe. This line is created as a *Pit Vertical Axis* feature using *Option 1713 – Join Lower to Higher Coord*.

#### Pipe Ends

A requirement of the D-SPEC specification is that all pipes must be "snapped" to the centre of pits. Use *Option 1383 – Move End of Line Retaining Grade* to make the pipe ends coincident with the pit centre (press Shift key to snap onto point). This retains the grade of the line.

#### Property Connection End

The downstream end of the Property Connections should either coincide with a Pit centre or lie on the Line of a Pipe (use *Option 1715 – Extend Property Connection to Pipe on Grade*).

#### Pipe Directions

The direction of all Pipe and Property Connections lines should be checked using *Option 1712 – Check the Direction of Pipes & PCs*. Where required, Lines may be reversed by clicking *Edit > Position > Reverse Direction of Elements*.

#### Property Connection Depth

The finished surface level (FSL) point near the end of the Property Connection must be made coincident in X & Y using *Option 32 – Move Coord on Screen* (click on the FSL point and then press Shift key to snap onto upstream end of Property Connection).

#### Assign Attributes

Where Pipe or Pit attributes differ from the stage default they must be individually assigned using *Option 1703 – Assign Pipe Attributes* or *Option 1704 – Assign Pit Attributes*.

Each Property Connection must be assigned to an allotment using *Option 1705 – Assign Attributes to Property Connections*. If the Property Connection diameter, material, etc are different to the default values, enter them on the same form.

#### View in Elevation

Some aspects of data verification and editing are best achieved by viewing the pipe network in elevation using *Option 1708 – View Data in Elevation*. Use *Option 1709 – Remove Elevation View* to return to the plan view.

## Design Boundary Extents

The D-SPEC specification requires the design boundary extents be supplied as a polygon in a separate layer with the Development Name and Stage as text labels. To achieve this, create a GeoCivil Parcel using *Option 1711 – Define Design Boundary Extent*. You will be requested to set the appropriate Feature, click the bounding node points and enter the name. The resultant Parcel will be automatically assigned class 199.

# **D\_SPEC ATTRIBUTE NAMES**

Individual Pipes, Pits and Property Connections may be assigned attributes, which are held as part of the element description. Each attribute in the description string is separated by "\". For example, a pipe may be assigned the following description: Pipe\_Diam=375\Material=CONC\Return\_Period=25

The available attribute names are:

PIPE	PIT	PROPERTY CONNECTION
Pipe_Num	Pit_Type	DS_Pipe_Num
Pipe_Diam	Lid_Type	Allot_Num
Material	Con_Type	Depth
Comment	Depth	Diam
Street_Name	Side_Len	Material
Return_Period	Side_Wid	Comment
	Litter_Trap	Street_Name
	Comment	
	Street_Name	

These attributes may be included in the total station Code List together with a list of the associated parameters. For example, when a Pit is surveyed the user would be prompted for the Pit Type, Lid Type and Construction Method with a value selected from a "drop down" list.

The D-SPEC parameters are held in the database file D-SPEC\_Parameters.mdb. The associated tables are:

# Conduit\_Material

Code	Description	Comment
AG	AG Drains	
CONC	Concrete	Not known if reinforced
GEW	Glazed Earthenware	
HDPE	High Density Polyethylene	
IRON	Iron	Type Unknown
MPDE	Medium Density Polyethylene	
PE	Polyethylene	Used for Underground Conduits
PVC	Polyvinylchloride	
RC	Reinforced Concrete - No Class	
RC1	Reinforced Concrete - Class 1	
RC2	Reinforced Concrete - Class 2	
RC3	Reinforced Concrete - Class 3	
RC4	Reinforced Concrete - Class 4	
SPD	Glazed Stoneware	
UCON	Un-reinforced Concrete	
UNK	Unknown	
UPVC	Un-plasticised Polyvinylchloride	Thin Walled - Non Pressure Pipe
UPVC-P	Profile-Wall Un-plasticised Polyvinylchloride	Including Ultra-rib
VC	Vitreous Clay	Spigot/Socket

# Pit\_Construction\_Type

Code	Description	Comment
BR	Brick	
CI	Cast Insitu	Concrete Insitu
PC	Pre-cast	Concrete pre cast
UNK	Unknown	

# Pit\_Lid\_Type

Code	Description	Comment
CA	Cast Iron	
CI	Concrete Insert	
СО	Concrete	
F	Fibreglass	
GA	Steel-Gatic	
GR	Grate	
UNK	Unknown	

# Pit\_Type

Code	Description	Comment
DGP	Double Grated Pit	
DJP	Double Junction Pit	
DSEP	Double Side Entry Pit	
EP	End Pipe	End pipes are not pits, but necessary codes to define pipe endings
EW	End Wall	End walls are not pits, but necessary codes to define pipe endings
GF	Grated Footpath Pit	
GP	Grated Pit	
GPT	Gross pollutant trap	
GS	Grated top and side entry pit	
JP	Junction Pit	
JPC	Junction Pit with Chamber	
JPD	Junction Pit with Drop	
OUTB	Outfall to Bay	
OUTR	Outfall to River/Creek	
PW	Pump Well	
SEP	Side Entry Pit	
TSE	Triple Side Entry Pit	
UNK	Unknown	
VP	V Throated Pit	

# Diameters

Pipe & Property Connection diameters may alternatively be assigned on the basis of feature (i.e. entity). This is done through the GeoCivil *Feature Definition Manager*.

