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Research Article



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Analyses of Canal Flows in NSP (Nagarjuna Sagar Project) Right Canal Using Flow Pro 2.1 Software

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ABSTRACT

Nagarjuna Sagar Right (Jowhar) Canal Command area spared 37 mandals in Guntur and 23 mandals in Prakasham districts. Hydraulic particulars of main and branch canal was collected from Water resources department, Lingamguntla circle and Ongole circle. The area irrigated under Nagarjuna Sagar Right Canal (Jawahar canal) is 4.75 lakh ha covering Guntur district with 2.84 lakh ha and Prakasam district with 1.91 lakh ha. The computed values at head, middle and tail section s of the main canal were 3.05 m/s, 0.85 m/s and 0.719 m/s and as per the design 3.048 m/s, 0.85 m/s and 0.814 m/s respectively. The variation in values is also not more than 11%. The computed values at head, middle and tail sections of the Addanki branch canal was 0.807 m/s, 0.782 m/s and 0.73 m/s and as per design 0.889 m/s, 0.87 m/s and 0.805 m/s respectively. The maximum variation is even not more than 10%. Darsi branch canal were 0.832 m/s, 0.802 m/s and 0.155 m/s and as per the design 0.82 m/s, 0.753 m/s and 0.135 m/s respectively. The maximum variation is even not more than 14%. Hence, the simulated discharges of flowpro2.1 software compared with designed discharges and velocities and there is no much variation in canal flow.

Keywords: NSPRCC, Hydraulic particulars, Flowpro, Water surface profile and Critical depth.

INTRODUCTION

Nagarjuna Sagar Project is built across river Krishna at Nandikonda village of Nalgonda District. The main objective of this Nagarjuna Sagar project is to bring the 9 lakhs hectare of land in to cultivation. The right canal was designed 11,000 cusecs carrying capacity. Rapid growth in industrialization and urbanization in the country resulted as decrease in the availability of water for domestic and irrigation purpose and it creates the high demand in those sectors.

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Guntur and Prakasam Districts of 4.75 lakhs ha area is irrigating by Nagarjuna Sagar Jawahar Canal (Anonymous, 1999). The Canal is divided into 9 branch canals spread across Guntur and Prakasam districts. The Right main canal having Guntur, Zulakallu, Bellarnkonda, Peddanandipadu, Addanki, Eddanapudi, Darsi, Pamidipadu and Ongole branch canals. The scope for resilience and adaptation of large surface irrigation systems is vital to the development of management strategies designed to mitigate the impact of river basin closure on food production and the livelihoods of farmers.

Study area

Nagarjuna Sagar Project Right Canal (Jawahar) Command

The command area lies between the latitudes of 15° 20' to 16° 41' 24" N and the longitudes of 79° 18'44" to 80° 25' 56" E, encompassing Guntur and Prakasham districts in the state of Andhra Pradesh. The geographical command area consists from block 1 to 22 (GA) as shown in Figure 1.



Figure1. Location map of study area

Nagarjuna Sagar Right (Jowhar) Canal Command area spared 37 mandals in Guntur and 23 mandals in Prakasham districts.

Milage	N	Name of the Branch Canal/ Major	Length	Designed	Block
M-F-Ft	MAI		M-F-Ft	discharge in C/S	No
0-0-000	CHT	Right Canal Head Regulator		11,000	
4-6-000	R RIG	Pasuvemula Major	1-0-207	5.24	1
7-0-000	<u>GAI</u> NAL	Tallapalli Major – I	0-4-365	4.48	2
8-4-000	A SA CA	Tallapalli Major – II	0-4-300	10.13	2
12-1-558	NDC	Mallavaram Major	7-7-572	126.18	3
13-6-000	GAR	Khambampadu Major	1-6-290	18.53	3
15-7-000	NA	Paluvai Major	5-0-110	64.09	3
20-7-076		Buggavagu O T Regulator		11000	

Line Diagram	of Nagarjuna	Sagar Right	Main Canal

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21-7-00	Rentachintala Major	9-5-655	42.64	4
24-0-110	Daida Major	12-6-360	266.40	4
24-6-440	Charlagudipadu Major	3-4-150	24.16	4
27-3-550	Miryala Major	2-5-495	17.20	5
30-2-220	Ramapuram Major	18-3-018	253.80	5
33-4-000	Pedakodamagundla Major	2-4-402	22.30	5
34-2-655	Cross regulator cum surplus escape		10100	
38-0-330	Kesanupalli Major	6-6-613	68.80	6
40-4-280	Zulakallu Branch Canal	1-3-299	564.29	6
42-0-560	Janapadu Major	4-4-000	34.40	6
46-3-000	Guttikonda Major	2-4-535	15.20	7
47-3-550	Kotanemalipuri Major	7-2-330	31.40	7
49-5-570	Bellamkonda Branch Canal	11-3-027	645	8&9
52-5-165	Guntur Branch Canal	32-1-000	2920	10
52-7-400	O.T. of 1 AR Kothapalli Major(shifted from GBC)		8.64	10
57-0-475	Addanki Brach Canal	37-3-272	2469	11
57-2-250	Cross regulator		3947.00	
58-6-543	Inumella D.P		1.07 / 0.25	11A
59-5-300	Inumella Major	8-0-080	23.20	11A
64-2-330	Ipur D.P		1.80	12
66-0-610	Angaluru Major	8-0-440	52.02	12
69-6-049	Perumallapalli Major	20-5-372	192.60	13
74-0-470	Perurupadu Major	3-1-110	28.97	13
78-3-196	Dondapadu Major	6-2-220	48.97	14
81-5-474	Cheekateegalapalem Major	14-1-550	140.14	14
83-2-402	Palakuru Major	0-6-250	5.57	14
85-3-150	Cross regulator cum escape		3346	

Description of Flow pro 2.1

Flow Pro 2.1 Visually design waterways and channels with an intuitive interface. Effortlessly design open-channel waterways, culverts, irrigation channels, sluiceways, and flumes with Flow Pro. Looking for easy to use software to help you plot water surface profiles, or calculates critical depth and slope. Flow Pro saves you time and money by letting you compare more than one hydraulic design alternatives and exports the results to Word or Excel. Visualize depth, flow, and velocity with its built-in graphing software.

The software having File, Channel type, Units, Tools and Help are appeared in the main menu bar. DUFLOW is a microcomputer software package for simulating oneInd. J. Pure App. Biosci. (2020) 8(5), 31-39

dimensional unsteady flow in open-channel systems by Clemmens et al. (1993). In Channel type there is option to select the sections like trapezoidal, circular, U shaped, elongated circular and channel type and name. In units icon select the either SI or English. According to Charles et al. (2018) requires calculated, remote manual adjustments to all the canal check structure gate positions in addition to two flow rate changes made at the head of the canal, followed by are turn to automated upstream control. In Tools icon critical depth and slope, depth, flow rate, slope and Roughness, Orifices, underflow gates, water surface profile and weirs.

Nagarjuna Sagar Right Canal Command area flows were analyzed using the Flow Pro 2.1 version software at three different sections like head section, middle and tail end of the main canal. The input data needed for the software as given in the Table 1 and computed water surface profiles as shown in Figure 1, 2 and 3.

S No	Particulars	Head section	Middle	Tail end
1	Start Station, m	0	92211+00.000	199616+00.000
2	End station, m	3532+00.000	92593+00.000	202796+00.000
3	Flow rate, m ³ /s	311.49	111.77	79.65
4	Width, m	18.593	26.213	18.8976
5	Manning's	0.018	0.0255	0.0255
6	Bottom slope	0.00034072	0.00008333	0.00008333
7	Control depth, m	9.296	3.871	3.871
8	Side slope	0.25:1	2:1	2:1