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SWD1200	D120	347	34	GX_4	404	1.0mm	Solid	0.1	13mm	9	9		
SWD1350	D135	348	34	GX_4	404	1.0mm	Solid	0.1	13mm	9	9		
SWD150	D150	332	34	GX_4	404	1.0mm	Solid	0.1	13mm	9	9		
SWD1500	D15D	349	34	GX_4	404	1.0mm	Solid	0.1	13mm	9	9		
SWD1650	D165	350	34	GX_4	404	1.0mm	Solid	0.1	13mm	9	9		
SWD1800	D180	351	34	GX_4	404	1.0mm	Solid	0.13mm		<b>V</b>	V.		
SWD1950	D195	352	34	GX_4	404	1.0mm	Solid	0.13mm		<u> </u>	V.		
SWD2100	D210	353	34	GX_4	404	1.0mm	Solid	0.13mm		¥	V		
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SWD300	D300	334	34	GX_4	404	1.0mm	Solid	0.13mm		¥	¥		
SWD375	D375	335	34	GX /	404	1.0mm	Solid	0.1	13mm	-V	V		
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# SOFTWARE TOOLS

A number of software tools have been included in GeoCivil to assist with the data preparation. These have been grouped onto a D-SPEC toolbar.



The D-SPEC process basically progresses from left to right across the toolbar.

# <sup>F3/2</sup> Option 1171 – Assign Pit Name

Before running this option you should turn off all features except the *Pit Lid Centre Points*.

Commencing at the drainage discharge point click on the Pit Lid Centre Point and assign its unique number, using a maximum of 10 characters. These may be alpha/numeric and may contain the stage number (e.g.  $3\21$ ,  $3\22$ , etc)

# Deption 1382 – Create Rectangle by Length and Width

Before running this option, set the current feature to Pit or Access Point.

This requires you to enter the length & width, click the centre point and then enter (or click) the orientation bearing. The rectangle will be created of the current feature and will be made into an object, which is assigned the name of the centre point (the pit name).

# **28** Option 1707 – Define Pit as Object

If the pit rectangle already exists it can be made conform with the D-SPEC requirements. Click on a Pit line and then click the Pit centre point (to which the pit name has previously been assigned).

Note: Occasionally you may encounter a non-standard access point in the form of an end wall, inspection shaft or non-rectangular pit. These must be created using general GeoCivil coordinate geometry routines.

# 🗡 Option 1714 – Create Pipe – Join & Retain Points

Where Pipe inverts have been surveyed as Points it is necessary to create the Pipes. Click the downstream Point and then the upstream point.

# Option 1713 – Join Lower to Higher Coords

This tool can be used to create Pipes (joining from downstream to upstream end) and can be used to create the Pit vertical axis, which defines the Pit depth.

# Option 1383 – Move End of Pipe Retaining Grade

The pipe ends must coincide with the pit centre. When moving the pipe ends it is essential to retain the grade of the pipe. The end of a Line is clicked and then a new location clicked. The Shift key is held down during the second click to snap onto an existing Coord. The original grade of the Line is retained.

# 

The surveyed downstream end of a Property Connection must fall on a pipe or coincide with a Pit centre. This tool extends a Property Connection on its grade to intersect a Pipe. First click the Pipe and then click each associated Property Connection.

# **Provide a contraction of Pipes & PCs**

All Pipes & PCs must be defined from downstream to upstream end. This tool will display an arrow on each Pipe and Property Connection. Click on any that are to be reversed.

# **61** Option 1708 – View Data in Elevation

This option displays the pipe network in elevation view. Click a Coord about which the Z axis is to be rotated then enter of define the bearing to become the new X axis.





Zooming in on the elevation view allows you to examine the relationship between pipes, pits and property connections. If you press F9 the RLs will be displayed.

# **Option 1709 – Remove Elevation View**

The screen display reverts from elevation to plan view.

# Option 1703 – Assign Attributes to Pipes

Pipe attributes may be entered into the form. Fields left empty will inherit the project default values.

The diameter of a pipe may alternatively be derived from the associated Line's feature attributes (see **Diameters** above).

	a b bi cortai	annocoris		
PA/6	Pipe Attributes Number Diameter (mm) Material Return Period Street Name Comment	375 CONC - Concrete SAND BEDDING		24/7
2A/2		Apply	Cancel	24/3

# Option 1704 – Assign Attributes to Pits

Pit attributes may be entered into the form. Fields left empty will inherit the project default values.