4					Flow	Pro 2.1 (unregi	stered)					_ 0
e Channel Type	e Units Tools	Help										
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Required	d Inputs					Wate	er Surface Profil	le Data				
itart station, m:	0+00.000	Station	Depth	Specific	Area	Velocity	Тор	Momentum	Froude	Velocity	Hydraulic	Wetted
ad abation inc	2522+00.000	m	m	m	m^2	m/s	Width, m	cms	Number	Head, m	Radius, m	Per, m
na station, in:	3332400.000	3532+00.000	9.296	9.427	194.417	1.602	23.238	921.070	0.031	0.131	5.150	37.754
owrate, m^3/s:	311.49	3523+48.600	9.082	9.219	189.444	1.644	23.131	881.240	0.034	0.138	5.077	37.312
fidth.m:	18.59	3514+73.600	8.867	9.012	184.494	1.688	23.024	842.539	0.036	0.145	5.004	36.870
	(around	3505+70.900	8.653	8.806	179.567	1.735	22.916	804.968	0.039	0.153	4.929	36.428
anning's n:	0.010	3496+35.300	8.438	8.600	174.664	1.783	22.809	768.527	0.042	0.162	4.854	35.985
attom slope:	0.00034072	3486+60.000	8.224	8.395	169.783	1.835	22.702	733.216	0.046	0.172	4.777	35.543
ontrol depth m	9.296	3476+36.300	8.009	8.191	164.925	1.889	22.595	699.038	0.050	0.182	4.699	35.101
and or obpart, m.	0.000	3465+52.100	7.795	7.988	160.091	1.946	22.487	665.994	0.054	0.193	4.619	34.659
de slope:	0.25	3453+90.500	7.580	7.785	155.279	2.006	22.380	634.089	0.059	0.205	4.538	34.217
		3441+26.800	7.366	7.584	150.490	2.070	22.273	603.325	0.065	0.218	4.456	33.775
. .	10 11	3427+22.800	7.151	7.384	145.724	2.138	22.166	573.709	0.071	0.233	4.372	33.332
Computed	d Results	3411+14.400	6.937	7.186	140.982	2.209	22.058	545.246	0.078	0.249	4.286	32.890
m atrach leave	6.072	3391+81.800	6.722	6.989	136.262	2.286	21.951	517.945	0.086	0.266	4.199	32.448
onnaracipar, n.		3366+57.800	6.508	6.793	131.565	2.368	21.844	491.815	0.095	0.286	4.111	32.006
ormal area, m^2:	122.101	3326+98.400	6.293	6.600	126.892	2.455	21.737	466.868	0.105	0.307	4.020	31.564
itical depth, m:	3.017	2963+17.200	6.079	6.410	122.241	2.548	21.629	443.117	0.117	0.331	3.928	31.122
itical area, m^2:	58.370											
nfile tune: mild,	.M·1											
ow tuper subr	ritical											
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Fig. 1: Flow Pro computed water surface profile data and other parameters at head section of the NSRC command area

Normality in the Channel Type Units Tools Help Image: Channel Type Units Tools Help Necuried Inputs Water Surface Profile Dats Statistion, nr. Sizil-100.000 Normality in the Specific Area Water Surface Profile Dats Statistion, nr. Sizil-100.000 Sizil-100.000 Normality in the Specific Area				Flow Pro 2.1 (unregistered)								_ 0		
Image: Second	e Channel Type	Units Tools	Help					giotoroay						_
Computed Results State Name Number Hoddau Mediate Mediate <th></th>														
Water Surface Profile Data State station, m. South and m.														
Start tation, m: frid tation, m: g2291-00.000 m 92211-00.000 m 92211-00.000 m 92293-00.000 m 3071 3308 131.40 3308 131.40 0.455 Number M*d/M; m Fixude m Velocity m Hydraulic m Velocit	Required	I Inputs					Wate	er Surface Profi	le Data					
m m m m m2 m4 Wdrh, m cm Number Head, m Radius, m Per. Sep39-00.00 3 671 3908 131.40 0.685 41.897 244.789 0.023 0.035 3.022 4.355 Sep39-00.000 3 690 3.927 13.242 0.845 41.774 244.724 0.023 0.035 3.022 4.351 Sep39-00.000 3 690 3.927 13.242 0.845 41.774 244.724 0.023 0.035 3.022 4.351 Sep39-00.000 3.930 3.946 13.8407 0.845 41.774 244.724 0.023 0.035 3.022 4.351 Sep30-00.000 3.930 3.946 13.8407 0.825 44.020 0.023 0.035 3.067 4.352 Sep30-00.000 3.937 3.946 4.021 156.455 0.021 0.024 0.024 0.034 3.067 4.354 Sep30+30.000 4.025 4.025 <t< th=""><th>art station, m:</th><th>92211+00.000</th><th>Station</th><th>Depth</th><th>Specific</th><th>Area</th><th>Velocity</th><th>Top</th><th>Momentum</th><th>Froude</th><th>Velocity</th><th>Hydraulic</th><th>Wetted</th><th>^</th></t<>	art station, m:	92211+00.000	Station	Depth	Specific	Area	Velocity	Top	Momentum	Froude	Velocity	Hydraulic	Wetted	^
convalue, m ² 3/2; 111.77 252659-00.00 3 677 3 938 131.440 0.850 4 1877 244.798 0.023 0.037 3 0.00 4 352 jaming's r. 0.025 0.035 3 0.02 4 352 3 0.02 4 352 3 0.02 4 352 3 0.02 4 352 3 0.02 4 352 3 0.02 4 352 3 0.02 4 352 3 0.02 4 352 3 0.02 4 352 3 0.02 4 352 3 0.02 4 352 3 0.02 4 352 3 0.02 4 352 3 0.02 4 352 3 0.02 4 352 3 0.02 4 352 3 0.02 4 352 3 0.02 4 352 4 351 3 0.02 4 352 4 351 3 0.02 4 352 4 351 3 0.02 4 352 4 353 3 0.02 4 353 3 0.02 4 353 3 0.02 4 352 4 352 4 351 4 0.02 0.035 3 0.02 4 353 3 0.02 4 353 3 0.02 4 353 4 352 4 354 3 0.02 4 0.02 0.035 3 0.02 4 0.02<	nd station im	92593+00.000	m	m	m	m^2	m/s	Width, m	cms	Number	Head, m	Radius, m	Per, m	_
condext, m: 3/2: 11.1/1 2/2: 0.00 3980 392/2 12.2/2/2 0.045 10/2/2 0.035 30.02 4.301 arring n: 0.0255 3/2 3.845 133.049 0.840 41.851 2/26.724 0.023 0.035 3.045 4.3337 arring n: 0.0255 0.00003233 3.846 133.049 0.840 41.851 2/26.7241 0.022 0.035 3.045 4.3337 attom slope: 0.00003233 3.946 133.049 0.849 41.930 2/26.7241 0.022 0.035 3.045 4.3337 system nick dept, m: 3.371 3.966 4.021 136.674 0.021 0.024 0.044 44.04 system nick dept, m: 3.371 0.000 4.025 4.068 137.987 0.811 42.236 2.267.609 0.001 0.033 3.119 44.12 system nick dept, m: 141.061 0.072 0.072 0.033 3.131 44.22 2.281.9 0.020 0.033 3.144 44.394 system nick dept, m: 141.661 <td>in attaction, m.</td> <td>111.77</td> <td>92593+00.000</td> <td>3.871</td> <td>3.908</td> <td>131.440</td> <td>0.850</td> <td>41.697</td> <td>244.759</td> <td>0.023</td> <td>0.037</td> <td>3.020</td> <td>43.525</td> <td></td>	in attaction, m.	111.77	92593+00.000	3.871	3.908	131.440	0.850	41.697	244.759	0.023	0.037	3.020	43.525	
Videls, m. D26.213 (2566-81.000 3.909 3.945 13.3045 0.840 4.1651 247.724 0.023 0.036 3.045 4.849 torningin, n. 0.0255 0.00008333 3.945 13.3045 0.840 4.1851 247.724 0.022 0.036 3.045 4.389 considers, m. 0.00008333 13.4457 0.830 4.2041 257.724 0.022 0.035 3.077 4.382 considers, m. 3.877 4.002 13.8457 0.825 4.2081 257.83 0.022 0.035 3.064 4.4081 25254+0.000 3.986 4.021 13.8457 0.820 4.2181 258.448 0.021 0.034 3.064 4.4081 25254+0.000 4.004 4.007 135.74 0.820 4.2181 2.258.448 0.021 0.034 3.107 4.4183 25264+80.000 4.004 4.007 139.071 0.801 4.238 2.280.480 0.021 0.033 3.114 4.4183	owrate, m ¹¹ 3/s:	1111.77	92585+00.000	3.890	3.927	132.242	0.845	41.774	247.234	0.023	0.036	3.032	43.611	