E	D-SPEC Para	ameters		
	Pit Attributes	SEP - Side Entru Pit		
	Type Lid Type	CI - Concrete Insert		
	Construct Type	CI - Cast Insitu	•	
	Depth	1.25		
	Length	1200		
	Width	900		
	Litter Trap (Y/N)		Y	
	Street Name	PONTING PLACE		1
	Comment			2A/7
L	\	Apply	Cancel	
2 <b>A</b>	/2			
				2A/3
				1 -

# Option 1705 – Assign Attributes to Property Connections

Property connection attributes may be entered into the form. Fields left empty will inherit the project default values.

The Allot Number must be assigned being the lot served by the Property Connection.

The diameter of a pipe may alternatively be derived from the associated Line's feature attributes.



# 🔢 Option 1711 – Define Design Boundary Extent

D\_SPEC requires the graphics to include the extent of the drainage project to be represented by a closed boundary. Create each extent node by LMB click. Use a RMB to finish and close the polygon. Enter a name for the region (e.g. STAGE 3). The resultant GeoCivil Parcel will be assigned class 199.



G Database Link Manager	
Database Linked Data D-SPEC	
GIS Databases / Tables	
I11111ascondrainage05-DSPEC.   Pipe   Pipe   Pit   PropertyConnection	)S_IL

The logic adopted when populating the database is as follows:

All displayed Point features are considered to be Pit Lid centres.

Line elements are differentiated as follows:

- All Lines containing the attribute "DS\_Pipe\_Number" or "Allot\_Num" will be considered to be Property Connections
- All Lines comprising an Object are considered to be Pit extents
- All Lines comprising Parcels are considered to be part of the bounding polygon
- All other Lines are considered to be drainage Pipes

On the *Database Link Manager* form click *D-SPEC* > *Add Pits Pipes PCs*.

A *D-SPEC Parameters* form will be displayed into which the project header and default values are entered. These values can be saved to a .TXT file by clicking the *Save Parameters* button. In subsequent sessions these parameters can be retrieved by clicking the *Load Parameters* button.

D-SPEC Pipe		
As-Constructed Header ar	nd Default Data	
Subdivision Name	CAMBERWELL ESTATE	
Stage Number	28	
Design Company	GECOMP-SUNTAC PTY LTD	
Construction Company	BOB THE BUILDER	
Plan Number	987654A	
Street Name	MARGARET COURT	
Construction Date	1/11/05 Plot Scale	500
Pit Default Values		
Pit Type	SEP - Side Entry Pit	▼
Construction Type	CI - Cast Insitu	-
Lid Type	CI - Concrete Insert	-
🔲 Litter Trap		
Pipe Default Values		
Pipe Material	RC - Reinforced Concrete - No Class	•
Diameter (mm)	375 Return Pe	eriod (yrs) 5
Property Connection De	fault Values	
P.C. Material	FVC - Polyvinylchloride	▼
P.C. Diameter (mm)	150 💌	
Load Parameters	Gave Parameters Populate Database	Close

Click the *Populate Database* button to close the parameters form and move on to adding the as-constructed data to the database.

## **Option 1701 – Populate D-SPEC Pits Pipes & Connections**

The elements of the current selection are used to populate the database. This means that different regions of a drainage project can be added as required. Before making a selection turn off all elements not required. The only elements required are Pits, Pipes and Property Connections.

G Database Link Manager							
Database Linked Data D-SPEC							
GIS Databases / Tables	Table:	Pipe					
⊡-D-SPEC Survey.mdb	ID	GIN Pipe_Number	Subdivision_Name	Stage_Number	Street_Name	DS_IL	~
Pipe	1	64 1-2	CAMBERWELL ESTATE	2B	MARGARET COURT	74.557	
Pit	2	65 2-3	CAMBERWELL ESTATE	2B	MARGARET COURT	74.76	=
PropertyConnection	3	66 3-5	CAMBERWELL ESTATE	2B	MARGARET COURT	75.237	
	4	67 2-4	CAMBERWELL ESTATE	2B	MARGARET COURT	74.876	~
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## **Option 1702 – Export**

When Pit, Pipe and Property Connection database tables are completed and verified, the data is exported in MapInfo Mid/Mif format, as .CSV files and the graphics saved in .DWG and .DXF files. On the *Database Link Manager* form click *D-SPEC* > *Export*. A report is displayed showing the current contents of the database.

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# Doption 1706 – Create D-SPEC Plan Drawing

This creates a drawing of the currently displayed elements and treats Objects (eg Pits) as drawing blocks. Pipes are automatically labelled with pipe type and diameter. A parcel of class 199 is treated as the project extent polygon and will be included in the drawing as such. During the drawing creation process the D-SPEC data is also exported to .CSV files (Pipe, Pit & Property Connection).