Computed Results Signed Processing Signed Procesing Signed Procesing	fidth, m:	26.213	92576+31.000	3.909	3.945	133.045	0.840	41.851	249.724	0.023	0.036	3.045	43.697	
Marting Arm Vector Score-3/L0U 3.948 3.933 13.4657 0.810 4.204 257.474 0.022 0.035 3.070 4.388 orbitol depth, m. 3.977 3.977 4.002 135.455 0.825 4.2081 257.233 0.022 0.035 3.070 4.3884 4.3954 orbitol depth, m. 3.977 137.475 0.825 4.2081 257.233 0.022 0.035 3.070 4.3864 4.3954 Score 3.977 4.002 135.455 0.825 4.2181 257.233 0.022 0.035 3.070 4.3864 4.434 Score 3.977 4.012 135.455 0.825 4.2181 2.025 0.020 0.033 3.119 44.12 Score 4.4407 138.971 0.816 4.027 2.656 0.020 0.033 3.114 4.438 2.0226 0.020 0.033 3.118 4.444 4.437 Score 17.917 138.071 0.916 <t< td=""><td>anning's n</td><td>0.0255</td><td>92566+81.000</td><td>3.929</td><td>3.964</td><td>133.850</td><td>0.835</td><td>41.928</td><td>252.231</td><td>0.022</td><td>0.036</td><td>3.057</td><td>43.782</td><td></td></t<>	anning's n	0.0255	92566+81.000	3.929	3.964	133.850	0.835	41.928	252.231	0.022	0.036	3.057	43.782	
attom dop: 0.000833 3977 3977 3971 3977 3971 3977 3971 3977 3971 3977 3971 3977 3971 3977 3971 3091 3971 3094 2531+870.00 3.094 4009 3177.085 01019 0.021 2521+870.00 4.006 4009 137.937 01019 0.021 2521+870.00 4.006 4.021 137.937 01019 0.022 2521+870.00 4.006 2521+870.00 4.006 2521+870.00 4.006 2521+870.00 4.003 2521+870.00 4.003 2523+848 0.021 2523+848 0.021 25245+30.00 4.024 25245+30.00 4.025 2523+848 0.021 2523+848 0.021 2523+848 0.021 2523+848 0.021	anning s ri:	0.0233	92556+37.000	3.948	3.983	134.657	0.830	42.004	254.754	0.022	0.035	3.070	43.868	
convol deph, m 3871 gestore 4000 2051725.000 4006 4009 4019 2051725.000 4006 4009 4019 2020176.000 4004 4009 137,097 0811 42,238 2020176.000 4044 4007 138,171 0806 42,238 2020196.000 4044 4005 133,528 0810 42,488 202176.000 4083 4101 4112 4119 0732 22314.0000 4104 4117 142,683 0783 42,776 208,770 0.019 0.021 31	ottom slope:	0.00008333	92544+80.000	3.967	4.002	135.465	0.825	42.081	257.293	0.022	0.035	3.082	43.954	
Source Source<	notrol depth in:	3.871	92531+87.000	3.986	4.021	136.274	0.820	42.158	259.848	0.021	0.034	3.094	44.040	
de idope: IS S2500-65000 4.025 4.058 137.997 0.811 42.312 2260.06 0.021 0.033 3.119 44.212 S2400-95.00.00 4.025 4.058 137.997 0.811 42.339 2267.069 0.021 0.033 3.119 44.219 S2400-95.00.00 4.042 4.077 138.711 0.006 42.239 0.020 0.033 3.131 44.249 S2407-95.00.00 4.063 4.096 139.565 0.011 42.646 277.229 0.020 0.033 3.144 44.349 S2478-76.00 4.063 4.096 139.565 0.011 42.646 277.229 0.020 0.033 3.144 44.349 S2478-76.00 4.002 4.114 14.161 0.792 42.656 277.295 0.020 0.033 3.184 44.568 S2347-86.00 4.124 4.112 14.2802 0.783 42.775 286.670 0.013 0.031 3.183 44.726 S246			92517+25.000	4.006	4.039	137.085	0.815	42.235	262.419	0.021	0.034	3.107	44.126	
S240-99.000 4.044 4.077 138.711 0.006 4.2.38 267.699 0.020 0.033 3.131 44.289 294.796.100 0.033 3.131 44.384 44.384 43.84 44.84 44.38 44.384 43.84 43.84 43.84 43.84 43.84 43.84 43.84 43.84 43.84 43.84 43.84 43.84 43.84 43.84 43.84 43.84 43.84 43.84 44.56 275.517 0.019 0.032 3.180 44.456 42.773 280.970 0.019 0.031 3.133 44.731 44.731 44.733 44.731 44.733 44.731 44.731 44.731 44.731 42.776	de slope:		92500+50.000	4.025	4.058	137.897	0.811	42.312	265.006	0.021	0.033	3.119	44.212	
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Computed Kesuts omail depth, m. 4160 23211-100.000 40.02 4115 140.043 0.796 42.543 272.855 0.020 0.032 3166 44.456 sozial depth, m. 143.649 718 42.513 272.857 0.019 0.032 3166 44.456 sozial depth, m. 143.649 141.15 141.181 0.787 42.659 278.157 0.019 0.032 3180 44.456 sozial depth, m. 1191 142.02 0.787 42.659 278.157 0.019 0.032 3180 44.457 sozial depth, m. 1191 142.033 0.783 42.776 280.970 0.019 0.031 3133 44.731 size alrea, m.*2 24.045 140.472 142.833 0.783 42.776 280.970 0.019 0.031 3193 44.731 sov type: subbritical subbritical 140.72 142.833 0.783 42.776 280.970 0.019 0.031 3193 44.731 sow type:	Commenter	Decides	92457+61.000	4.063	4.096	139.526	0.801	42.466	270.229	0.020	0.033	3.144	44.384	
comal depth, m 4160 42371+10:00 4.102 4.134 14.11:61 0.732 4.2519 275.57 0.019 0.032 3.186 44.565 comal depth, m [43.649] 5237+84.000 4.112 4.134 141.161 0.787 42.559 275.157 0.019 0.032 3.186 44.565 sc337+84.000 4.121 4.152 141.981 0.787 42.559 277.185 0.019 0.032 3.186 44.562 inclad depth, m [1797] 143.641 4.171 142.802 0.783 42.2773 280.970 0.019 0.031 3.183 44.728 solid type, midd-H-2 midd-H-2 midd-H-2 142.803 0.783 42.776 280.970 0.019 0.031 3.193 44.731 wings, midd-H-2 midd-H-2 midd-H-2 142.803 0.783 42.776 280.970 0.019 0.031 3.193 44.731 wings, midd-H-2 midd-H-2 midd-H-2 142.803 0.783 42.776	Computed	1 Results	92428+74.000	4.082	4.115	140.343	0.796	42.543	272.865	0.020	0.032	3.156	44.470	
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ormal area, m ⁻² , 143.649 inteal degh, m ⁻² , 143.649 inteal degh, m ⁻² , 240.55 oile type, mid, M-2 tow type: ubbrinded = v + v + v + v + v + v + v + v + v + v	ormai depin, m.	4.100	92337+84.000	4.121	4.152	141.981	0.787	42.696	278.185	0.019	0.032	3.180	44.642	
nical desph. nr 17191 nical aea, nr 2 34.045 note type nubernical	ormal area, m^2:	143.649	92246+35.000	4.140	4.171	142.802	0.783	42.773	280.870	0.019	0.031	3.193	44.728	
inicial area, m ² 34,045 inicial area, m ² 34,045 inicial AM-2 involutional involutional involutional	itical denth. m:	1.191	92211+00.000	4.141	4.172	142.833	0.783	42.776	280.970	0.019	0.031	3.193	44.731	
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Start station. m:	199616+00.000	Station	Depth	Specific	Area	Velocity	Top	Momentum	Froude	Velocity	Hydraulic	Wetted	^
Fund stations and	202796+00.000	m	m	m	m^2	m/s	Width, m	cms	Number	Head, m	Radius, m	Per, m	
Eriu stauori, III.	202730400.000	0+02.02796E+07	3.871	3.901	103.122	0.772	34.382	186.532	0.020	0.030	2.848	36.209	_
Flowrate, m ⁺ 3/s:	79.655	0+02.027879E+07	3.881	3.911	103.474	0.770	34.423	187.567	0.020	0.030	2.854	36.255	
Width, m:	18.8976	0+02.027791E+07	3.891	3.921	103.826	0.767	34.463	188.607	0.020	0.030	2.860	36.301	_
Manning's n	0.0255	0+02.027696E+07	3.902	3.932	104.179	0.765	34.504	189.650	0.020	0.030	2.866	36.347	_
	0.0200	0+02.027592E+07	3.912	3.942	104.532	0.762	34.545	190.696	0.020	0.030	2.872	36.392	_
Bottom slope:	0.00008333	0+02.027477E+07	3.922	3.952	104.886	0.759	34.586	191.747	0.019	0.029	2.878	36.438	
Control depth, m:	3.871	0+02.027349E+07	3.932	3.962	105.240	0.757	34.627	192.801	0.019	0.029	2.885	36.484	_
Side alana	2	0+02.027205E+07	3.943	3.972	105.595	0.754	34.668	193.859	0.019	0.029	2.891	36.530	_
Joide slope.	6	0+02.02/041E+07	3.953	3.982	105.949	0.752	34.709	194.920	0.019	0.029	2.897	36.575	_
		0+02.026851E+07	3.963	3.992	106.305	0.749	34.750	195.986	0.019	0.029	2.903	36.621	_
Compute	ed Results	0+02.026625E+07	3.973	4.002	106.661	0.747	34.791	197.055	0.019	0.028	2.909	36.667	
		0+02.026347E+07	3.984	4.012	107.017	0.744	34.832	198.128	0.018	0.028	2.915	36.713	
Normal depth, m:	4.025	0+02.025987E+07	3.994	4.022	107.373	0.742	34.873	139.205	0.018	0.028	2.321	36.758	_
Normal area m^2	108.456	0+02.025478E+07	4.004	4.032	107.730	0.739	34,314	200.285	0.018	0.028	2.327	35.804	_
ritorinar area, in E.	1.100	0+02.024603E+07	4.014	4.042	100.000	0.737	34,300	201.363	0.018	0.028	2.333	36.650	_
Critical depth, m:	1.168	0+02.0156236.+07	4.024	4.052	100.440	0.755	34.333	202.457	0.018	0.028	2.333	30.030	_
Critical area, m^2:	24.799												
Profile type: mile	d, M-2												
Flauringer Put	ocritical												
Plow type: soc	Johnodi												
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Fig. 3: Flow Pro computed water surface profile data and other parameters at tail end of the NSRC command area

The computed parameters like profile type, flow type, critical depth, critical area, velocity,

wetted perimeter and hydraulic radius as shown in the Table 2 and Figure 4.

	1	1		
S No	Particulars	Head section	Middle	Tail end
1	Profile type	Mild, M-1	Mild, M-2	Mild, M-2
2	Flow type	Subcritical	Subcritical	Subcritical
3	Critical depth, m	3.017	1.190	1.168
4	Critical slope	0.00295	0.00634	0.00646
5	Critical area, m ²	58.37	34.045	24.799
6	Depth (normal), m	9.296	3.871	3.871
7	Velocity, m/s	3.05	0.85	0.719
8	Area, m ²	194.44	131.44	103.12
9	Wetted perimeter, m	37.757	43.525	36.209
10	Hydraulic radius, m	5.150	3.020	2.848

 Table 2: Flowpro2.1 computed values at three levels



Fig. 4: Comparison of flowpro2.1 computed values with designed values at different locations of NSRJC

The computed values at head, middle and tail section s of the main canal were 3.05 m/s, 0.85 m/s and 0.719 m/s and as per the design 3.048 m/s, 0.85 m/s and 0.814 m/s respectively. The

variation in values is also not more than 11%. Similarly, Addanki branch canal of NSRJC input data were tabulated in the following Table 3.

S No	Particulars	Head section	Middle	Tail end
1	Start Station, m	30700+00.000	43721+00.000	199616+00.000
2	End station, m	38025+00.000	50006+00.000	202796+00.000
3	Flow rate, m ³ /s	51.578	41.680	79.65
4	Width, m	22.555	18.288	18.8976
5	Manning's	0.025	0.025	0.025
6	Bottom slope	0.0005152	0.0005152	0.0005152
7	Control depth, m	2.438	2.438	2.286
8	Side slope	1.5:1	1.5:1	1.5:1

 Table 3: Data input for Addanki branch canal of NSRJC

The computed values at head, middle and tail sections of the Addanki branch canal was shown in following Table 4and Figure 5 as 0.807 m/s, 0.782 m/s and 0.73 m/s and as per

the design 0.889 m/s, 0.87 m/s and 0.805 m/s respectively. The maximum variation is even not more than 10%.

Table 4: Computed values at three levels of Addanki branch canal of NSRJC

S No	Particulars	Head section	Middle	Tail end
1	Profile type	Mild, M-1	Mild, M-2	Mild, M-1
2	Flow type	Subcritical	Subcritical	Subcritical
3	Critical depth, m	0.796	0.791	0.731
4	Critical slope	0.00691	0.00698	0.00718
5	Critical area, m ²	18.915	15.412	12.393
6	Depth (normal), m	2.438	2.438	2.286
7	Velocity, m/s	0.807	0.782	0.73
8	Area, m ²	63.905	53.297	44.072
9	Wetted perimeter, m	31.345	27.049	24.092
10	Hydraulic radius, m	2.039	1.97	1.829



Fig. 5: Comparison of computed values with designed values at different locations of Addanki branch canal of NSRJC

Similarly	y, Darsi	branch c	anal of I	NSRJC	input dat	a were	tabulated	in the	following	Table 5	
	,,								O		

S No	Particulars	Head section	Middle	Tail end			
1	Start Station, m	30700+00.000	43721+00.000	199616+00.000			
2	End station, m	38025+00.000	50006+00.000	202796+00.000			
3	Flow rate, m ³ /s	51.578	41.680	79.65			
4	Width, m	22.555	18.288	18.8976			
5	Manning's	0.025	0.025	0.025			
6	Bottom slope	0.0005152	0.0005152	0.0005152			
7	Control depth, m	2.438	2.438	2.286			
8	Side slope	1.5:1	1.5:1	1.5:1			

Table 5:	Data	input fo	or Darsi	branch	canal	of NSRJC
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The computed values at head, middle and tail sections of the Darsi branch canal were shown in following Table 6 and Figure 6.

S No	Particulars	Head section	Middle	Tail end
1	Profile type	Mild, M-1	Mild, M-2	Mild, M-1
2	Flow type	Subcritical	Subcritical	Subcritical
3	Critical depth, m	1.149	1.022	0.054
4	Critical slope	0.00516	0.00513	0.01349
5	Critical area, m ²	39.396	33.224	0.619
6	Depth (normal), m	3.871	3.871	1.829
7	Velocity, m/s	0.832	0.802	0.155
8	Area, m ²	153.84	127.149	2.908
9	Wetted perimeter, m	49.312	45.726	12.383
10	Hydraulic radius, m	3.12	2.781	0.235



Fig. 6: Comparison of computed values with designed values at different locations of Darsi branch canal of NSRJC

From the above data Darsi branch canal were 0.832 m/s, 0.802 m/s and 0.155 m/s and as per the design 0.82m/s, 0.753 m/s and 0.135 m/s respectively. The maximum variation is even not more than 14%.

Hence, the simulated discharges of flow pro2.1 software compared with designed discharges and velocities and there is no much variation in flow. The maximum variation is occurred only 10%.

CONCLUSIONS

The computed values at head, middle and tail section s of the main canal were 3.05 m/s, 0.85 m/s and 0.719 m/s and as per the design 3.048 m/s, 0.85 m/s and 0.814 m/s respectively. Similarly, Addanki and Darsi branch canals were also computed using Flowpro2.1 software. Hence, flow pro2.1 software simulated discharges compared with designed discharges and velocities and there is no much variation in flow.

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